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Centers for Disease Control and Prevention

Influenza Division International Activities

Fiscal Year 2010 Annual Report

View Outline View Table of Contents

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 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 work has contributed to greater global health security.

Special thanks to Ann Moen, Emily Cramer, Sarah O'Brien, Howard Hall, Lucinda Johnson and Meg McCarron for editing and producing this 2010 International Influenza Report.

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Cover Photo Credit

Pig and chicken sharing feed ... and possibly influenza, Rajshahi district, Bangladesh.
Courtesy of Andrea Mikolon, CDC Veterinary Medical Officer, based in Dhaka.

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Centers for Disease Control and Prevention

Influenza Division International Activities

Fiscal Year 2010 Annual Report

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Contents

Influenza Division International Overview

Foreword

Dear Friends and Colleagues,

I am delighted to present to you CDC's Influenza Division International Activities 2010 Annual Report. The report includes detailed updates on the global work supported by the Division including country briefs, research collaborations, training programs, and other influenza-related activities.

In 2010, the Division provided funding support and technical assistance for influenza activities to 48 countries in the form of direct cooperative agreements or indirectly through our partners. Under these agreements, partner countries have made significant progress in the development of their influenza surveillance capacity and pandemic preparedness. Their collective progress is evident in the positive movement of scores captured in 2010 using the Division's National Inventory of Core Capacities for Pandemic Preparedness and Response monitoring and evaluation tool (see page 258). There is no doubt the hard work countries have put in to developing both their laboratory and epidemiologic surveillance systems and strengthening their pandemic preparedness not only enhanced their response to the 2009 influenza pandemic but has also helped to build general capacity for all emerging infectious diseases.

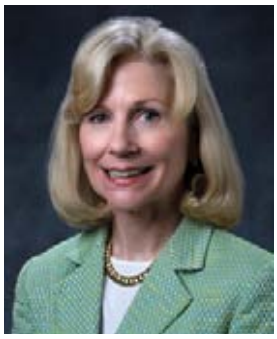
In other achievements for 2010, China's National Influenza Center in Beijing was designated a WHO Collaborating Center for Reference and Research on Influenza. The Division has worked closely with the National Influenza Center in Beijing for over two decades and congratulates China on becoming just one of five such Centers globally. Likewise, the Division wishes to congratulate its partner countries who achieved WHO National Influenza Center status in 2010 in the following locations: Guatemala City, Guatemala; Kathmandu, Nepal; Accra, Ghana; Ho Chi Minh City, Vietnam and Vientiane, Lao People's Democratic Republic.

The findings in this report represent a substantial amount of work, cooperation and dedication from all involved. I would like to take this opportunity to thank our country partners, international collaborators, field staff, CDC partners and the Atlanta-based team on their achievements for 2010, which are shared by all.

We hope you enjoy reading this update and very much look forward to working with all our partners in the future.

Warmest wishes,

Nancy Cox
Director, Influenza Division
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention



Mission

Mission statement: The Centers for Disease Control and Prevention (CDC) Influenza Division (ID) provides scientific and programmatic foundation and leadership for the diagnosis, prevention, and control of influenza domestically and internationally.

In carrying out its mission, the ID:

(1) conducts global and domestic surveillance to guide vaccine formulation and understand the impact of influenza;

(2) develops policy for the prevention and control of influenza;

(3) 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 for the purpose of developing better tools for the prevention and control of influenza; and

(4) provides international technical assistance for outbreak investigations, the expansion of laboratory and epidemiologic capacity, and international and domestic training.

Background

CDC's Influenza Division has a long history of supporting the World Health Organization (WHO) and its global network of National Influenza Centers (NICs). With limited resources, most international assistance provided in the early years was through hands-on laboratory training of in-country staff, the annual provision of WHO reagent kits (produced and distributed by CDC), and technical consultations for vaccine strain selections. The Influenza Division (at that time, the Influenza Branch) also conducted epidemiologic research including vaccine studies and serologic assays and provided international outbreak investigation assistance.

In 1997, the first human cases of influenza A (H5N1) were reported in Hong Kong, and the Influenza Division played a key role in assisting with the outbreak investigations. The re-emergence of fatal human cases of avian influenza A (H5N1) in China in 2003 following the outbreak of SARS, followed by human outbreaks caused by highly pathogenic avian influenza A (H5N1) viruses in Vietnam and Thailand in 2003 and 2004 led to a growing concern that a pandemic of influenza may emerge. These outbreaks highlighted several important gaps that needed to be closed to improve the ability to rapidly identify novel influenza viruses with pandemic potential. These 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.
- longstanding obstacles and gaps in the sharing of information, resources and specimens between agriculture and human health authorities.

These events fostered the beginning of a larger international program to improve global pandemic preparedness and enhance capacity for laboratory and epidemiologic surveillance of influenza and avian influenza.

In 2004, the U.S. government (Health and Human Services (HHS)/CDC) committed resources and developed a multi-faceted approach to support global capacity for seasonal influenza and pandemic preparedness. Support was made available through cooperative agreements to enhance the existing

Influenza Division microbiologist inoculating 10-day old embryonated chicken eggs with a specimen containing an H5N1 avian influenza virus.

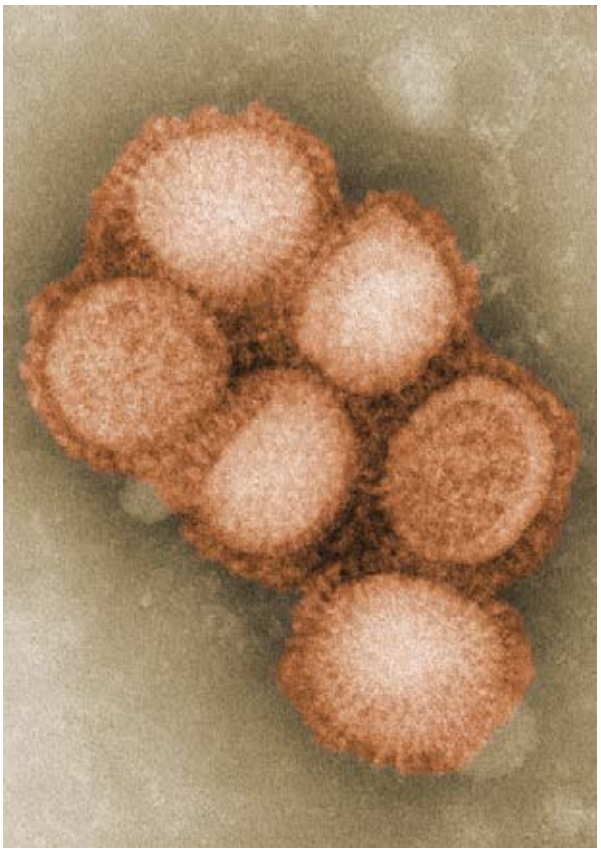
WHO Global Influenza Program (GIP) and to help establish influenza surveillance in some countries not participating in WHO's GIP. These cooperative agreements, paired with technical assistance, support the provision of training, staffing, direct assistance, supplies and reagents. The program accomplishes key goals by building on existing programs and infrastructure including WHO and its regional offices, CDC Global Disease Detection (GDD) sites and International Emerging Infections Program (IEIP) sites, Department of Defense (DoD) international program sites, and by utilizing the assistance of U.S. embassies.

In April 2009, the first case of pandemic 2009 H1N1 influenza virus infection in the United States was identified. Subsequent cases were quickly identified in Mexico and other states. 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. The 2009 H1N1 pandemic allowed many countries with cooperative agreements to showcase the progress they have made in the last few years. First-time investigations of influenza were conducted in response to the pandemic and labs that previously could not identify influenza virus were able to diagnose pandemic 2009 H1N1 using molecular techniques. Many countries that previously had not reported influenza routinely were able to report consistently and contribute to the global picture of influenza epidemiology during the pandemic.

Over the past six years the program has undergone remarkable growth [see Maps] and has expanded to provide support to over 40 countries, all WHO regional offices and WHO Headquarters. Partnerships have been developed with the DoD, United States Agency for International Development (USAID), Biosecurity Engagement Program (BEP) and other entities to enhance global surveillance and preparedness. Over 20 permanent staff have been placed in the field [see Map] to provide on-the-ground assistance and support to countries and to WHO, and to augment the GDD program.

Recognizing that needs vary by countries, the program is designed as a continuum to include: improvements to surveillance, efforts to enhance pandemic preparedness, implementation of burden of disease studies to measure the impact of influenza, and studies to determine the effectiveness of intervention measures such as vaccination. With the data generated through surveillance, each country can determine which populations are most vulnerable to influenza-related morbidity and mortality and who should receive influenza vaccine. Based on surveillance and other analyses, influenza vaccination policy and issues related to vaccine production can be approached on a country-by-country and a regional basis. In 2010, we embarked on placing more emphasis on the development of data to help countries evaluate the need and feasibility of vaccine policy.

While the response to the 2009 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 in the past years, a broad-based commitment to build and maintain influenza surveillance globally that is sustainable (and eventually self-sustainable) requires dedicated, annualized resources and staffing. It is our hope that these 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. We also envision that each affected country will utilize the technical assistance and resources available to improve surveillance, develop influenza vaccination policy, make plans for the use of influenza vaccine both annually and during a pandemic, and work closely with regional and international partners to further preparedness.



An electron micrograph of the 2009 H1N1 influenza virus taken in the CDC Influenza Laboratory.

This program has implications beyond influenza. The capacity being developed for laboratory and epidemiologic surveillance of severe respiratory disease has served as the basis for capacity for the diagnosis and investigation of other infectious diseases, particularly other respiratory pathogens. Laboratory equipment and training has enabled the diagnosis and investigation of other diseases. Likewise, through the implementation of a global rapid response training program, CDC has provided training and materials for thousands of people in all WHO regions. These courses have enabled the trained teams to participate in outbreaks not only for the recent pandemic but for other respiratory diseases and many other pathogens including Rift Valley Fever, dengue, cholera, Ebola and rabies. Evidence shows that the technical assistance provided by the Influenza Division is assisting countries in increasing their capacity necessary for compliance with the new International Health Regulations (IHR). The generic approach, with a focus on influenza and avian influenza, contributes greatly to global capacity for laboratory, epidemiology and overall preparedness for emerging and re-emerging infectious diseases. Efforts are underway to plan for the sustainability of the gains that have been made. This report is the third annual update on the Influenza Division's international activities

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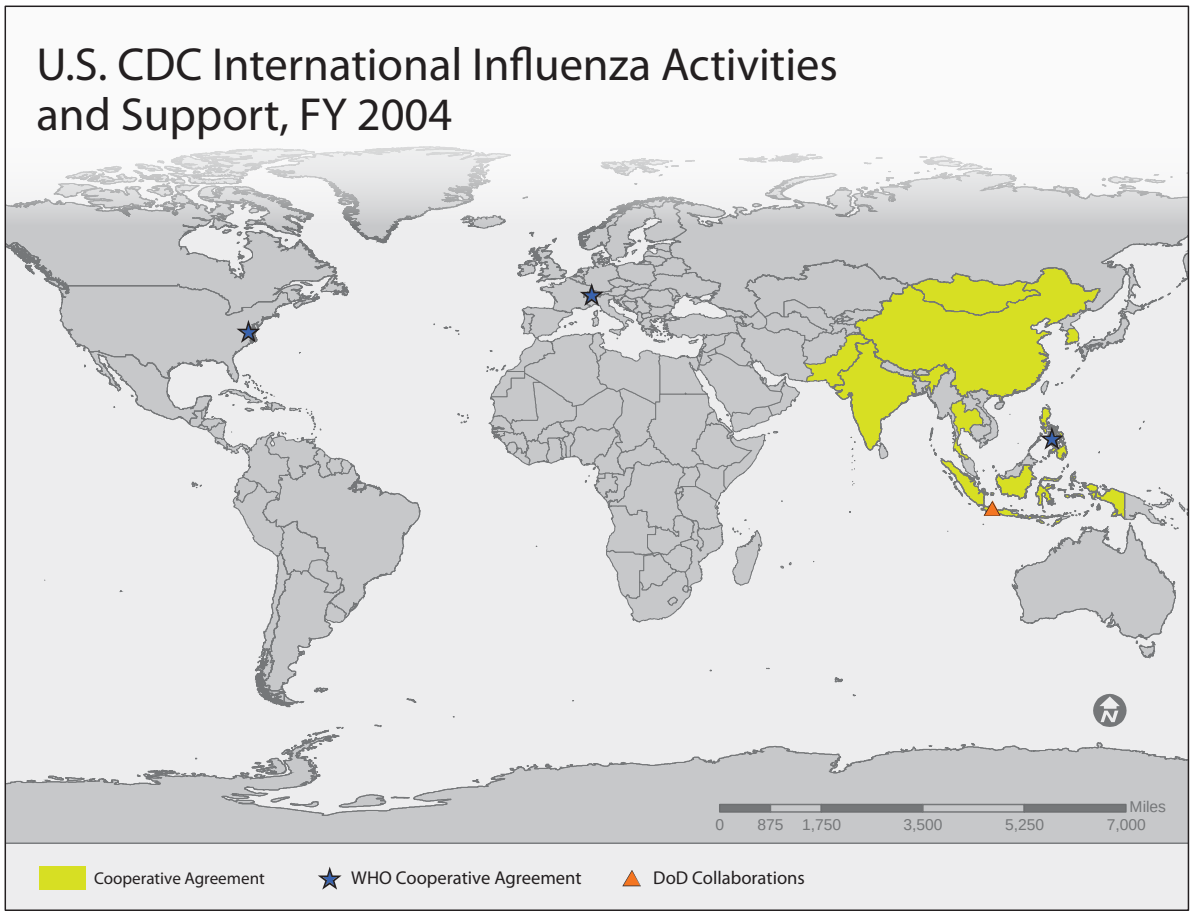

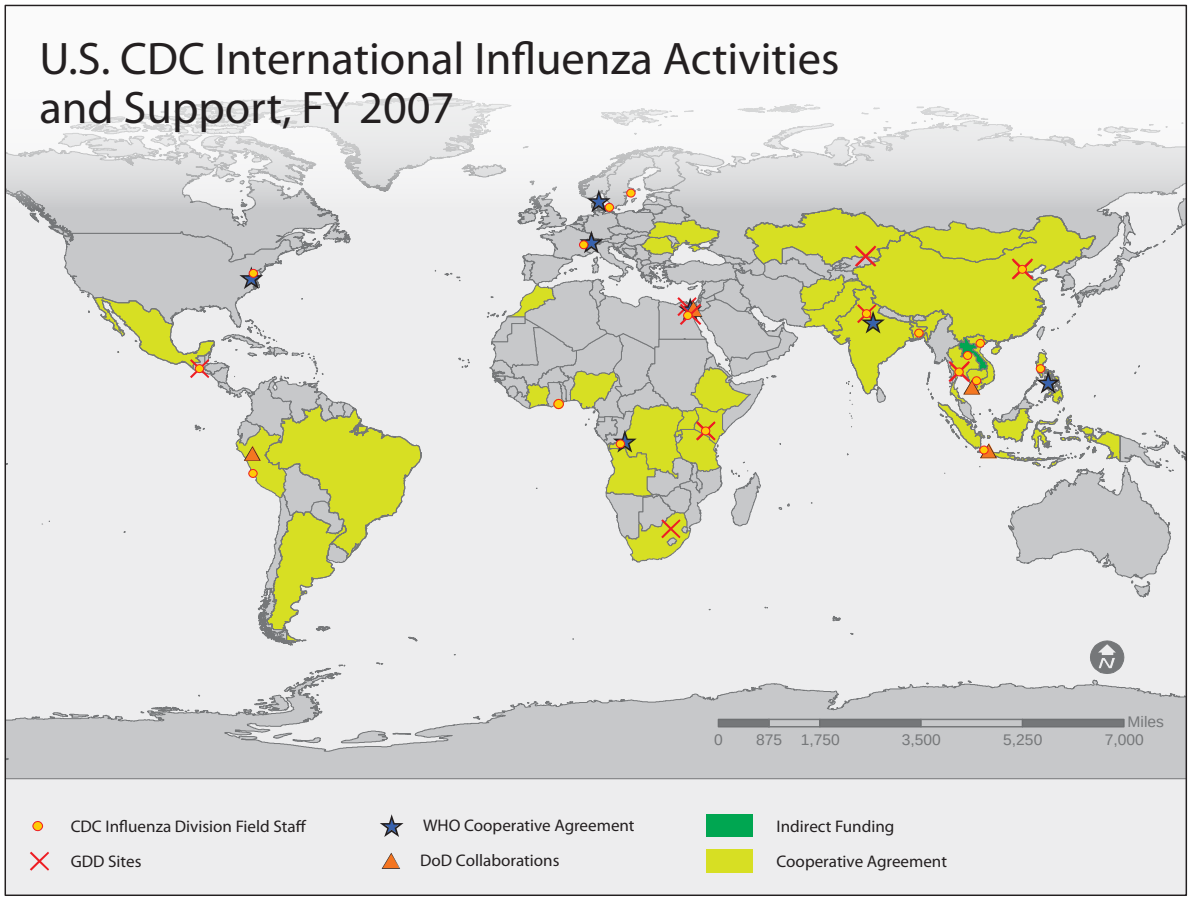

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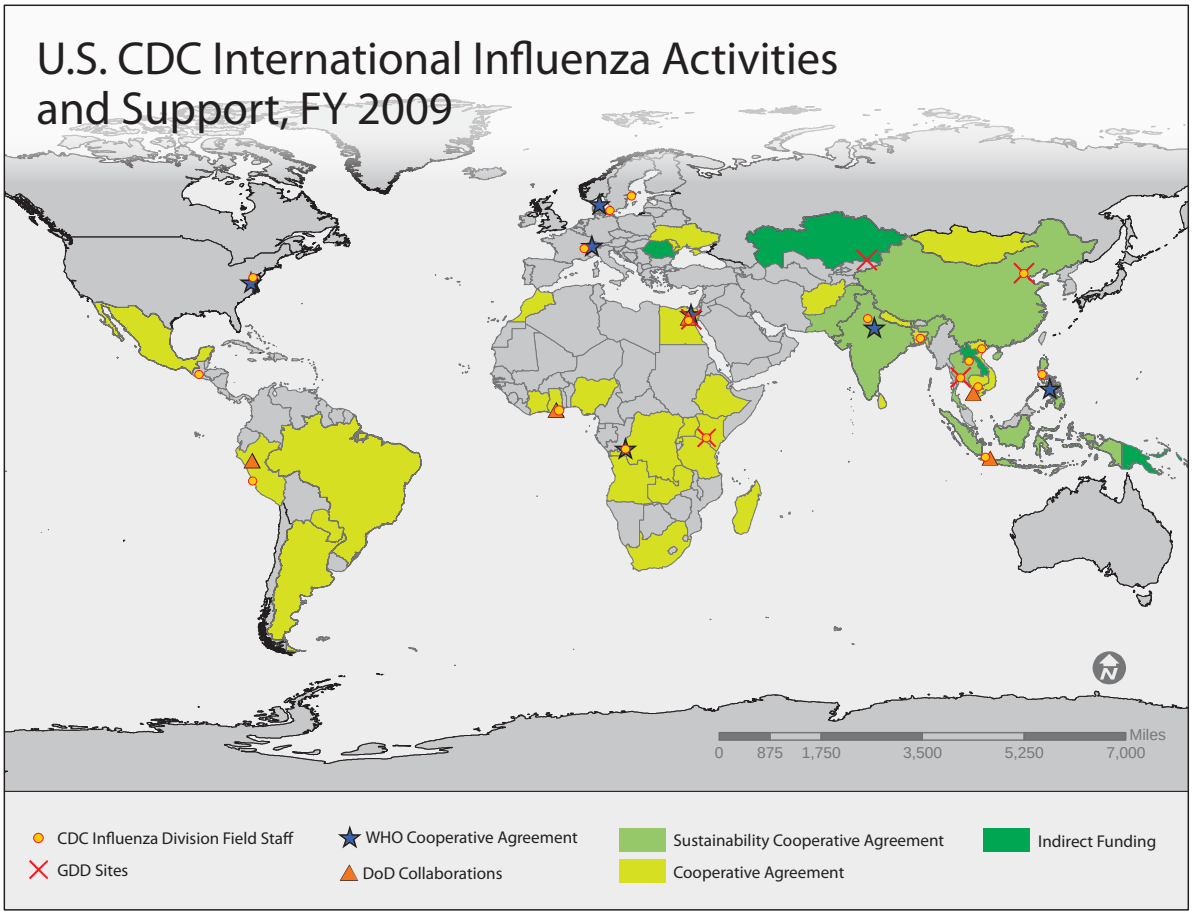

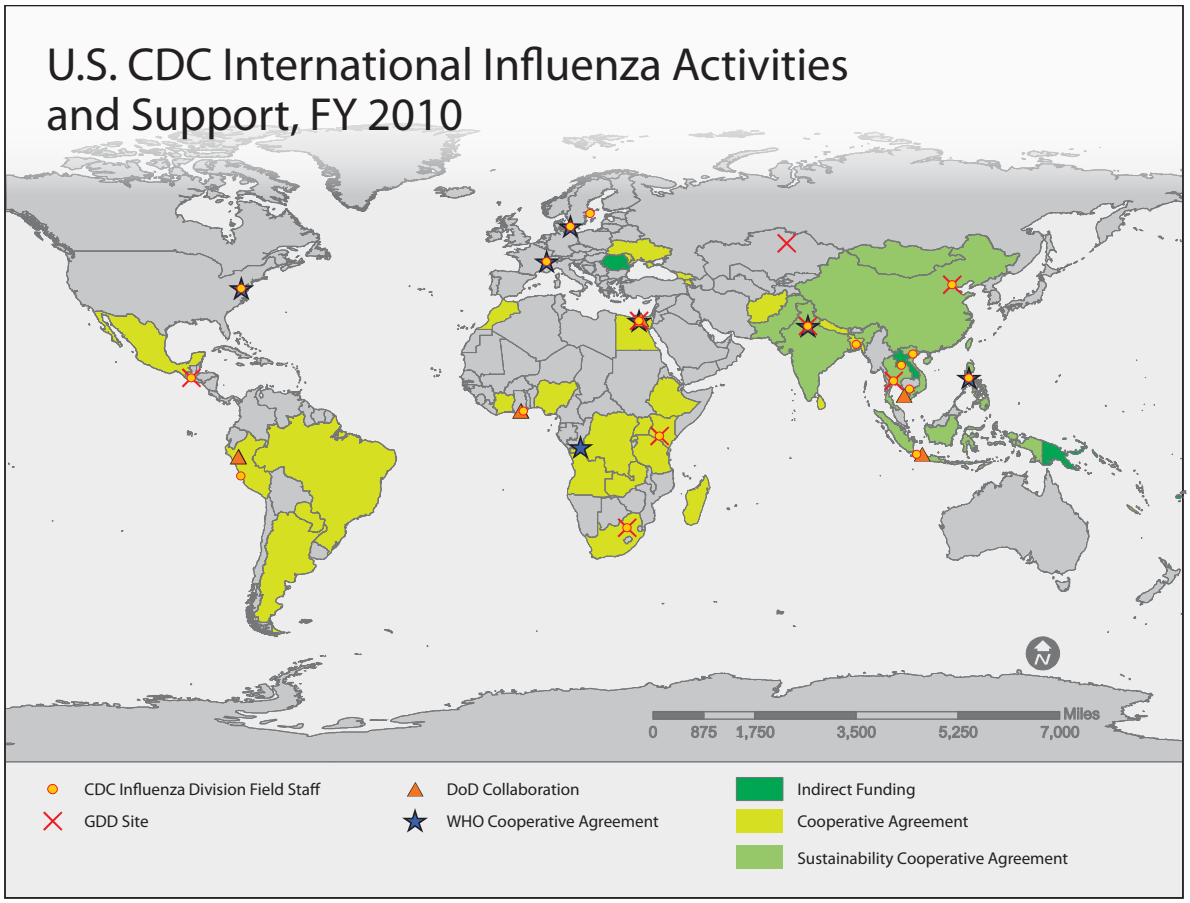

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U.S. CDC and WHO Collaborations—Influenza

The HHS/CDC Influenza Division has maintained cooperative agreements with WHO Headquarters and the WHO Pan American (PAHO) and Western Pacific Regional Offices (WPRO) for many years to address seasonal and pandemic influenza. In 2006, new cooperative agreements were put in place with the WHO South-East Asia Regional Office (SEARO), the Africa Regional Office (AFRO), the Eastern Mediterranean Regional Office (EMRO) and the European Regional Office (EURO). The main purpose of the cooperative agreements is to address global and regional preparedness for influenza - both seasonal and avian - and to add support to enhance the WHO Global Influenza Surveillance Network (GISN) through development of standard surveillance guidelines and support to WHO and many countries. In addition, more recently we have supported efforts to develop guidelines for conducting burden of disease studies for influenza and projects on vaccine use, evaluation and policy. This effectively increases the number of countries participating in the global system and more importantly enhances the early warning capacity and communications so there is a greater chance for early identification of a pandemic. Information about the project activities for the regional offices is integrated under the specific regions. CDC's Influenza Division provided funding and technical support to WHO Headquarters in 2010 for multiple projects related to influenza, outlined below.

Activities supported through WHO:

Influenza Laboratory Surveillance

- Strengthening of global influenza laboratory surveillance through improved diagnostics capacity and enhanced shipping capacity of influenza viruses/specimens to WHO Collaborating Centers (WHO CCs).
- Strengthening global coordination and communication of GISN by conducting a third National Influenza Center (NIC) survey and feeding results of the analysis into a NIC meeting with all regions.
- NICs were invited to attend the vaccine composition consultations in September and February to support this goal.

Influenza Epidemiology and Surveillance

- Strengthening influenza monitoring at the global level including development of automated analysis and visual presentation tools.
- Developing a pandemic assessment tool.
- Supporting developing countries in risk assessment and response.
- Supporting countries in the development of influenza surveillance systems and assessment of disease burden to inform vaccine and antiviral use decisions.
- Development of a tool for community-level risk assessment for H5N1 infection in collaboration with OIE (World Organisation for Animal Health) and FAO (Food and Agriculture Organization of the United Nations).

Strengthening Influenza Pandemic Preparedness and Response Planning

- Review of national pandemic assessment and development of lessons learned to revise pandemic preparedness guidelines.
- Review of:
  - measures and indicators of severity during a pandemic.
  - the concept of pandemic phases for decision-making.
- Assessment of effectiveness of school closure in different settings.
- Maintenance and improvements to the digital library.

Public Health Leadership and Global Coordination

- Provision of technical guidance and support to member states for:
  - development of coordinated pandemic preparedness initiatives.
  - developing future strategies aligned with WHO Headquarters and regional office guidance for global pandemic preparedness with a view toward longterm public health capacity for vulnerable populations.
- Dissemination of guidance:
  - to minimize social and economic disruption.
  - to other United Nations agencies and programs.

Seasonal Influenza Vaccine Introduction

- Collection and dissemination of information on influenza vaccine availability and utilization.
- Assurance of quality and safety of influenza vaccines by visiting manufacturing sites and technical reviews of production procedures.
- Support for influenza vaccination policy through the development of mathmetical models to estimate potential public health impact of various vaccine introduction strategies and potential impact of vaccine introduction on mortality among children younger than 5 years old.
- Capacity development and facilitation of influenza vaccine policy in WHO regions.

Influenza Reagent Resource (IRR)

The Influenza Reagent Resource (IRR) was established by the U.S. CDC to provide registered users with reagents, tools and information for studying and detection of influenza virus. The IRR acquires, authenticates, and produces reagents that scientists need to carry out basic research and develop improved diagnostic tests, vaccines, and detection methods. Public health labs also use the reagents across the globe for the surveillance of newly emerging strains of influenza, such as H1N1 and H5N1. By centralizing these functions within the IRR, access to and use of these materials in the scientific and public health community is monitored and quality control of the reagents is assured.

The roles of IRR 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 CDC's international pandemic preparedness plan to provide a surge option (~$10+ million per year) which can be exercised to distribute reagents and diagnostic kits to domestic and international public health laboratories.

Post pandemic, CDC and IRR continue to provide reverse transcriptase polymerase chain reaction (RT-PCR) 2009 H1N1 and seasonal influenza diagnostic kits, ancillary reagents, reference viruses and other materials to 241 countries supporting more than 375 international laboratories. These kits and reagents were also provided to more than 150 public health laboratories domestically in 50 states and territories.

Product	Total Kits International	# Countries Distributed	# Int Labs Distributed	Total Kits in U.S.	# of Domestic Distributed	# of U.S. State Labs Distributed	Total Kits
H1N1 RT-PCR Kit	1,364	241	390	1,862	50 + DC + PR	184	3,226
Seasonal RT-PCR Kit	819			1,073			1,892
WHO reference Kit	406	104	153	262	52	163	668

This WHO kit is sent out to the WHO NICs annually for surveillance and influenza type/subtype identification. It contains inactivated viruses (also known as antigens), antisera and receptor destroying enzyme (RDE) to perform HAI assays. It also contains monoclonal antibodies for IFA testing of influenza. Instructions provided with the kit explain how to perform the assays and how to interpret the results.

IRR is currently available via fluorder@cdc.gov. The IRR website is live and displays over 150 different reagents and kits available to the public health labs globally. Registration to the IRR should commence in the near future, allowing registrants to order reagents electronically as well as view a large amount of information relating to influenza reagents.

The IRR is providing better access to quality influenza-related reagents by manufacturing and distributing influenza viruses a la carte and as panels, recombinant proteins, antisera, monoclonal antibodies, ribonucleic acid (RNA) standards, non-influenza respiratory pathogens and more. Institutions that have access to these reagents are qualified domestic and international WHO NICs and public health laboratories, commercial test developers, vaccine manufacturers, and research institutions.

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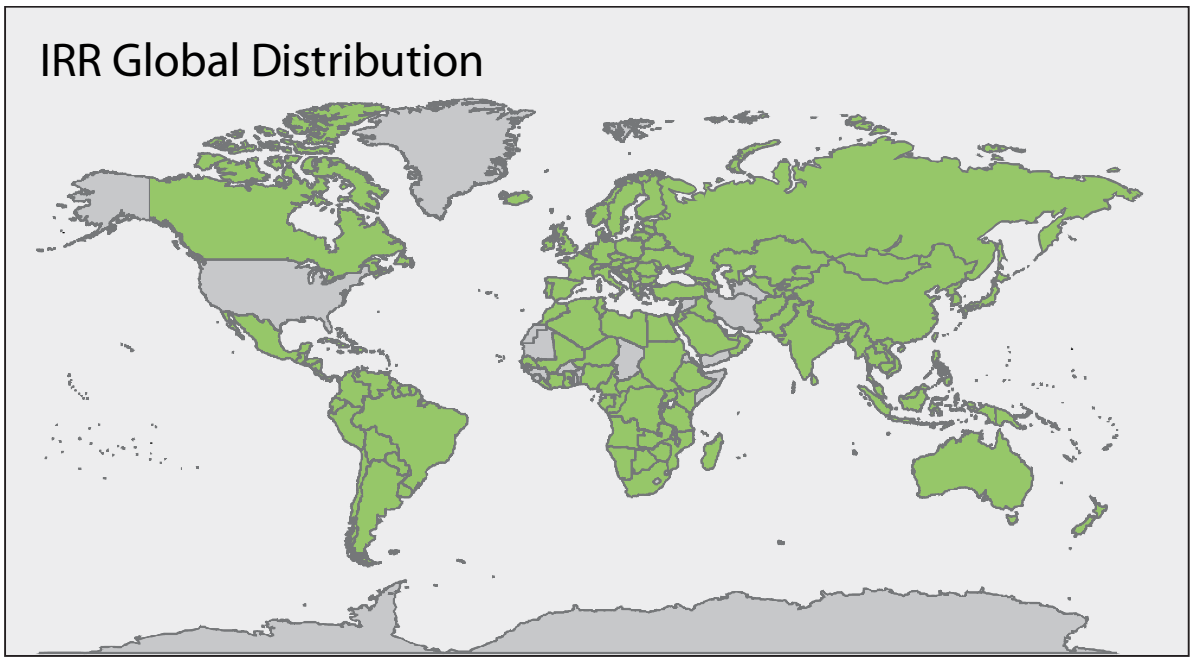

A map of IRR's distribution of diagnostic kits and reagents to 241 countries globally since 2009.

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WHO African Region (AFR)

WHO African Region (AFR) Overview

Currently there are 12 bilateral influenza cooperative agreements in the sub-Saharan region of Africa. These agreements are with Ministries of Health or institutions designated by the Ministry of Health (MOH) to work with CDC to build capacity to routinely identify, diagnose and respond to seasonal and pandemic influenza across the African continent.

CDC direct country support via cooperative agreements is established in the following countries:

- Angola.
- Cote d'Ivoire.
- Democratic Republic of Congo.
- Ethiopia.
- Kenya.
- Madagascar.
- Nigeria.
- Rwanda.
- South Africa.
- Tanzania.
- Uganda.
- Zambia.

In addition, CDC supports the WHO African Regional Office (AFRO) via a cooperative agreement.

The core activities of our bilateral agreements and technical assistance are:

- To build sustainable national capacity for seasonal influenza, pandemic influenza and other emerging diseases and preparedness for implementation of the International Health Regulations (IHR).
- To make routine contributions of surveillance data to the WHO Global Influenza Surveillance Network (GISN).
- To increase the geographic reach of WHO's GISN.
- To provide earlier access to critical virus isolates from humans and birds for WHO's GISN.
- To increase the numbers of shipments and influenza isolates provided by Africa influenza labs for analysis by WHO Collaborating Centers.
- To develop sustainable epidemiologic and virologic surveillance systems for severe influenza, in order to gain understanding of the burden of disease from influenza in the WHO AFR Region.

In additional to our bilateral work, we also partner with the Navy Medical Research Unit No. 3 (NAMRU-3) in Accra, Ghana, to jointly support the following West African countries that are starting influenza surveillance:

- Burkina Faso.
- Mali.
- Mauritania.
- Togo.

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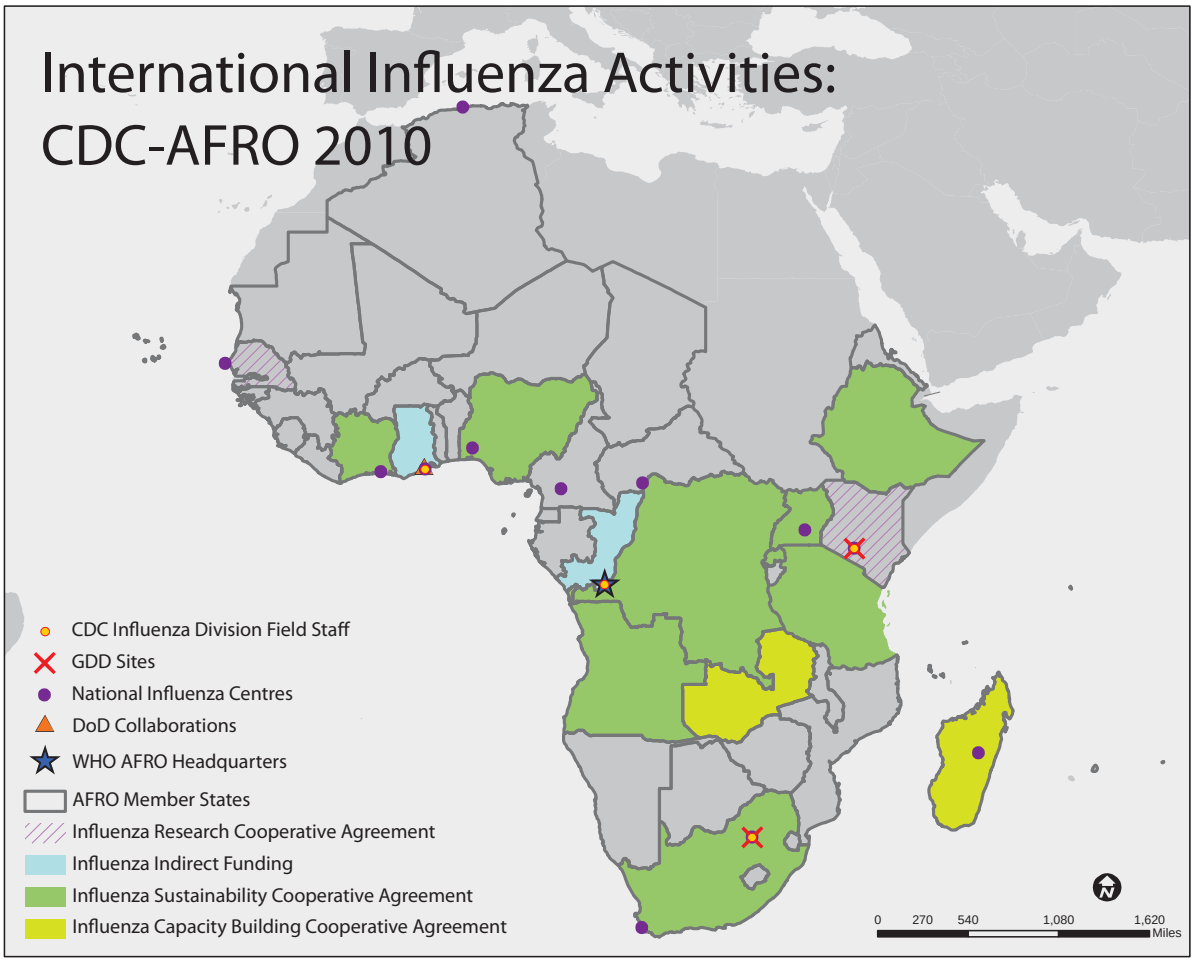
WHO African Regional Office (AFRO)



U.S. CDC Direct WHO Regional Office Support

In 2006, a five-year cooperative agreement between CDC and WHO African Regional Office (AFRO) was initiated to support the strengthening of avian influenza preparedness and response in the WHO African Region (AFR). The overall objectives of the grant are to enhance epidemiological and virological surveillance of influenza, to reinforce response and containment of avian and pandemic influenza, and to strengthen preparedness and communication for avian and pandemic influenza in the Region.

Surveillance

Before the agreement, AFR had implemented an Integrated Disease Surveillance and Response strategy (IDSR). This strategy included only limited influenza surveillance. Recognizing the system's limitations, AFR undertook to revise the technical guidelines and training modules for IDSR to include surveillance for human influenza caused by new influenza subtypes, influenza-like illness (ILI), and severe acute respiratory illness (SARI).

Key Surveillance Activities

- The new IDSR guidelines incorporating ILI and SARI were revised and translated into three WHO AFR languages and disseminated to all Member States.
- While preparing for a possible avian influenza pandemic, as well as during the 2009 H1N1 pandemic, capacity for sentinel surveillance for influenza improved in all 46 Member States.

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Laboratory

With support from the grant and other partners, polymerase chain reaction (PCR) testing capacity for the detection of influenza viruses has been established in 24 countries in the Region. In addition, virus isolation capacity for influenza has been transferred to 12 out of the 24 countries with influenza laboratories. Twenty out of 24 countries are regularly reporting data on influenza to FluNet. In addition, 13 countries are submitting isolates to WHO Collaborating Centers (WHO CCs).

Key Laboratory Activities

- An annual influenza laboratory meeting was organized for lab staff located throughout Africa.
- Burkina Faso, Malawi and Mozambique laboratories were assessed for setting up the detection of influenza virus using RT-PCR.
- The influenza External Quality Assessment Program (EQAP) has been introduced in 19 of these countries and plans have been drawn up to scale up this activity to all the influenza labs in the Region.
- Influenza laboratory staff in the Region has been trained on polymerase chain reaction (PCR), virus isolation, biosafety level (BSL) 3 laboratory operation, antiviral testing, sequencing, and safe shipment of infectious materials.

Preparedness

In August 2006, Member States adopted a resolution pertaining to the regional pandemic influenza preparedness and response plan. In August 2009, Member States adopted the resolution "Strengthening Outbreak Preparedness and Response in the African Region" in the context of the pandemic 2009 H1N1.

Key Preparedness Activities

- Rapid response teams have been established in the Region.
- Pandemic 2009 H1N1 prompted most countries in the Region to establish national epidemic management and coordination committees.
- Contingency stocks of personal protective equipment for pandemic influenza including antiviral drugs, viral transport media (VTM) and triple packaging boxes are prepositioned and available at four sites in the Region; these materials were also sent to all Member States.

Training

WHO AFRO hosted the following training activities in 2010:

- Hands-on training for virus isolation.
- Operation of BSL-3.
- Influenza antiviral resistance testing.
- Influenza sequencing.
- Training on safe shipment of infectious substances.

2009 H1N1 Activities, FY 2010

The Region continued to monitor the circulation of 2009 H1N1 and other influenza in 2010. Capacity for reporting and sharing isolates was improved in 2010.

Key 2009 H1N1 Activities, 2010

- An article "Pandemic (H1N1) 2009 in the WHO African Region" was published in the African Health Monitor Bulletin.
- WHO AFRO regularly provided feedback to countries on the 2009 H1N1 situation through weekly bulletins and quarterly reports.

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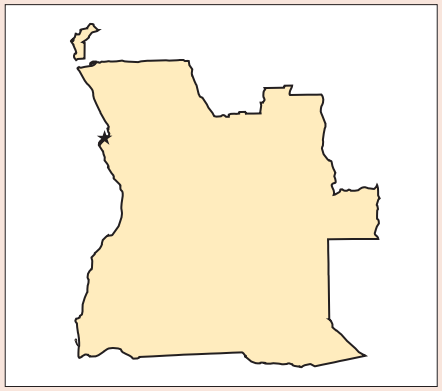
Angola



- **Capital:** Luanda
- **Area:** 1,246,700 sq km
- **Population:** 13,338,541 (July 2011 est.)
- **Age Structure:** 0-14 years: 43.2% (male 2,910,981/female 2,856,527); 15-64 years: 54.1% (male 3,663,400/female 3,549,896); 65 years and over: 2.7% (male 157,778/female 199,959) (2011 est.)
- **Life Expectancy at Birth:** Total population: 38.76 years; male: 37.74 years female: 39.83 years (2011 est.)
- **Infant Mortality Rate:** Total: 175.9 deaths/1,000 live births; male: 187.86 deaths/1,000 live births; female: 163.34 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 67.4%; male: 82.9%; female: 54.2% (2001 est.)
- **GDP:** $114.1 billion (2010 est.)
- **GDP per Capita:** $8,700 (2010 est.)

U.S. CDC Direct Country Support

The Republic of Angola has been collaborating with the U.S. CDC on influenza control since 2006, through the cooperative agreement *Support Preparedness and Response to Avian and Pandemic Influenza*. The National Institute of Public Health (INSP) is the central reference laboratory of the MOH.

Support through the cooperative agreement has contributed to strengthening epidemiologic and virologic surveillance for influenza in the country. Notably, influenza laboratory diagnosis capacity has improved since the beginning of the collaboration. The agreement has also enhanced the general level of preparedness and response capacity for influenza and other emerging diseases in Angola.

Surveillance

The CDC has supported the implementation of national influenza protocols on the basis of the WHO generic protocol for influenza surveillance. CDC provides the MOH with technical assistance, training, and supplies to reinforce sentinel sites and laboratory capacity. This collaboration contributes to the implementation of the Field Epidemiology Laboratory Training Program (FELTP).

Key Surveillance Activities

- CDC and INSP staff made several on-site visits in Luanda to provide refresher training to health workers on influenza sentinel surveillance techniques.
- Necessary equipment and supplies were purchased and distributed to three new sentinel sites in Luanda and provinces.
- The INSP reports weekly data to the MOH epidemiology unit, WHO and CDC.

Laboratory

CDC has supported the INSP laboratory with capacity building, supplies, and infrastructure upgrade. The INSP laboratory provides testing for seasonal flu, 2009 H1N1 flu, and avian flu. It participates in surveillance activities for SARI and ILI for MOH and WHO.

Key Laboratory Activities

- In December 2009, MOH/INSP staff participated in the Africa Influenza Scientific Symposium in South Africa, where they presented two posters.
- In June 2010, a consultant from the Association of Public Health Laboratories (APHL) conducted a laboratory assessment to evaluate influenza diagnosis capacity in the central reference laboratory.
- In July 2010, MOH/INSP staff participated in a CDC international partners meeting and the International Conference on Emerging Infectious Diseases (ICEID) in Atlanta, where they presented three posters.
- Two new BSL-2 cabinets were installed at INSP in August 2010.

Preparedness

Preparedness activities began in 2005 after the threat of avian influenza was recognized by the Government of Angola. By presidential decree an inter-ministerial commission was created to implement measures for prevention and control of the 2009 H1N1 pandemic. The Angolan preparedness plan was collaboratively developed and updated with all stakeholders involved in the pandemic response.

Key Preparedness Activities

Preparedness activities for Angola include the following:

- Ongoing sensitization and awareness sessions for air and sea companies' workers.
- Production and distribution of educational and communication materials, i.e. pamphlets and fliers.
- Assurance of antiviral stock for severe influenza disease treatment.
- Training of rapid response teams in the 15 provinces of Angola.

Training

The MOH hosted the following training activities in 2010:

- Trainings were provided to air and seaport workers on surveillance and detection of flu signs and symptoms in Luanda and provinces.
- Two short courses were conducted by MOH/INSP and CDC: one in Luanda in December 2009 that included participation of 20 epidemiologists from eight provinces, and another in March 2010 that covered the southern regions of Angola. In addition to the MOH, the training included the participation of several sectors of government, including the military, police, customs and universities. The trainings were held to provide information on influenza sentinel surveillance techniques.

2009 H1N1 Activities, FY 2010

From July to September of 2009, 37 cases of 2009 H1N1 flu were detected. Positive cases were detected in Luanda, Bengo and Huila provinces. No 2009 H1N1 cases were detected in 2010. Laboratory activities played an important role in surveillance; the MOH is currently improving coordination between laboratory activities and epidemiologic data.

Key 2009 H1N1 Activities, 2010

- Frequent inter-ministerial workgroup meetings.
- Presentations in medical conferences throughout the country.
- Launch of the Influenza Strategic Plan of Action.
- Enhancement and extension of surveillance sites to public and private hospitals.
- Training for more than 150 medical students and new medical staff in the surveillance network for data collection..

Other Notable Achievements in FY 2010

- The avian influenza program contributes to the overall effort to establish an effective and sustainable field epidemiologic and public health laboratory workforce capacity for Angola.
- The INSP participates in the genotyping study conducted by the National Institute for Communicable Disease (NICD) in South Africa for the African region.
- A national exercise to inventory core capabilities for pandemic influenza preparedness and response was completed.

Special Influenza Projects

- Implementation of the FELTP Program.
- An agreement between CDC and Agustinho Neto University (public university) to increase the number of surveillance officers.

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Influenza sentinel surveillance training in Uíge Province, northwestern Angola.

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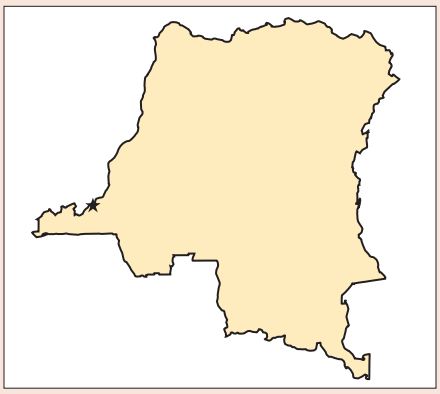
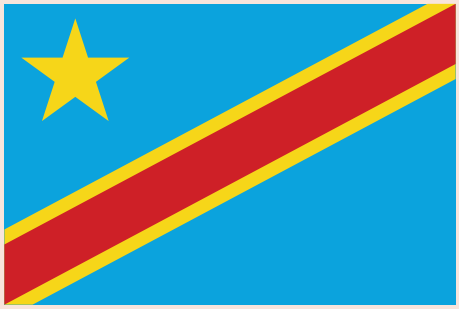
Democratic Republic of Congo





- **Capital:** Kinshasa
- **Area:** 2,344,858 sq km
- **Population:** 71,712,867 (July 2011 est.)
- **Age Structure:** 0-14 years: 44.4% (male 16,031,347/female 15,811,818); 15-64 years: 53% (male 18,919,942/female 19,116,204); 65 years and over: 2.6% (male 767,119/female 1,066,437) (2011 est.)
- **Life Expectancy at Birth:** Total population: 55.33 years; male: 53.9 years; female: 56.8 years (2011 est.)
- **Infant Mortality Rate:** Total: 78.43 deaths/1,000 live births; male: 82.2 deaths/1,000 live births; female: 74.55 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 67.2%; male: 80.9%; female: 54.1% (2001 est.)
- **GDP:** $23.58 billion (2010 est.)
- **GDP per Capita:** $300 (2010 est.)

U.S. CDC Direct Country Support

Surveillance of avian and pandemic influenza in DRC began in 2006, with the cooperative agreement between U.S. CDC and the Kinshasa School of Public Health (KSPH). The agreement is titled *Surveillance and Response to Avian and Pandemic Influenza*. This project aims to improve DRC capacity in surveillance, diagnosis, and provision of rapid response to avian and pandemic influenza outbreak.

Surveillance

In order to prepare DRC for a potential avian influenza outbreak event, the national surveillance system has been strengthened and has added seasonal influenza to the list of diseases to be reported to WHO. The country has set up ten sentinel sites out of the 50 planned.

Key Surveillance Activities

- The MOH, in collaboration with CDC, developed surveillance protocol for influenza.
- During FY 2010, sites collected 1,836 samples from 1,115 patients with ILI, and 273 patients with SARI.
- Supervisors held monthly sentinel site visits.

Laboratory

- The National Institute for Biomedical Research (INRB) is the national influenza reference laboratory. It is well equipped and currently uses four trained staff to analyze samples in real time using RT-PCR testing. In Kinshasa, samples are collected daily from sentinel sites and delivered to INRB by car.

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Key Laboratory Activities

- From October 1, 2009, to September 30, 2010, the INRB analyzed 1,836 samples, of which 265 (14.4 %) were positive for influenza A, 139 for influenza B (7.5%), and 20 cases were unclassified by real-time RT-PCR (7.5%).
- INRB distributes sample collection kits monthly to sentinels sites, and then provides analyzed results when testing is complete.

Preparedness

The avian influenza national plan, developed in 1996, was last revised in October 2009 by the Avian Influenza National Technical Committee. The aim was to adapt this plan according to the current epidemiologic context and available resources.

Training

The DRC MOH hosted the following training activities in 2010:

- In July 2010, the MOH provided refresher training on sample collection procedures for 20 participants in Kinshasa.
- In September and October 2010, ten participants in Matadi attended a refresher course on sample collection procedures.

2009 H1N1 Activities, FY 2010

Activities related to 2009 H1N1 began with the appearance of the pandemic throughout the world. A multi-sector committee was set up under the leadership of the DRC health ministry; this committee refined a strategic plan for response and surveillance.

Key 2009 H1N1 Activities, 2010

- The multi-sector committee updated a communication plan and developed communication tools (pamphlets, pictures and traveler guidelines) in response to 2009 H1N1.
- The multi-sector committee also organized broadcasts regarding safe practices during the 2009 H1N1 pandemic.

Other Notable Achievements in FY 2010

- Students and pregnant women were taught how to prevent getting sick with the flu.
- The health service in charge of quarantine distributed guidelines for travelers for influenza.

Principal Collaborators

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PCR Equipment Room at the National Institute for Biomedical Research (INRB), Kinshasa, Democratic Republic of Congo.

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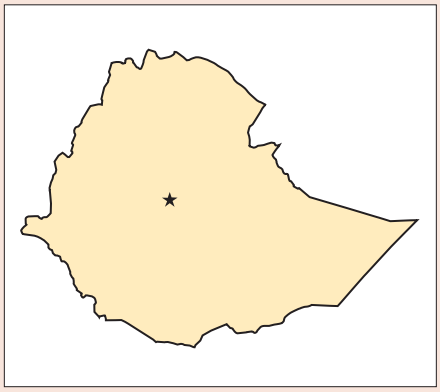
Ethiopia



- **Capital:** Addis Ababa
- **Area:** 1,104,300 sq km
- **Population:** 90,873,739 (July 2011 est.)
- **Age Structure:** 0-14 years: 46.3% (male 20,990,369/ female 21,067,961); 15-64 years: 51% (male 22,707,235/ female 23,682,385); 65 years and over: 2.7% (male 1,037,488/female 1,388,301) (2011 est.)
- **Life Expectancy at Birth:** Total population: 56.19 years; male: 53.64 years; female: 58.81 years (2011 est.)
- **Infant Mortality Rate:** Total: 77.12 deaths/1,000 live births; male: 88.03 deaths/1,000 live births; female: 65.88 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 42.7%; male: 50.3%; female: 35.1% (2003 est.)
- **GDP:** $84.02 billion (2010 est.)
- **GDP per Capita:** $1,000 (2010 est.)

U.S. CDC Direct Country Support

The cooperative agreement between the Federal MOH/Ethiopia Health and Nutrition Research Institute (EHNRI) and the U.S. CDC began in August 2007. This was a four-year project titled *Preparedness and Response to Avian and Pandemic Influenza in the Federal Democratic Republic of Ethiopia*. The overarching goal was to strengthen the public health emergency capacity to rapidly detect, assess, respond to, and contain the public health risks that could be brought about by a pandemic.

Surveillance

Sentinel surveillance has the potential to provide more complete data about some of the epidemiologic characteristics of severe acute respiratory infections (SARI). Ethiopia has selected 20 priority diseases with mandatory reporting. Among those that are required to be reported immediately are avian-human influenza, pandemic influenza, and SARS. The MOH Ethiopia started SARI/ILI sentinel surveillance activities in September 2008. Currently, there are a total of five sites – two are dedicated to SARI and three are dedicated to ILI; all are functional.

Key Surveillance Activities

- In 2010, three additional sentinel sites were established (one SARI, two ILI) in Addis Ababa. These sites feed into the National Influenza Laboratory (NIL).
- In June 2010, a two-day national review meeting was conducted in conjunction with the NIL and CDC-Ethiopia (CDC-E). In attendance were 35 surveillance officers from all five sites and from animal health, and a WHO country representative. The objective of the meeting was to review activities carried out over the past 12 months.

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- In February 2010, EHNRI hosted a five-day on-site technical assistance visit from CDC-Atlanta, Influenza Division. Activities included participating in a monitoring and evaluation exercise for pandemic preparedness, making a sentinel surveillance site visit to clinics and hospitals in Addis Ababa, and discussing cooperative agreement planning and data management coordination.
- CDC-E supervised and provided onsite orientation, technical assistance and feedback for all SARI/ILI sites.

Laboratory

The NIL at EHNRI is the only laboratory capable of influenza diagnostic testing in the country. The laboratory became functional in June 2009. The NIL has worked closely with CDC to establish a state of the art laboratory. Routine testing of respiratory samples collected through the SARI/ILI sites commenced in 2008, and testing services for flu were provided upon request from different health facilities and organizations in 2009.

Key Laboratory Activities

- The NIL participates in the EQAP to test proficiency of influenza virus testing using real-time PCR. The NIL correctly identified all samples in the last three panels.
- The NIL's findings have been presented at local and international scientific meetings, in the form of abstracts, oral presentations and posters.
- The NIL conducted PCR testing. From a total of 308 influenza specimens collected in 2010, 38 (12.5%) of them tested positive for 2009 H1N1.
- The NIL participated in outbreak investigations of respiratory illnesses reported in the country. NIL also participated in the training of health personnel on specimen collection for respiratory diseases at regional hospitals in the areas where outbreaks were reported.
- The CDC/APHL Influenza Laboratory Capacity Review tool was used to conduct an NIL capacity review in 2010.
- The NIL sent 34 samples for confirmatory and additional antigenic characterization to the WHO CC Atlanta.
- The NIL participated in surveys to investigate frequency of pandemic flu occurrence among patients diagnosed with SARI in public and private hospitals in Addis Ababa.
- Lab equipment and reagents were received from CDC-Kenya, CDC-Atlanta, and USAID at various times throughout the year.
- The NIL forwarded weekly flu reports to the WHO.

Preparedness

An overhaul of the entire health sector was carried out in 2009, during which new organizational structures were set up, including the Public Health Emergency Management Center (PHEMC). This Center is responsible for preparedness, early warning and response to any public health emergencies including avian and human influenza (AHI) and pandemic influenza. This newly established body is now situated at EHNRI in order to spearhead epidemiological surveillance of diseases and events with the EHNRI laboratory providing the technical support.

Key Preparedness Activities

- The national influenza pandemic preparedness and response plan was reviewed to reflect critical action to be undertaken in light of the characteristics of the ongoing 2009 H1N1 flu pandemic.
- Regularly-organized avian influenza and pandemic influenza meetings were held in which staff from the Federal MOH, EHNRI, CDC-E, and the WHO Country Office participated in order to exchange progress updates as well as to tackle any problems encountered during project implementation.
- The *Terms of Reference of the Public Health Emergency Management Taskforce-Technical* (PHEMT-T), Ethiopia was prepared and endorsed.
- Core capacity assessment for surveillance and response was conducted to evaluate the ability of existing national structures and resources to meet the minimum requirement of International Health Regulations (IHR).

Training

FMOH/EHNRI/CDC-E hosted the following training activities in 2010:

- The PHEMC in collaboration with NIL and CDC-E provided four days of training on influenza preparedness, surveillance and PHEMC core process for 764 public health officers in four mega regions - Amhara, Southern Nations, Nationalities, and People's Region (SNNPR), Oromia, and Tigray.
- Two laboratory personnel from NIL attended training on cell culture of influenza viruses, August 2-13, 2010, at KEMRI-CDC Training Center in Nairobi, Kenya.
- Seventeen surveillance officers, sentinel sites coordinators, data managers, public health emergency management officers and flu lab professionals participated in a three-day international Epi Info training in Addis Ababa, Ethiopia.
- A training session was conducted on aspects of influenza surveillance and specimen handling for health professionals from different administrative regions of the country.
- Thirty-five surveillance officers, health managers, sentinel sites coordinators and lab professionals received training at EHNRI on flu surveillance, epidemiology, data management and laboratory specimen processing.

The following trainings are planned for the near future:

- Pandemic Preparedness and Response.
- Early Warning and Risk Communication.
- International Epi Info Statistical Package.
- Epidemiology.
- Epi and Lab Coordination.

2009 H1N1 Activities, FY 2010

The first positive case of 2009 H1N1 infection was identified in June 2009 and the virus continues to co-circulate with seasonal viruses in Ethiopia. In 2010, it was the predominately circulating influenza virus (92%).

Key 2009 H1N1 Activities, 2010

- EHNRI organized and conducted a rapid survey to investigate frequency of pandemic flu occurrence among hospitalized SARI patients in randomly selected public and private hospitals in the capital city of Addis Ababa.
- Currently, 2009 H1N1 pandemic flu is part of the Integrated Disease Surveillance and Response system. It is one of the prioritized and immediately reportable diseases in Ethiopia.
- Based on the WHO recommendation, 2.5 million doses of 2009 H1N1 influenza vaccine were provided for priority groups sequentially.
- CDC-E provided advice on case management and control measures to health care workers including guidelines on appropriate specimen collection during outbreak investigations and site visits.

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'Epi Info' training in Addis Ababa, Ethiopia, September 2010.

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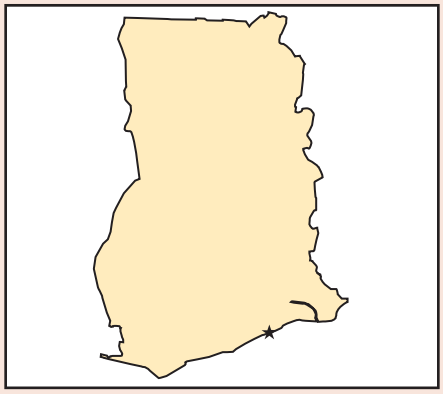
Ghana



- **Capital:** Accra
- **Area:** 238,533 sq km
- **Population:** 24,791,073 (July 2011 est.)
- **Age Structure:** 0-14 years: 36.5% (male 4,568,273/female 4,468,939); 15-64 years: 60% (male 7,435,449/female 7,436,204); 65 years and over: 3.6% (male 399,737/female 482,471) (2011 est.)
- **Life Expectancy at Birth:** Total population: 61 years; male: 59.78 years; female: 62.25 years (2011 est.)
- **Infant Mortality Rate:** Total: 48.55 deaths/1,000 live births; male: 51.99 deaths/1,000 live births; female: 45.01 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 57.9%; male: 66.4%; female: 49.8% (2000 census)
- **GDP:** $38.24 billion (2010 est.)
- **GDP per Capita:** $1,600 (2010 est.)

U.S. CDC Direct Country Support

Influenza surveillance in Ghana is carried out through collaboration between the U.S. CDC, the Naval Medical Research Unit No. 3 based in Egypt (NAMRU-3), the Ghana Health Service (GHS), and the Noguchi Memorial Institute for Medical Research (NMIMR). This partnership has been in place since 2007. Influenza surveillance in Ghana is conducted through sentinel sites located in all regions of the country. In addition, Ghana serves as a platform to assist regional neighbors in developing influenza surveillance systems. Countries benefiting from this partnership are Togo, Burkina-Faso, Mali, and Mauritania.

Surveillance

Seasonal influenza surveillance began at sentinel sites in Ghana in September 2007. Between October 1, 2009, and September 30, 2010, NMIMR, the country's NIC, processed more than 6,000 influenza specimens, and cultured 336 isolates. Samples were collected from a total of 22 sentinel sites (civilian and military) located nationwide in all ten regions of Ghana.

Key Surveillance Activities

- Sentinel surveillance sites for ILI were established and expanded in all ten regions in Ghana, including military sites.
- Surveillance staff was trained on sample collection, storage and transportation.
- A SARI site was established in Tamale, in the Northern region of Ghana.
- Surveillance staff received ethics training.

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- In-country surveillance training was held in Burkina Faso and Togo in collaboration with NAMRU-3.
- Monitoring was conducted for 2009 H1N1 pandemic flu and other influenza circulating influenza strains.

Laboratory

During FY 2010, the national influenza reference laboratory in Ghana was officially recognized as a WHO NIC. The NIC, which is located at the Noguchi Memorial Institute for Medical Research at the University of Ghana campus, Legon, has been continuously provided with influenza reagents through the Influenza Reagents Resource (IRR) established by CDC. This provision enabled the NIC to process 6,191 specimens during FY 2010.

Key Laboratory Activities

- The NIC ensured availability of sample collection kits at all sentinel sites and also coordinated transportation of specimens from all sites within 48 hours.
- The NIC worked closely with NAMRU-3 and WHO CC London to maintain high quality-control standards as well as influenza genotyping technology transfer.
- The NIC submitted weekly and timely reports to WHO AFR and to FluNet.
- NIC staff participated in international meetings and training workshops where they shared their work with other colleagues on the continent and worldwide.

Preparedness

With the occurrence of pandemic 2009 H1N1 flu in April 2009, GHS, in collaboration with key influenza partners including NMIMR, CDC, NAMRU-3, USAID, WHO, United Nations Children's Fund (UNICEF), Red Cross and the National Disaster Management Organization, took specific measures to mitigate the health, social and economic impacts of the pandemic in the country.

Key Preparedness Activities

- A health communication campaign was implemented to bring awareness to pandemic influenza and pandemic vaccine.
- A communication strategy was activated and posters on 2009 H1N1 pandemic flu were distributed.
- Technical support visits were made to regional and public health laboratories and sentinel surveillance sites.
- Meetings of the technical coordinating committee were held.
- Public education was intensified through mass media (i.e electronic, print).
- Surveillance and management of cases was continued by regional and district teams.
- Specimens were collected and transported from the sentinel sites to NIC.

Training

Ghana hosted the following training activities in FY 2010:

- Thirty-two training sessions were held for a total of 364 staff members from all SARI sites. Staff members were trained on acute respiratory illness (ARI) surveillance protocol, ethics for human subject research, informed consent and sample collection, packaging and transportation,

monitoring of enrollment, direct immunofluorescence (DFA) testing, and quality assurance and biosafety in the laboratory.

- The influenza team at Ridge Hospital in Accra was trained on case definitions and specimen collection.
- Health care providers at all eight military sites were trained on use of the rapid diagnostic kits according to WHO guidelines.
- All regional and public health reference lab staffs were trained on sample collection, packaging and transportation in January 2010.
- A training session was organized for the six members of the Cape Coast Regional Hospital influenza team.
- One lab staff member from the NIC participated in training on resistance testing and sequencing at WHO CC London in September 2010.
- Two senior staff members - one epidemiologist and one laboratorian - attended an international epidemiology course at the Rollins School of Public Health at Emory University in Atlanta, Georgia in September and October 2010.

2009 H1N1 Activities, FY 2010

Prior to the confirmation of the first pandemic 2009 H1N1 case in Ghana, influenza surveillance was strengthened nationwide, especially at ports of entry, through the monitoring of travelers. Temporary surveillance sites were established and additional health staff was trained, including medical practitioners from the private sector.

Key 2009 H1N1 Activities, 2010

- Reinforcement of surveillance allowed detection, care and treatment of people with confirmed cases of 2009 H1N1.
- From October 1, 2009, to September 30, 2010, 1,018 cases of 2009 H1N1 flu were confirmed and two deaths were recorded.
- The GHS developed and implemented communication campaigns for private and public radio and TV.
- The GHS provided 2009 H1N1 vaccine to high risk groups.

Other Notable Achievements in FY 2010

- The Noguchi Memorial Institute for Medical Research influenza lab was officially recognized as a WHO NIC.
- Real-time PCR capability was sustained at the NIC and diagnostic capacity was strengthened with the implementation of the gene-sequencing technique and drug resistance testing.
- A number of manuscripts presenting influenza data in Ghana are being prepared for publication. One of these manuscripts titled “Influenza Virus Strains Among Young Children in Accra, Ghana” will be submitted soon to a peer-reviewed journal.

Special Influenza Projects

- In the framework of the Integrated Hospital-based Infectious Disease Surveillance (IHBID) study, staff members at all SARI sites will be trained on the use of personal digital assistants (PDAs), which will speed up data capture, improve completion and quality of data, and allow for better reporting and faster feedback.

- A population-based surveillance study will be implemented at the demographic surveillance site of Dodowa in the Dangme West District; this is a collaborative project between CDC, NAMRU-3, GHS and NMIMR. This study will generate data on denominators, the disease and economic burden of influenza, and risk factors for severe influenza morbidity and mortality in Ghana.

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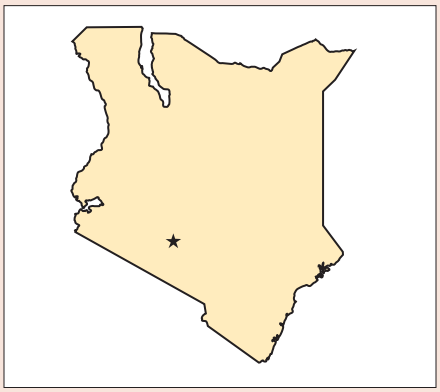
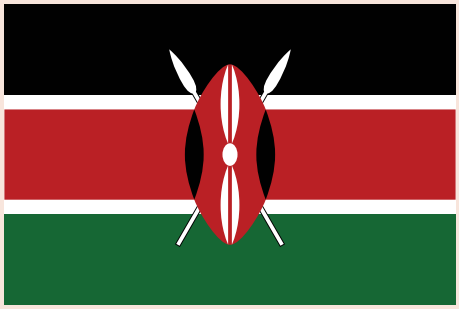
Example of a traditional medical center in a community of the Greater Accra Region. Centers like these provide herbal treatment for several medical conditions including "cough".

Kenya





- **Capital:** Nairobi
- **Area:** 580,367 sq km
- **Population:** 41,070,934 (July 2011 est.)
- **Age Structure:** 0-14 years: 42.2% (male 8,730,845/female 8,603,270); 15-64 years: 55.1% (male 11,373,997/female 11,260,402); 65 years and over: 2.7% (male 497,389/female 605,031) (2011 est.)
- **Life Expectancy at Birth:** Total population: 59.48 years; male: 58.91 years; female: 60.07 years (2011 est.)
- **Infant Mortality Rate:** Total: 52.29 deaths/1,000 live births; male: 55.03 deaths/1,000 live births; female: 49.49 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 85.1%; male: 90.6%; female: 79.7% (2003 est.)
- **GDP:** $65.95 billion (2010 est.)
- **GDP per Capita:** $1,600 (2010 est.)

U.S. CDC Direct Country Support

The CDC Influenza Division has maintained a cooperative agreement with the Kenya Ministry of Public Health and Sanitation (MOPHS), formerly the MOH, since 2006. In addition to the cooperative agreement with the MOPHS, CDC-Kenya has an additional cooperative agreement with the Kenya Medical Research Unit (KEMRI), which also supports influenza work in-country.

The cooperative agreement aims to strengthen surveillance and detection for seasonal, avian and human influenza in the country. Cooperative agreement funds have been used to set up a sentinel surveillance system for influenza that includes 11 hospitals around the country. Testing is conducted at the KEMRI-led NIC and the KEMRI/CDC International Emerging Infections Program (IEIP) laboratory. The cooperative agreement has also supported investigation of suspected outbreaks, avian-human interface surveillance, and surveillance for hospital-acquired infections.

Surveillance

Limited surveillance for influenza existed in Kenya prior to 2006. The current sentinel surveillance system includes 11 sites: six provincial hospitals, a district hospital, an outpatient clinic, two refugee camp hospitals, and the national referral hospital. Surveillance is conducted for both SARI and ILI, and samples are tested at one of two laboratories in Nairobi – the KEMRI-NIC or the CDC/KEMRI IEIP laboratory.

Key Surveillance Activities

- CDC-Kenya followed the evolution of pandemic 2009 H1N1 influenza through sentinel sites in the country in late 2009 and early 2010, and coordinated with the following surveillance sites and the NIC:
    - MOPHS-KEMRI/CDC sentinel surveillance system.
    - Walter Reed Project/KEMRI sentinel surveillance network for ILI.
    - Sanofi Pasteur sentinel provider network for ILI.
    - CDC/KEMRI IEIP population-based surveillance sites.
- In addition, CDC-Kenya used the MOPHS-KEMRI/CDC sites to evaluate 2009 H1N1 vaccine effectiveness among health care workers in the country.
- CDC-Kenya, in collaboration with the Kenyan Department of Veterinary Services, conducted monthly surveillance for influenza viruses in live bird markets in 2009 and 2010.

Laboratory

There are currently two functional laboratories in Kenya, the KEMRI-NIC and the CDC/KEMRI IEIP laboratory. Both laboratories are able to test for influenza by RT-PCR and culture. CDC/KEMRI has a new BSL-3 laboratory in Kisumu, where testing for animal samples for influenza is conducted.

Key Laboratory Activities

- Laboratory staff from East and West Africa were trained at NIC and at CDC/KEMRI laboratories in Nairobi.
- More than 9,000 respiratory specimens from sites across the country were tested for influenza types and subtypes.
- RT-PCR-positive specimens from surveillance sites and a 2009 H1N1 shedding study were cultured; viral isolates were sent to the WHO CC Atlanta for further characterization.

Preparedness

The MOPHS has conducted numerous national and provincial trainings on rapid response to an avian influenza outbreak. National and provincial response teams were deployed to investigate outbreaks of pandemic 2009 H1N1 influenza in mid-2009.

Key Preparedness Activities

- Outbreak response teams were deployed to investigate ongoing transmission of pandemic 2009 H1N1 after the virus was first identified in Kenya in late June 2009; teams continued to investigate suspected outbreaks over the following three months.
- Kenya MOPHS supported trainings for Integrated Disease Surveillance and Response (IDSR), which strengthened surveillance in health facilities throughout the country.

- In August 2010, the MOPHS, supported by CDC-Kenya, conducted a monitoring and evaluation meeting to assess the core capabilities for pandemic influenza preparedness and response.

Training

The following trainings were held in Kenya in FY2010:

- The NIC, together with CDC/KEMRI, provided a number of trainings for Kenya-based laboratory staff and regional laboratory staff on PCR testing for influenza, including pandemic 2009 H1N1.
- The Kenyan MOPHS conducted regional trainings on IDSR.
- The MOPHS together with CDC conducted a training on 2009 H1N1 pandemic preparedness for sentinel surveillance officers and hospital officials.

Leonard Nderitu (seated) and Lillian Mayieka, both assistant laboratory research officers at CDC-Kenya, demonstrate how to take a nasopharyngeal swab during training for healthcare-associated infection surveillance officers in Nairobi.

2009 H1N1 Activities, FY 2010

Pandemic 2009 H1N1 was first identified in Kenya in late June 2009. The MOPHS and the Kenya Ministry of Medical Services worked together with the WHO, the NIC, and partners like KEMRI/CDC and the Walter Reed Project-Kenya to monitor the pandemic through continued surveillance and special studies.

Key 2009 H1N1 Activities, 2010

- The Kenya MOPHS together with KEMRI/CDC and CDC-Atlanta conducted a survey to measure knowledge, attitudes and practices of health care workers to inform communications strategy for a large pandemic 2009 H1N1 vaccination campaign in 2010.
- KEMRI/CDC conducted a viral shedding study to understand pandemic 2009 H1N1 shedding patterns in a poor, urban population in Nairobi in order to inform decisions about infection control policies for the new virus.
- The MOPHS conducted a pandemic 2009 H1N1 monovalent vaccine campaign using donated vaccine from the WHO. Over 200,000 Kenyans were vaccinated.
- The MOPHS and KEMRI/CDC conducted a 2009 H1N1 vaccine effectiveness evaluation among health care workers.
- The MOPHS, CDC-Kenya and the Field Epidemiology and Laboratory Training Program conducted an investigation into the first 50 hospitalized pandemic 2009 H1N1 cases in Kenya.

Special Influenza Projects and Other Notable Achievements in FY 2010

- CDC-Kenya organized two writing workshops to help local and regional epidemiologists and laboratory staff finalize their influenza-related manuscripts for publication.
- CDC-Kenya conducted an evaluation of the relative performance of nasopharyngeal and oral-pharyngeal specimens for influenza.
- CDC-Kenya undertook the first year of a seasonal influenza vaccine effectiveness study in two CDC IEIP population-based sites.

Public Health Importance

- The NIC and KEMRI/CDC laboratory staff now routinely test for respiratory viruses other than influenza.
- The MOPHS-KEMRI/CDC surveillance systems work together with the Walter Reed Project influenza surveillance system and the Sanofi Pasteur/KEMRI sentinel surveillance network to monitor ILI and ARI hospitalizations throughout the country.
- Laboratory training and development have made the Kenya laboratories more prepared to test for other pathogens by PCR.

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GDD-Kenya

The GDD (Global Disease Detection) Regional Center in Kenya (GDD-Kenya) 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.

Coverage

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

GDD-Kenya activities include:

- Outbreak Response.
- Pathogen Discovery.
- Training.
- Surveillance.
- Networking.

Effect

In 2010, the GDD Regional Center in Kenya discovered one pathogen new to the region and increased their laboratory testing capacity by 22%. GDD-Kenya trained ten FELTP graduates and nearly 1,000 participants in short-term regional and national trainings. GDD-Kenya responded to 43 outbreaks and provided lab support in 91% of these outbreaks.

In-Country Field Staff

Rob Breiman, MD, MPH
Kenya GDD Regional Center Director

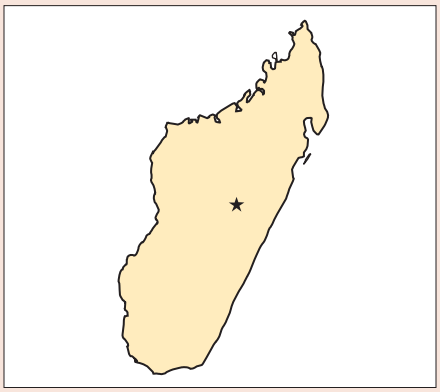
Mark Katz, MD, MPH
Influenza Lead

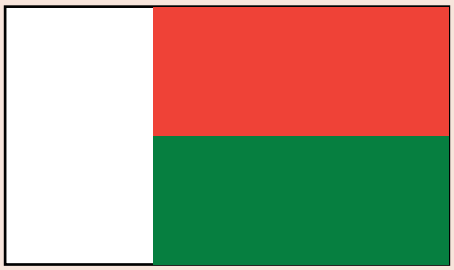
Principal U.S. CDC Program Collaborations In-Country

- Influenza Division International Program
- International Emerging Infections Program
- Field Epidemiology and Laboratory Training Program
- Laboratory Systems Development Program
- Immigrant, Refugee, and Migrant Health
- International Emergency Preparedness Program

Save As...

Madagascar





- **Capital:** Antananarivo
- **Area:** 587,041 sq km
- **Population:** 21,926,221 (July 2011 est.)
- **Age Structure:** 0-14 years: 43.1% (male 4,762,589/female 4,693,259); 15-64 years: 53.8% (male 5,864,520/female 5,938,029); 65 years and over: 3% (male 295,409/female 372,415) (2011 est.)
- **Life Expectancy at Birth:** Total population: 63.63 years; male: 61.62 years; female: 65.7 years (2011 est.)
- **Infant Mortality Rate:** Total: 51.45 deaths/1,000 live births; male: 56.23 deaths/1,000 live births; female: 46.52 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 68.9%; male: 75.5%; female: 62.5% (2003 est.)
- **GDP:** $20.73 billion (2010 est.)
- **GDP per Capita:** $1,000 (2010 est.)

U.S. CDC Direct Country Support

FY 2010 is the first year of the U.S. CDC's cooperative agreement with Pasteur Institute of Madagascar (IP-Madagascar). The agreement is titled *Developing Seasonal, Pandemic, and Influenza Surveillance Networks*. Madagascar's NIC has had an influenza surveillance network in operation since 1972 when this network encompassed sentinel sites located in Antananarivo, the capital. In 2007, extension of the existing influenza surveillance network began with new sentinel sites opening across the entire country. The cooperative agreement awarded by the CDC in 2009 has strengthened influenza surveillance in Madagascar and has supported building capacity, which enhanced the level of preparedness and response of the country.

Surveillance

When the cooperative agreement began in 2009, the sentinel surveillance network encompassed 23 ILI sites and 15 SARI sites. This network is an integrated surveillance system that monitors several diseases with epidemic potential (i.e. malaria, arboviruses, influenza and febrile diarrhea). With the emergence of 2009 H1N1 pandemic flu, efforts have been made to train clinicians and staff from the MOH for the early detection and monitoring of outbreaks.

Key Surveillance Activities

- The cooperative agreement supported clinician training for specimen sampling and shipping.
- The NIC expanded its influenza surveillance network to include 31 ILI and 17 SARI sites.
- The NIC set up active SARI surveillance, including sample and analyses, in one hospital.

Laboratory

Before the cooperative agreement, the NIC in Madagascar already possessed all necessary capabilities for performing diagnostic tests including virus isolation, molecular diagnostic and serology. Nevertheless, the 2009 H1N1 pandemic demonstrated that there is room to improve diagnostic capacities, and there are additional ways to be prepared for surge in testing during future pandemics. The cooperative agreement supported the laboratory through the acquisition of new equipment and sampling materials, which allowed for an increase in the number of specimens that could be processed.

Key Laboratory Activities

- The NIC developed an assay for the detection of 14 respiratory viruses.
- The NIC participated in the WHO EQAP and scored 100% for quality assurance.
- The laboratory hired one technician dedicated to influenza diagnosis.
- The NIC trained biologists from the Democratic Republic of Congo and the Republic of Central Africa to diagnose influenza.

This vehicle is a mobile laboratory and used in rural and remote areas for outbreak investigations and conducting serological surveys to estimate the burden of influenza.

Preparedness

The National Steering Committee for the Fight against Avian Influenza (CNPLGA) was created in 2006. The *Integrated National Action Plan (INAP)* was written in 2008. Since the beginning of the cooperative agreement, the MOH has updated its INAP and related communication materials have been produced and disseminated.

Key Preparedness Activities

- A pool of trainers is available for training of regional task forces.
- NIC, MOH, and the Ministry of Livestock adapted and updated training materials for regional task forces.
- MOH trained regional task forces for response to avian and pandemic flu.

Training

Madagascar hosted the following activities in 2010:

- Epidemiology surveillance and field outbreak investigation training was provided to ten public health officers from Madagascar, Mauritius and Seychelles.
- Antiviral resistance training was provided to five laboratory scientists from Madagascar, Central Africa, Cameroon and Senegal.
- Influenza surveillance training was provided to 50 doctors and nurses from ILI and SARI sites.
- Training on laboratory techniques for diagnosis of influenza infection was provided to two biologists from Democratic Republic of Congo and the Republic of Central Africa.

For FY 2011, another course on epidemiologic surveillance and field outbreak investigation is planned. Madagascar will train other regional task forces in order to cover all Malagasy regions. Finally, two biologists and four technicians from regional hospitals in Toamasina (East Coast) and Mahajanga (West Coast) will be trained for molecular diagnosis of influenza.

2009 H1N1 Activities, FY 2010

After the start of the 2009 H1N1 pandemic, the NIC received kits for RT-PCR testing from CDC. IP-Madagascar provided technical assistance to the MOH for detection and monitoring of pandemic influenza in Madagascar; training was provided to new staff in the laboratory, in order to increase lab capabilities for diagnostics and testing.

Key 2009 H1N1 Activities, 2010

- The MOH installed an ad hoc national task force in order to strengthen the response and contain the epidemic.
- A new algorithm for analysis of specimens was put in place at the NIC.
- The NIC delivered additional personal protective equipment (PPE) and sampling material upon request from MOH after MOH's stock was depleted.
- Medical officers from SARI and ILI sentinel sites received refreshers on case definition, monitoring of patients, use of PPE, use of antiviral drugs, specimen collection, and shipment to the NIC.

Other Notable Achievements in FY 2010

- The MOH created a phone hotline to answer questions related to 2009 H1N1.
- In most of suspected cases of 2009 H1N1, NIC delivered results with a turn-around time of 12 to 24 hours.
- The influenza sentinel network served as backbone for monitoring the spread and intensity of the pandemic in the country.

Special Influenza Projects

- The NIC developed an assay for detection of swine influenza viruses.
- The NIC detected human seasonal A/H3N2 in a specimen collected from pigs in July.
- Together with the Epidemiology Unit, the NIC tried to address the impact of the pandemic in rural parts of Madagascar through a serological survey.

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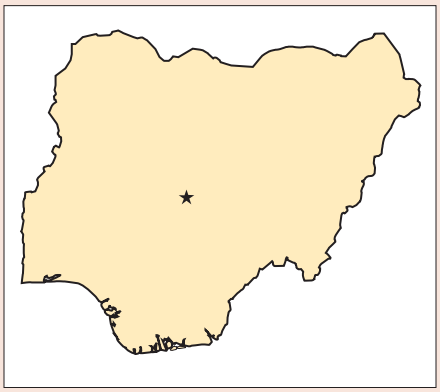
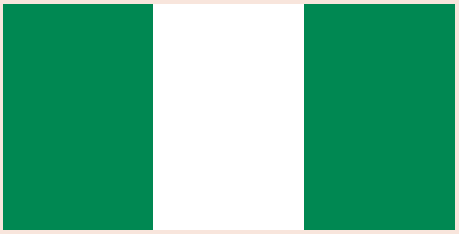
Nigeria





- **Capital:** Abuja
- **Area:** 923,768 sq km
- **Population:** 155,215,573 (July 2011 est.)
- **Age Structure:** 0-14 years: 40.9% (male 32,476,681/female 31,064,539); 15-64 years: 55.9% (male 44,296,228/female 42,534,542); 65 years and over: 3.1% (male 2,341,228/female 2,502,355) (2011 est.)
- **Life Expectancy at Birth:** Total population: 47.56 years; male: 46.76 years; female: 48.41 years (2011 est.)
- **Infant Mortality Rate:** Total: 91.54 deaths/1,000 live births; male: 97.42 deaths/1,000 live births; female: 85.31 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** total population: 68%; male: 75.7% female: 60.6% (2003 est.)
- **GDP:** $369.8 billion (2010 est.)
- **GDP per Capita:** $2,400 (2010 est.)

U.S. CDC Direct Country Support

In 2006, the Nigerian Federal Ministry of Health (FMOH) secured a U.S. CDC five-year cooperative agreement titled *Surveillance and Response to Avian and Pandemic Influenza Project*. FY 2010 was the fourth year of the grant.

The goal of the project is to establish a system of early detection and effective response to avian and pandemic influenza in Nigeria. The National Influenza Reference Laboratory (NIRL) with molecular diagnostic capacity and the National Influenza Sentinel Surveillance System (NISS) were established in 2007 and 2008 respectively and. The FMOH also developed a plan that guides preparedness and response to avian and pandemic influenza in the country.

Surveillance

Prior to the beginning of the FMOH/CDC cooperative agreement in 2006, there was no surveillance system to monitor influenza epidemiology in Nigeria. In 2008, the National Influenza Surveillance System (NISS) was established. Currently there are four sentinel sites, each with an ILI component in the outpatient clinic and a SARI component in the inpatient unit. The surveillance system also captures suspected cases of avian influenza and other pandemic influenza viruses, including 2009 H1N1. From the limited data available so far, Nigeria's peak influenza activity appears to be concurrent with the dry harmattan season, which occurs between November and March.

Key Surveillance Activities

- Almost all of the reported cases of 2009 H1N1 in Nigeria were detected via the NISS.
- In 2010, the flu team started reporting epidemiological data via the WHO FluNet and FluID platforms.
- NISS data were presented at the 2010 International Conference on Emerging Infectious Diseases (ICEID), and the Options for Control of Influenza VII conference.
- The NISS structure continues to provide a platform that supports surveillance for other priority diseases in the country. A case example is the detection of Lassa fever through the influenza surveillance system.
- The NISS continue to host the Nigeria Field Epidemiology and Laboratory Training Program (FELTP) students, providing them with needed field experience.

Laboratory

In 2007, the FMOH, with the financial and technical support of CDC, established a NIRL situated in Abuja, the nation's capital. It is currently the only laboratory with a real-time RT-PCR diagnostic capacity for influenza in the country. Additional MOH laboratories with influenza diagnostic capacity are under construction and due to open from 2012.

Key Laboratory Activities

- In 2010, the lab tested over 2,400 samples from influenza sentinel sites and outbreak investigations.
- The NIRL participated in the WHO-AFRO laboratory network and WHO FluNet by sending weekly virology reports.
- The lab submitted specimens to WHO CC Atlanta.
- During 2010, the NIRL participated two times in the WHO EQAP and received a perfect score for each proficiency test.

The National Influenza Reference Laboratory manager receives a CDC-donated automatic nucleic acid extractor. From right to left: Mr. Shilo Paul (Lab Manager, NIRL); Dr. Ibrahim Dalhatu (CDC Nigeria Influenza Focal Point); Dr. Muhammad Shakir Balogun (NFELTP Resident on Posting in the NIRL); Ms. Amaka Onyiah (NIRL); Ms. Amina Garba.

Preparedness

In 2006, Nigeria initiated the development of its avian and pandemic influenza preparedness plan following the emergence of the global threat of influenza pandemic. In 2010, a tabletop exercise was conducted to test the revised version of the national avian and pandemic influenza preparedness and response plan.

Key Preparedness Activities

- The FMOH avian and pandemic influenza control project prepositioned antivirals at the state MOH and at selected health facilities across the country.
- Federal, state and local government-level rapid response teams were retrained.

Training

The FMOH hosted the following training activities in 2010:

- In a bid to strengthen capacity of the flu surveillance team, one of the staff member was enrolled in the two-year Nigeria Field Epidemiology and Laboratory Training Program (N-FELTP) in 2010.
- Refresher training on influenza sentinel surveillance was offered to officers from all the influenza sentinel sites.
- Four staff of the NIRL participated in a two-week hands-on training on molecular diagnosis at CDC-Kenya.
- Eight laboratory personnel from clinical laboratories with RT-PCR capacity (under-construction) were provided hands-on training at the NIRL in Abuja.

Future Trainings

- The leadership of the NIRL will be participating in laboratory management training organized by CDC-Atlanta.
- All laboratory personnel will receive complete modular training in Quality Management System (QMS).
- NIRL laboratory personnel will be trained on virus culture.
- The data management focal points will be retrained on data management and report writing.

2009 H1N1 Activities, FY 2010

Following the reported outbreak of 2009 H1N1 in April 2009, the Nigerian MOH began enhanced surveillance by utilizing its existing Integrated Disease and Surveillance Reporting (IDSR) and the NISS. The first case of 2009 H1N1 was detected in October 2010; by the end of September 2010, about 100 cases had been recorded.

Key 2009 H1N1 Activities, 2010

- More than 50 epidemiologists from all the states of the federation were trained on 2009 H1N1 outbreak detection and response.
- Surveillance tools for 2009 H1N1 were developed and used.
- State MOHs and hospitals were provided with antivirals and clinical management guidelines.

- With the help of partners, including CDC-Atlanta, the FMOH developed a 2009 H1N1 vaccine deployment strategy and campaign plan that was utilized for the administration of 2009 H1N1 vaccine donated by WHO.

Other Notable Achievements in FY 2010

- The FMOH/CDC avian and pandemic influenza project was relocated to the national epidemiology division for better integration and sustainability.
- In a bid for the NIRL to qualify for NIC designation, plans to begin performing viral culture in the NIRL were implemented.
- Support from the influenza project for establishing and training rapid response teams strengthened disease surveillance and response to all priority diseases in the country.

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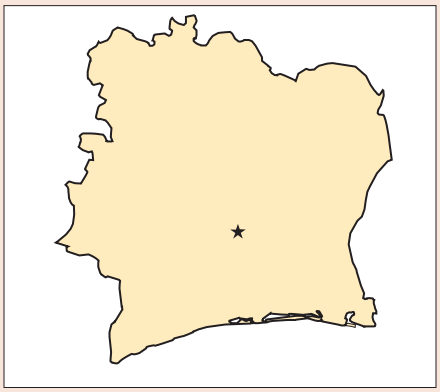

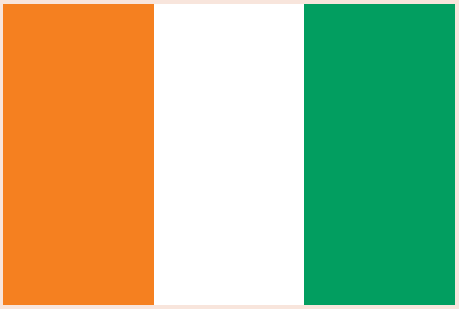

- **Capital:** Yamoussoukro
- **Area:** 322,463 sq km
- **Population:** 21,504,162 (July 2011 est.)
- **Age Structure:** 0-14 years: 39.8% (male 4,312,133/female 4,240,500); 15-64 years: 57.2% (male 6,262,802/female 6,039,458); 65 years and over: 3% (male 320,396/female 328,873) (2011 est.)
- **Life Expectancy at Birth:** Total population: 56.78 years; male: 55.79 years; female: 57.81 years (2011 est.)
- **Infant Mortality Rate:** Total: 64.78 deaths/1,000 live births; male: 71.54 deaths/1,000 live births; female: 57.83 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 48.7%; male: 60.8%; female: 38.6% (2000 est.)
- **GDP:** $37.8 billion (2010 est.)
- **GDP per Capita:** $1,800 (2010 est.)

U.S. CDC Direct Country Support

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 at MSHP for the *Developing Influenza Surveillance Networks Cooperative Agreement,* which began in 2006. FY 2010 is the fourth year of the cooperative agreement.

During the 2009-2010 budget period, all planned operational activities were implemented. Implementation of these activities produced a number of results, namely the reinforcement of 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 transportation to the NIC is operational.

To ensure timely information and availability of laboratory results, four new sentinel sites were provided with internet connections. In addition to internet access, the NIC located at the Insitut Pasteur of Côte d'Ivoire (IPCI) and eight sentinel sites received information technology equipment (i.e., desktop computer, uninterruptable power supply, scanner, printer, fax).

Key Surveillance Activities

- A virologist from the IPCI took part at the first Africa Influenza Scientific Symposium held in Johannesburg, South Africa in December 2009, during which surveillance data were shared.

- Two staff – one epidemiologist and one virologist – participated in the CDC Influenza Division International Partners and Disease Burden Meeting in Atlanta in July 2010.
- One virologist from NIC (IPCI) presented a poster at the Options for the Control of Influenza VII conference held in Hong Kong, in September 2010.
- From October 1, 2009, to September 30, 2010, a total of 4,545 suspected cases of influenza were investigated. Suspected cases of avian influenza and 2009 H1N1 were investigated in numerous health districts of Côte d'Ivoire (Abidjan, Bingerville, Bouake, and Grand-Bassam).

Laboratory

The NIC located at IPCI was provided with reagents and laboratory materials through the cooperative agreement in order to fulfill its role as NIC and reinforce its operational capacity. The laboratory was able to analyze 338 influenza samples in the fourth quarter of 2009 and approximately 741 samples in first three quarters of 2010.

Preparedness

- The MSHP organized two meetings which brought together supervisors from all 17 sentinel sites to present data, share experiences and discuss challenges. The first meeting was held in November 2009, and the second meeting was held in June 2010.
- During August 2010, a series of sensitization campaigns were conducted that engaged 12 cities in northern and southern Côte d'Ivoire. During these campaigns, leaflets and brochures that explained influenza infection, pandemic flu, and preventive measures, were distributed to the population.

Training

The MSHP hosted or participated in the following trainings:

- In October 2009, 24 laboratory technicians from sentinel sites were trained at the IPCI on sample collection, packaging, storage and transportation, as well as sample analysis (i.e., PCR), and cell culture.
- A training workshop on pandemic influenza was organized for journalists and other media outlets at Grand-Bassam in November 2009, with the goal of improving communication with the general population.
- In March 2010, a training session for 185 medical health district directors and hospital directors provided information about detection, care and treatment of pandemic influenza cases.
- During the month of July 2010, an epidemiologist in charge of the surveillance of diseases with epidemiologic potential attended a two-week epidemiologic training course at Paris XI University, France.
- In order to strengthen the capacity of epidemiologists at the INHP, in September 2010 two epidemiologists participated in a international course in epidemiology and applied bioinformatics organized at the Regional Institute for Public Health at Ouidah, Republic of Benin.
- While conducting two supervisory visits to sentinel sites in October 2009 and June 2010, daily constraints, needs and challenges of health care workers were assessed. These visits allowed INHP/MOH to address health care workers' concerns and to suggest solutions to enable them to operate more efficiently and improve their working skills.

2009 H1N1 Activities, FY 2010

- Reinforcement of surveillance allowed for detection, isolation, care and treatment of confirmed cases of 2009 H1N1 flu.
- From October 1, 2009, to September 30, 2010, 36 2009 H1N1 cases were detected and successfully treated.
- The INHP/MOH setup a hotline to provide answers to questions and guidance to the general public about the threat of 2009 H1N1 flu.
- The MOH developed a communication campaign and disseminated messages via private and public radio and TV.
- PPE was acquired by USAID for use by the MSHP.
- Large posters were developed (electronic and hard copies) and made available at airports, seaports and at different borders.
- Five thousand N-95 facemasks were purchased in 2010 for use by people with severe cases of 2009 H1N1 flu.

Other Notable Achievements in FY 2010

- SARI surveillance was made routine at each of the medical teaching hospitals of Abidjan.
- At the IPCI, real-time PCR techniques were made available and were sustained; diagnostic capacity was also strengthened.
- The Ministry of Scientific Research procured a sequencing machine for the IPCI that improved diagnostic capacity of the molecular biology platform of the NIC.

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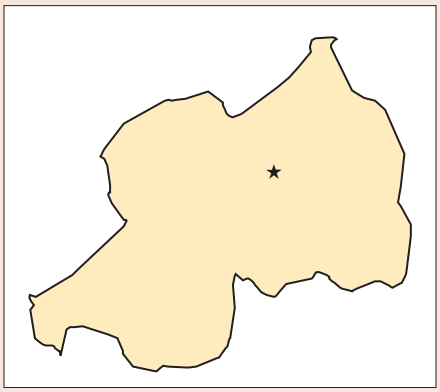
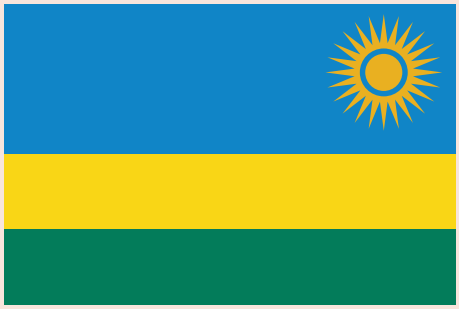
Rwanda





- **Capital:** Kigali
- **Area:** 26,338 sq km
- **Population:** 11,370,425 (July 2011 est.)
- **Age Structure:** 0-14 years: 42.9% (male 2,454,924/female 2,418,504); 15-64 years: 54.7% (male 3,097,956/female 3,123,910); 65 years and over: 2.4% (male 110,218/female 164,913) (2011 est.)
- **Life Expectancy at Birth:** Total population: 58.02 years; male: 56.57 years; female: 59.52 years (2011 est.)
- **Infant Mortality Rate:** Total: 64.04 deaths/1,000 live births; male: 67.64 deaths/1,000 live births; female: 60.32 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 70.4%; male: 76.3%; female: 64.7% (2003 est.)
- **GDP:** $11.84 billion (2010 est.)
- **GDP per Capita:** $1,100 (2010 est.)

U.S. CDC Direct Country Support

The cooperative agreement *Preparedness and Response to Avian and Pandemic Influenza in Rwanda* is a four-year grant between CDC Atlanta and the MOH/Center for Treatment and Research on AIDS, Malaria, Tuberculosis and other Epidemics (TRAC Plus). The cooperative agreement includes technical support from the CDC avian influenza country focal point. The project aims to strengthen preparedness and communication, to improve national diagnostic capabilities for avian influenza, to initiate human influenza surveillance, and to develop rapid response at the national and sub-national level.

The cooperative agreement began in 2007 and will close out in July 2011. FY 2010 is the fourth year of project implementation.

Surveillance

Influenza sentinel surveillance began in Rwanda in July 2008. A national protocol was developed by TRAC Plus with CDC assistance and endorsed by the MOH. According to the national strategy, six active sentinel sites were established in order to have one sentinel site in each province. These sentinel sites include two referral hospitals (Kigali University Teaching Hospital and Butare University Teaching Hospital) and four district hospitals (Gihundwe, Kibagabaga, Kibungo and Ruhengeri). The estimated population in the catchment area of each district hospital is approximately 200 to 300 thousand people whereas that of referral hospitals includes those seeking primary and secondary health care services not found at other levels of the health system. The selection of hospitals was based on willingness to participate, ease of transport of specimens, risk of avian influenza activity, and mix of urban/rural

Save As...

locations. Influenza surveillance is conducted in outpatient department (OPD), pediatric and internal medicine wards. During the 2009 H1N1 flu outbreak in Rwanda, surveillance activities were intensified to include non-sentinel hospitals.

Key Surveillance Activities

- MOH/TRAC Plus collected a total of 3,516 (ILI and SARI) samples from sentinel and non-sentinel sites that have been tested with the positivity rate of 19.5% (686/3,516).
- From sentinel sites, 2,996 specimens were collected and tested with a positivity rate of 13.8% (412/2,996) from July 2008 to December 31, 2010.
- 50.4% (1510/2,996) of ILI and SARI patients were children age 0-4 years.
- From non-sentinel sites, 520 specimens were collected and tested during the 2009 H1N1 flu outbreak with a positivity rate of 52.8% (274/520).
- Seventy-six medical doctors, 260 nurses and 64 laboratory technicians trained in influenza sentinel surveillance.
- TRAC Plus conducts joint supervisory site visits with the National Reference Laboratory and CDC that include review of protocol and refresher training in influenza sentinel surveillance.

A nurse labels an influenza specimen collected from a child in the pediatric ward at Ruhengeri District Hospital, northwestern Rwanda.

Laboratory

The National Reference Laboratory is equipped with three RT-PCR machines to test influenza samples by typing and sub-typing using CDC protocol and CDC-provided primers/probes and controls. One machine was acquired before the cooperative agreement began, the second was donated by USAID, and the third is a Fast RT-PCR machine acquired to improve turnaround time and standardize testing for quality control.

Key Laboratory Activities

- The Laboratory purchased and supplied specimen collection kits to sentinel sites.
- The Laboratory passed WHO EQAP testing with 100% score.
- The Laboratory successfully routinely tested seasonal and pandemic influenza specimens routinely and successfully.

Preparedness

Key Preparedness Activities

- Officials from the Rwanda Ministry of Agriculture and Animal Resources (MINAGRI), the MOH, the Ministry of Disaster Management and Refugees (MIDIMAR) and the Rwanda Development Board (RDB) participated in a tabletop exercise organized in country by the Emergency Centre for Transboundary Animal Diseases, part of the Food and Agriculture Organization of the United Nations, with other stakeholders.

Training

Rwanda/MOH hosted the following training activities in 2010:

- Surveillance officers and medical focal points at sentinel sites attended surveillance training conducted by CDC-Atlanta and TRAC Plus.
- TRAC Plus provided sentinel surveillance training for surveillance officers.

Training sessions planned for 2011 include:

- Laboratory management training for laboratory technicians by NICD, in South Africa.
- Outbreak investigation and response training for surveillance officers by Rwanda Field Epidemiology and Laboratory Training.
- Short Message Service (SMS texting) reporting of SARI, ILI, and total in- and outpatients training for surveillance officers by Tulane University in collaboration with TRAC Plus.

2009 H1N1 Activities, FY 2010

- In October 2009, a traveler returning from the United States developed an influenza-like illness and subsequently tested positive for 2009 H1N1 virus. An Emergency Working Group (EWG) was established by the MOH. The EWG began contact tracing to identify additional laboratory-confirmed cases in households, primary and secondary schools, government offices, and health facility settings, as well as among airplane passengers.
- NRL tested 2,380 nasopharyngeal specimens.
- As of June 1, 2010, 525 laboratory-confirmed cases of 2009 H1N1 were identified from 19 (63%) of 30 Rwandan districts.
- The last case of 2009 H1N1 was confirmed on June 1, 2010.
- A deployment plan for vaccination was developed and currently waiting for implementation.
- A donation from WHO of 200,000 doses of monovalent Pandemrix vaccine (GSK) was received by the Expanded Program of Immunization (EPI). The decision to use the vaccine is pending.

Other Notable Achievements in FY 2010

- A dispatch "2009 Pandemic Influenza A (H1N1) Virus Outbreak and Response –Rwanda, October, 2009 – April, 2010" was sent to the journal *Plos One* for publication.
- A manuscript "Influenza Sentinel Surveillance—Rwanda, 2008–2010" is being prepared for a supplement that will appear in the Journal of Infectious Diseases.

Special Influenza Projects

- The Laboratory is planning to test for other respiratory pathogens by Multiplex-PCR.
- TRAC Plus is working on increasing the quality of the Integrated Disease Surveillance and Response (IDSR) system in order to provide reliable surveillance data baseline.
- Virus isolation capability is being planned in order to be eligible to apply for WHO NIC status. However, additional space is needed, so a plan is in place for lab expansion.

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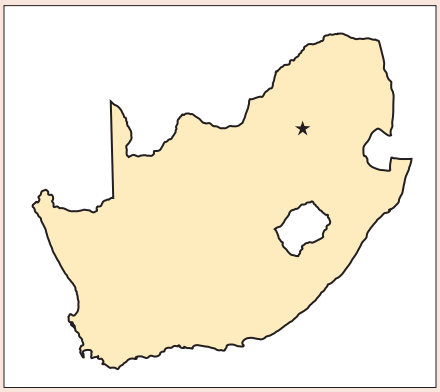
South Africa



- **Capital:** Pretoria
- **Area:** 1,219,090 sq km
- **Population:** 49,004,031 (July 2011 est.)
- **Age Structure:** 0-14 years: 28.5% (male 6,998,726/female 6,959,542); 15-64 years: 65.8% (male 16,287,314/female 15,972,046); 65 years and over: 5.7% (male 1,125,709/female 1,660,694) (2011 est.)
- **Life Expectancy at Birth:** Total population: 49.33 years; male: 50.24 years; female: 48.39 years (2011 est.)
- **Infant Mortality Rate:** Total: 43.2 deaths/1,000 live births; male: 47.19 deaths/1,000 live births; female: 39.14 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 86.4%; male: 87%; female: 85.7% (2003 est.)
- **GDP:** $527.5 billion (2010 est.)
- **GDP per Capita:** $10,700 (2010 est.)

U.S. CDC Direct Country Support

The Influenza Program in South Africa has both a national and a regional focus. The cooperative agreement between CDC and the National Institute for Communicable Diseases (NICD)/National Health Laboratory Service (NHLS) began in August 2007. The cooperative agreement is called *Preparedness and Response to Avian and Pandemic Influenza in South Africa* and the main goals of this agreement are to strengthen the capacity of national health authorities for surveillance of SARI and ILI, and to strengthen the capacity for the diagnosis of influenza by the health authorities in selected countries of the Southern Africa Development Community (SADC).

Surveillance

A number of influenza surveillance systems provide up-to-date data on influenza activity in South Africa. The Viral Watch Surveillance Programme is a long-standing ILI surveillance program with 256 outpatient sentinel sites in all nine provinces. SARI surveillance was introduced in 2009; currently, four hospital-based sites are fully functioning.

Key Surveillance Activities

- An additional SARI surveillance site, the Klerksdorp hospital complex, was added. The site includes one hospital for adults and one for pediatrics.
- The SARI case definition was expanded at two enhanced surveillance sites (Edendale Hospital, the Klerksdorp Hospital complex) to include patients admitted with a duration of symptoms greater than 7 days and suspected tuberculosis (TB). This will allow the NICD to describe the association between influenza and TB in this population.

- Surveillance reports were circulated to all stakeholders on a weekly basis during the influenza season and on a monthly basis during the rest of the year.
- The Epidemiology and Surveillance Unit (ESU) hosted the SARI annual investigators meeting in September 2010 to present program results and new and related projects to investigators and stakeholders, including the National Department of Health.
- NICD contributed influenza information to daily surveillance and outbreak reports for the National Health Cluster during the Soccer World Cup (June 11 - July 12, 2010).

Laboratory

The Respiratory Virus Unit (RVU) at NICD (a WHO NIC) is earmarked as a WHO regional reference laboratory for influenza and plays a key role in the support for the establishment of influenza laboratory and surveillance capacity in the SADC.

Key Laboratory Activities

The RVU and Virus Isolation Unit (VIU) regularly test and type influenza samples collected under the Viral-Watch, SARI, and the enhanced surveillance systems for 2009 H1N1 flu.

- The RVU performs molecular diagnosis and typing of influenza viruses as well as other respiratory viruses associated with SARI and investigates the molecular epidemiology of annual epidemics to assess genetic drift and viral resistance.
- Influenza strains are also isolated by the VIU on tissue culture and antigenic characterization is performed using hemagglutination inhibition (HAI) tests.
- The RVU provides diagnostic testing and training to neighboring countries when assistance is required.
- Weekly updates are provided to the WHO African and Global offices via FluNet.

The annual SARI surveillance investigator group meeting held at the Poliomyelitis Research Foundation (PRF) Centre on the campus of the National Institute for Communicable Diseases, a division of the National Health Laboratory Services. Johannesburg, South Africa. September 2010.

Preparedness

Much of the work to develop a pandemic influenza preparedness plan paid off as the country responded to the 2009 H1N1 pandemic. The state of the national preparedness plan for South Africa in 2010 was greatly improved and significantly more efficient compared to its pre-pandemic status. Key factors contributing to this include the implementation of an influenza vaccination campaign steering

committee, mass vaccination campaign training in every province, influenza management training in many provinces, and empowering the main public health laboratories to test for influenza by PCR.

Key Preparedness Activities

- Formulation of national guidelines for health care workers in collaboration with the South Africa Department of Health and other partners.
- Implementation of provincial workshops in seven of the nine provinces, to reinforce adherence to the pandemic response plans and response guidelines.
- Provision of advice on clinical case management, control measures, and infection control guidance, as well as guidelines on appropriate specimen collection, including support with field work during outbreak investigations.
- Development of monthly communiqués to raise awareness on communicable diseases including 2009 H1N1 and to update clinicians on case management; these communiqués were distributed to about 18,000 health professionals and published on the NICD website.
- Establishment of an influenza vaccination campaign steering committee.
- Implementation of provincial training with regard to both the mass vaccination campaign and influenza clinical management issues.
- Establishment of laboratory capacity for influenza testing at regional NHLS laboratories by providing guidance on protocols and quality control panels.
- Provision of confirmatory testing for SARI cases and deaths to private and public sector laboratories and testing of suspected H5N1 avian influenza cases in humans with a history of exposure or appropriate travel.

Training

NICD implemented the following training activities in 2010:

- From October 2009 to March 2010 the RVU trained laboratory scientists from Angola, Botswana, Mozambique, Zambia and Zimbabwe on the diagnosis of 2009 H1N1 using real-time RT-PCR.
- The RVU hosted a scientist from Malawi-Liverpool-Wellcome Trust Clinical Research Programme in Blantyre, Malawi from 19-21 July 2010.
- The national public health laboratory in Lilongwe, Malawi hosted a scientist from the RVU to perform on-site training for influenza testing.

Laboratory management training and phylogenetic analysis training planned in collaboration with and supported by CDC for African scientists are planned for February and March 2011.

2009 H1N1 Activities, FY 2010

Enhanced surveillance was initiated at 11 hospitals in all 9 provinces around the country to capture specimens for virological surveillance from patients with SARI. A registry was established for all 2009 H1N1 laboratory confirmed cases and severe cases and deaths, which allowed for monitoring the evolution and the severity of the epidemic. Surveillance was continued through the viral watch and SARI programs for influenza cases by routine testing for nine respiratory viruses including Influenza. All positive influenza A specimens were also subtyped and a selection of those were further characterized. Patients with ILI and SARI from the private sector and the port health authorities were also investigated to identify newly imported 2009 H1N1 cases outside of the influenza season.

Key 2009 H1N1 Activities, 2010

- A thorough investigation of the first 100 confirmed cases was carried out.
- These interventions detected risk factors for severe illness and death.
- This surveillance allowed for the estimation of the secondary attack rate, serial interval and basic reproductive number (R0) for the epidemic in the country.
- A molecular epidemiological investigation of 2009 H1N1 cases detected in 2009 and 2010 was carried out by comparison of strains detected through viral watch (ILI) and SARI surveillance from the start to the end of the pandemic.
- Surveillance for 2009 H1N1 at enhanced sites continued.

Special Influenza Projects and Other Notable Achievements in FY 2010

- A collaborative project between the RVU, the WHO Global Influenza Project Epidemiology Unit and numerous African countries has begun to investigate the epidemiological and virological characteristics of the 2009 H1N1 virus in Africa.
- Six publications by the Respiratory Virus Unit and the Respiratory and Zoonosis Programme at the Department of Medical Virology, University of Pretoria appeared in peer reviewed journals.
- Eleven posters and an oral presentation arising from various influenza projects were presented at the Options for the Control of Influenza VII conference held in Hong Kong, September 2010.
- A poster from the NIC on the molecular epidemiology of 2009 H1N1 in South Africa was awarded best poster at the WHO Meeting held in Morocco, Afriflu Alliance in June 2010.

Public Health Importance

- Training and surveillance allowed rapid response to 2009 H1N1 concerns in South Africa.
- Surveillance for influenza has provided a platform to explore the role of other viral respiratory pathogens in causing pneumonia in South Africa.
- Robust estimates of influenza burden in specific populations (e.g. HIV-infected patients) have provided evidence for possible policy formulation on the use of influenza vaccine to prevent disease in target groups.
- Strengthening of pandemic preparedness and response capacity and knowledge at a provincial level has provided a platform for improved preparedness and response to other communicable diseases of public health concern.
- Annual updates to the WHO on circulating influenza A and B strains to be included in the Southern Hemisphere vaccine.

Save As...

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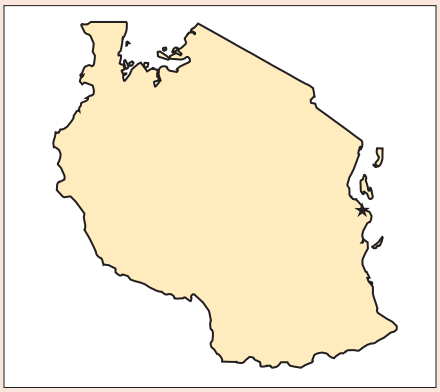
Save As...

Tanzania



- **Capital:** Dar es Salaam
- **Area:** 947,300 sq km
- **Population:** 42,746,620 (July 2011 est.)
- **Age Structure:** 0-14 years: 42% (male 9,003,152/female 8,949,061); 15-64 years: 55.1% (male 11,633,721/female 11,913,951); 65 years and over: 2.9% (male 538,290/female 708,445) (2011 est.)
- **Life Expectancy at Birth:** Total population: 52.85 years; male: 51.34 years; female: 54.42 years (2011 est.)
- **Infant Mortality Rate:** Total: 66.93 deaths/1,000 live births; male: 73.7 deaths/1,000 live births; female: 59.95 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 69.4%; male: 77.5%; female: 62.2% (2002 census)
- **GDP:** $62.22 billion (2010 est.)
- **GDP per Capita:** $1,500 (2010 est.)

U.S. CDC Direct Country Support

Tanzania began avian and pandemic influenza preparedness and response activities in 2006 by creating the National Multi-Sectoral Taskforce, and through the development of a national preparedness and response plan. In 2008, the Ministry of Health and Social Welfare (MOHSW), with the assistance of CDC, established the National Influenza Laboratory (NIL) in Dar es Salaam and initiated virologic and epidemiologic influenza sentinel surveillance in five hospitals around the country. This surveillance enhancement contributed to the country's timely response to Rift Valley Fever in 2007, the 2009 H1N1 influenza pandemic, and the Dengue Fever outbreak in 2010. FY 2010 was the fourth year of the cooperative agreement between CDC and the MOHSW.

Surveillance

The influenza surveillance system in Tanzania uses both the Integrated Disease Surveillance and Response (IDSR) system on suspected cases of SARI from all 133 districts, and the sentinel surveillance of sampled ILI cases and all SARI cases in five sentinel hospitals.

Key Surveillance Activities

- All five sentinel sites actively conducted influenza surveillance, and a total of 903 samples were sent to the NIL.
- MOHSW hosted one meeting with stakeholders to evaluate achievements and challenges of influenza surveillance and came up with steps to tackle these challenges.
- MOHSW established enhanced influenza surveillance to strengthen the response to the 2009 H1N1 pandemic.

Laboratory

The influenza laboratory network consists of five sentinel hospital laboratories that are mainly specimen collection, storage and transportation points, and the NIL, which is the only laboratory in Tanzania with capacity to diagnose influenza.

Key Laboratory Activities

- NIL tested a total of 2,096 influenza specimens (903 from sentinel hospitals, 1153 from 2009 H1N1 outbreak sites).
- NIL submitted a total of 110 PCR positive samples to the WHO CC Atlanta as part of the WHO GISN.
- NIL conducted five supervisory visits and provided logical support to laboratories in the influenza surveillance network.
- Tanzania participated in the WHO EQAP.

Preparedness

Tanzania's MOHSW continues to work with CDC, United Nations, and other stakeholders in the implementation of the preparedness and response plan for avian and pandemic influenza.

Key Preparedness Activities

- MOHSW developed 22,000 2009 H1N1 pandemic influenza leaflets in local language and distributed to the general public.
- The Tanzania Joint Human and Animal Technical Committee met nine times to share surveillance data from human and animal populations.
- MOHSW produced 3,500 travelers' screening forms and distributed them to three major airports to gather health information about incoming travelers.
- MOHSW produced and broadcasted TV and radio spots on seasonal and pandemic influenza awareness.

Training

Tanzania MOHSW hosted the following training activities in 2010:

- A refresher training on 2009 H1N1 pandemic influenza for 31 staff members from sentinel hospitals.
- A training session on preparedness and response to avian and pandemic influenza for 20 district rapid response teams and five private hospital staff.
- For all five sentinel hospitals, training sessions were conducted on influenza sample collection, storage, and transportation techniques.
- Two MOHSW senior staff attended an inter-ministerial conference on animal and pandemic influenza in Vietnam.

The following trainings are planned for the near future:

- Laboratory management for NIL.
- Preparedness and response to avian and pandemic influenza for ten additional district rapid response teams and ten private hospitals.

- Virus isolation by culture for NIL.
- Refresher trainings for sentinel hospital staff.

Participants from Mawanza Regional Hospital take part in influenza surveillance training held by the Ministry of Health and Social Welfare (MOHSW) at the Mwanza sentinel site, northwestern Tanzania.

2009 H1N1 Activities, FY 2010

The first 2009 H1N1 suspect case was identified through the travelers' screening process at the main international airport in Dar es Salaam on July 4, 2009; this case was laboratory-confirmed within 24 hours. Tanzania promptly distributed national guidance and procedures for surveillance and management of suspected/confirmed cases of 2009 H1N1 influenza.

Key 2009 H1N1 Activities, 2010

- MOHSW tested 652 samples (35 from sentinel hospitals, 617 from outbreak sites) that were positive for 2009 H1N1 virus by RT-PCR.
- MOHSW provided specimen collection materials, PPE, and antiviral drugs (where necessary) to health facilities in outbreak areas.

Other Notable Achievements in FY 2010

- MOHSW increased the amount of national influenza surveillance data; it shows prevalence trends and the types of influenza viruses that are circulating.
- Influenza surveillance and diagnosis capacity helped MOHSW to determine the presence of other viral outbreaks, including a dengue fever outbreak in 2010.
- MOHSW is now able to contribute positive samples to WHO GISN.
- MOHSW, through the influenza work in Tanzania, has increased collaboration between public and private health facilities on public health issues.

Special Influenza Projects

- Collaboration with the U.S. Department of Defense, Global Emerging Infections Surveillance (DoD-GEIS) to establish eight more sentinel sites.
- Participation in the East African Community's (EAC) trans-boundary avian influenza preparedness activities with Kenya, Uganda, Rwanda, and Burundi.
- Establishment of virus isolation by culture at the NIL.

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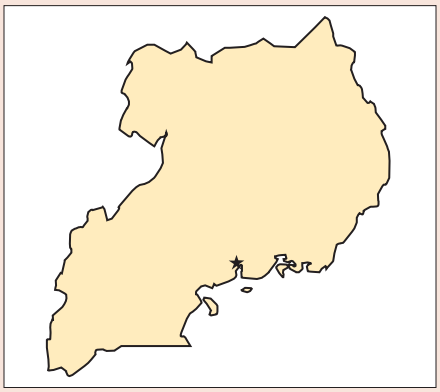
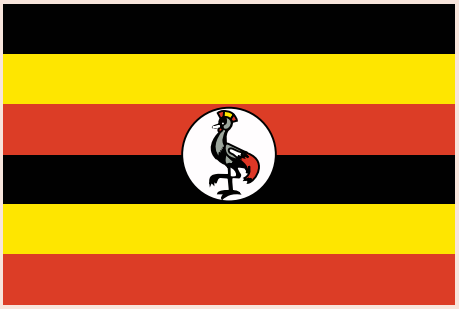
Uganda





- **Capital:** Kampala
- **Area:** 241,038 sq km
- **Population:** 34,612,250 (July 2011 est.)
- **Age Structure:** 0-14 years: 49.9% (male 8,692,239/female 8,564,571); 15-64 years: 48.1% (male 8,383,548/female 8,255,473); 65 years and over: 2.1% (male 291,602/female 424,817) (2011 est.)
- **Life Expectancy at Birth:** Total population: 53.24 years; male: 52.17 years; female: 54.33 years (2011 est.)
- **Infant Mortality Rate:** Total: 62.47 deaths/1,000 live births; male: 66.05 deaths/1,000 live births; female: 58.77 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 66.8%; male: 76.8%; female: 57.7% (2002 census)
- **GDP:** $41.7 billion (2010 est.)
- **GDP per Capita:** $1,200 (2010 est.)

U.S. CDC Direct Country Support

In 2007, a proposal titled *Strengthening National Capacity for Surveillance and Containment of Avian and Pandemic Influenza in Uganda* requested funds to support the Uganda NIC. The purpose of these funds was to help support the national avian flu preparedness plan and to establish a sustainable influenza surveillance network in Uganda. Funds were provided by U.S. CDC under the influenza cooperative agreement that began in August 2007. Influenza sentinel surveillance for ILI and SARI is now well-established in Uganda with nine routine sites and three sites that provide specimens periodically. Also, the national preparedness plan is under implementation.

Surveillance

Although, influenza surveillance was initiated in Uganda in the 1960s at the time of the cooperative agreement, no influenza activities remained. Now, monitoring of influenza activity is carried out routinely in nine locations: five outpatient clinics, where ILI is assessed and four hospitals, where both ILI and SARI are assessed. A further three sites provide specimens periodically and the NIC also works together with the Makerere University Walter Reed Project (MUWRP), which has four hospital-based sentinel sites.

Key Surveillance Activities

- One sentinel site was opened in western Uganda, at Fort Portal Referral Hospital and another was opened in eastern Uganda, at Tororo District Hospital. Both sites conduct ILI and SARI surveillance.
- Pandemic influenza spread to Uganda at the end of June 2009 and was identified through the

surveillance system. Sentinel sites in central and western Uganda were active in identifying and collecting samples from pandemic influenza patients.

- In order to facilitate the estimation of burden of disease due to influenza, data collection was initiated in Uganda. Data is now routinely collected and analysis is ongoing.

Laboratory

- The NIC is the only laboratory carrying out human influenza diagnostic testing in the country. The MUWRP and the CDC-funded influenza program work together in the NIC laboratory.

Key Laboratory Activities

- The laboratory carries out RT-PCR testing to confirm diagnosis and typing, and also carries out virus culture and HAI for subtyping.
- A subset of the influenza isolates were sent to the Atlanta CDC and for the first time some isolates were found to be resistant to adamantanes.
- The laboratory participated in the WHO EQAP panels and received a 100% score.
- The laboratory carried out training of personnel for capacity surge during pandemic situations.

Influenza Program staff in front of the Uganda Viral Research Institute's Influenza Surveillance Program building, Entebbe, Uganda.

Preparedness

The national preparedness plan for Uganda was finalized in 2007. Activities to implement the plan were delayed because of funding. In 2010 the World Bank provided a US $10 million loan to facilitate its execution. Many related activities are now being undertaken by the Government of Uganda.

Key Preparedness Activities

- Training district personnel on identifying influenza patients and rapid response in case of outbreaks.
- Building isolation centers at regional levels.
- Building mechanisms for public awareness.
- Production of a communication strategy and production of information, education and communication (IEC) materials.
- Expanding and strengthening surveillance and reporting in the districts.

- Regularly investigating SARI upsurges with laboratory support.
- Continuous revision of National Plan.

Training

Uganda NIC did not host any training, but the Uganda Viral Research Institute (UVRI) sent personnel to participate in trainings in Kenya and CDC-Atlanta.

2009 H1N1 Activities, FY 2010

The first cases of 2009 H1N1 influenza were detected in June 2009. The pandemic continued throughout 2009 and early 2010. Sporadic cases continued throughout 2010 but with reduced speed and with reduced severity of disease. Cases continued in central and western Uganda and also spread northward into Arua and Koboko at the Uganda-Sudan border.

Key 2009 H1N1 Activities, 2010

- Participated in activities of the *Integrated National Action Plan for Influenza*.
- Strengthened the NIC capacity to test for 2009 H1N1 virus.
- Participated in simulation exercises to improve rapid response.

Other Notable Achievements in FY 2010

- Funds totaling US $250,000 have been approved for expansion of the influenza laboratories. These funds are from the World Bank loan that the NIC negotiated together with MOH and Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) Uganda.
- UVRI received another ABI 7500 Fast RT-PCR machine, a centrifuge, a refrigerator and some additional supplies from USAID in support of 2009 H1N1 diagnostic activities.

Special Influenza Projects

- Initiated data collection for burden of diseases studies.
- Started to slowly shift from ILI surveillance to more SARI surveillance in hospitals.

Principal Collaborator

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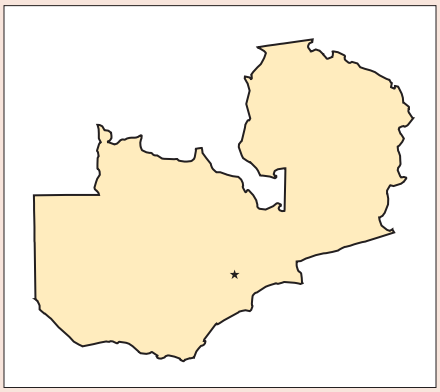
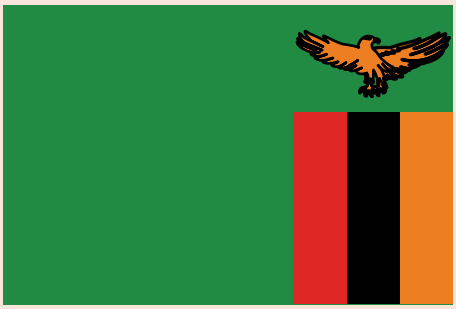
Save As...

Zambia





- **Capital:** Lusaka
- **Area:** 752,618 sq km
- **Population:** 13,881,336 (July 2011 est.)
- **Age Structure:** 0-14 years: 46.7% (male 3,253,125/female 3,228,844); 15-64 years: 50.8% (male 3,544,640/female 3,508,344); 65 years and over: 2.5% (male 148,531/female 197,852) (2011 est.)
- **Life Expectancy at Birth:** Total population: 52.36 years; male: 51.13 years; female: 53.63 years (2011 est.)
- **Infant Mortality Rate:** Total: 66.6 deaths/1,000 live births; male: 71.27 deaths/1,000 live births; female: 61.78 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 80.6%; male: 86.8%; female: 74.8% (2003 est.)
- **GDP:** $20.03 billion (2010 est.)
- **GDP per Capita:** $1,500 (2010 est.)

U.S. CDC Direct Country Support

The CDC Influenza Division has a four-year (2009–2013) cooperative agreement with the Zambia MOH. This cooperative agreement will complement ongoing initiatives and help strengthen influenza surveillance and the surveillance of other communicable diseases in Zambia by strengthening the public sector laboratory and surveillance capacity for ILI and SARI. The cooperative agreement will be implemented by the University Teaching Hospital (UTH) and the Lusaka district health office on behalf of the MOH and in close collaboration with CDC-Zambia, CDC-South Africa, and the National Institutes for Communicable Diseases (NICD-South Africa) and WHO.

Surveillance

Before the cooperative agreement, Zambia had a developing influenza surveillance system. The cooperative agreement has enabled Zambia to strengthen its surveillance system, and the surveillance of emerging pandemic viruses. Currently, Zambia has two ILI sites and two SARI surveillance sites, all in Lusaka.

Key Surveillance Activities

- Clinical coordinators and virology laboratory staff designed a new influenza surveillance data collection tool.
- The data manager at NICD-South Africa received Epi Info training.
- Nurse and clinical officer surveillance staff received additional training on the use of the new data collection tool.

Save As...

- Surveillance officers from the MOH and the Ministry of Livestock and Fisheries in Chipata province and district received rapid response training from a team of six trainers (three human health and three animal health staff).
- Andros Theo presented a poster at Options for the Control of Influenza VII conference in Hong Kong, September 2010.

Laboratory

Since the introduction of the cooperative agreement, the virology laboratory has been strengthened through training of laboratory scientists and the provision of reagent and consumables. It now functions as the country's reference laboratory and is on its way to becoming an accredited NIC.

Key Laboratory Activities

- Real-time PCR training was provided for five laboratory staff at the Tropical Disease Research Center on the USAID-donated ABI 7500 Fast machine.
- A draft influenza manuscript was authored at a writing workshop in Nairobi, Kenya.
- CDC experts visited the virology laboratory and strengthened testing and data management through their expertise.

Preparedness

The MOH conducts Integrated Disease Surveillance and Response (IDSR) for communicable diseases and is moving toward integrating influenza. This serves as an early-warning system for detection of outbreaks.

Key Preparedness Activities

- MOH developed a national action plan for preparedness and response to influenza threats.

Training

The MOH hosted the following training activities in 2010:

- Rapid response team (RRT) training activities in high risk provincial and district areas.
- Additional pandemic preparedness and response training in conjunction with the disaster management and response unit under the office of the Vice President.

The following training is planned for the coming fiscal year:

- Training on the development of organizational business continuity plans.
- RRT training in provinces that reported pandemic 2009 H1N1 outbreaks.

2009 H1N1 Activities, 2010

- MOH disseminated 2009 H1N1 data at a Zambia Medical Association meeting for practitioners.
- MOH finalized the pandemic 2009 H1N1 preparedness and response plan.
- The National Epidemic Committee is in the process of adopting 2009 H1N1 as a notifiable disease.
- The MOH developed and disseminated communication materials.
- Collaboration was established between animal and human health scientists.

- Pandemic 2009 H1N1 preparedness and response at border entry points was strengthened by technical supervisory visits of MOH experts.

Other Notable Achievements in FY 2010

- WHO donated 2,000 doses of Tamiflu and 256,800 vaccine doses to the MOH.
- CDC donated respiratory masks to the MOH.
- Health staff was vaccinated against 2009 H1N1.

Special Influenza Projects

- The MOH is seeking to designate surveillance nurses to collect data on SARI in order to keep influenza patients separate from other patients in the UTH pediatric ward.

Principal Collaborators

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WHO Eastern Mediterranean Region (EMR)

WHO Eastern Mediterranean Region (EMR) Overview

There are four bilateral influenza cooperative agreements in the Eastern Mediterranean Region (EMR). These cooperative agreements are with Ministries of Health or other institutions to build capacity to routinely identify, diagnose, and respond to seasonal and pandemic influenza in the Eastern Mediterranean Region.

CDC direct country support through cooperative agreements is established in the following countries:

- Afghanistan.
- Egypt.
- Morocco.
- Pakistan.

In addition, CDC supports the WHO Eastern Mediterranean Regional Office (WHO EMRO) via a cooperative agreement to provide coordination and technical support to Member States.

The core activities of the bilateral agreements with countries are:

- To build sustainable national capacity for the detection, identification and response to seasonal, avian, and novel influenza.
- To develop interagency national preparedness plans.
- To build capacity for integrated laboratory and epidemiologic surveillance for ILI and SARI, which includes making routine contributions to WHO Global Influenza Surveillance Network (GISN) and implementing International Health Regulations (IHR).
- To develop and train local rapid response and containment teams.

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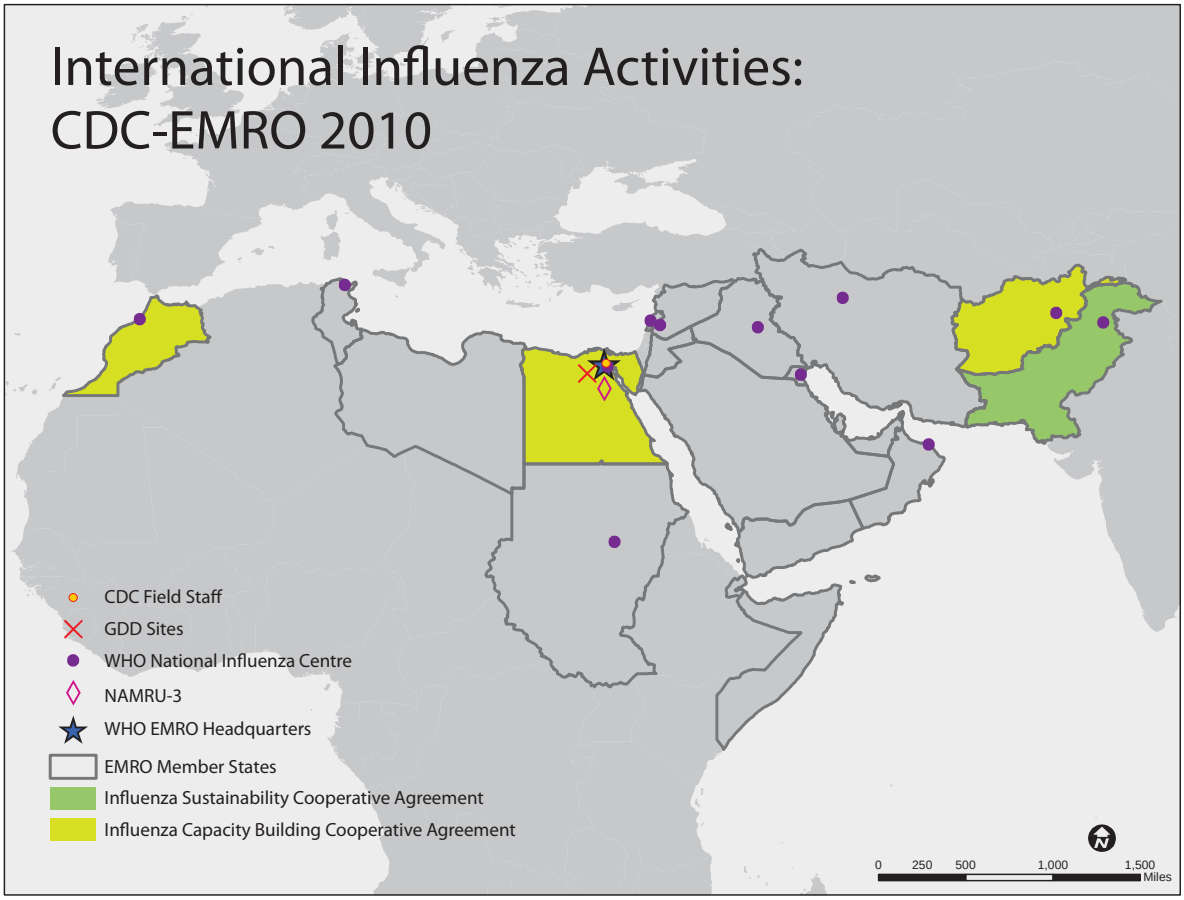
WHO Eastern Mediterranean Regional Office (EMRO)



A five-year project titled *Strengthening Surveillance and Response to Avian and Pandemic Influenza in the Eastern Mediterranean Region* was launched in October 2006, under a cooperative agreement between the Eastern Mediterranean Regional Office (EMRO) of the WHO and the U.S. CDC. This is the fifth year of the cooperative agreement.

The overarching goal of this project is to strengthen the public health capacities of 22 countries in the Region to rapidly detect, assess, respond to and contain public health threats emanating from highly pathogenic avian influenza (HPAI) and human pandemic influenza.

Surveillance

The Regional Office has undertaken a number of key activities aimed at strengthening the influenza surveillance and response capacities of the countries in the Eastern Mediterranean Region. At least 12 countries in the region are participating in the virological surveillance for seasonal influenza as part of the Global Influenza Surveillance Network (GISN), and seven countries in the Region (Afghanistan, Egypt, Jordan, Iran, Morocco, Oman, and Tunisia) were provided with technical and financial support through the Regional Office resulting in ILI and SARI surveillance.

Key Surveillance Activities

- WHO EMRO organized an inter-country meeting on human pandemic influenza in Cairo, Egypt during the month of April 2010. Representatives from national health authorities at the policy- and decision-making levels from all 22 countries in the Region attended this meeting.

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The meeting reviewed the ongoing epidemiological and virological surveillance systems of the countries.

- The Regional Office organized an inter-country workshop in Cairo, Egypt in March 2010 on the use of International Health Regulations (IHR) for event notification and reporting of pandemic influenza and other Public Health Emergencies of International Concern (PHEIC). The IHR National Focal Points (NFPs) of all 22 countries in the Region attending this meeting.
- The Regional Office conducted a preliminary assessment for setting up sentinel surveillance systems for ILI and SARI in three countries- occupied Palestine territory (OpT), Yemen and Pakistan. The assessment was conducted with a view of advising the national health authorities on optimal ways of generating adequate epidemiological and virological data on ILI and SARI.

Laboratory

Twelve NICs are now functional in the region owing to the technical and financial support provided to the countries through the cooperative agreement. Of these NICs, seven now have full capacity for influenza viral sequencing.

Key Laboratory Activities

- WHO EMRO and the Naval Medical Research Unit No. 3 (NAMRU-3) jointly conducted technical missions in Qatar and in the United Arab Emirates for assessment of influenza virus isolation units at the Central Public Health Laboratories of these two countries. Following completion of these training courses and assessments, the formal recognition process of WHO to designate these influenza laboratories as NICs has begun.
- WHO EMRO conducted an inter-country meeting of the national influenza laboratory focal points in Muscat, Oman in September 2010. The purpose of this meeting was to strengthen the laboratory network of NICs in the region and to encourage the countries in the region to build and expand laboratory-based surveillance for ILI and SARI.
- The Regional Office conducted a technical mission to Oman in March 2010 to develop a master plan on laboratory biosafety preparedness and response working jointly with WHO, the European Union, and the MOH, Sultanate of Oman.

Preparedness

The national preparedness plan for human pandemic influenza was developed for all 22 countries in the region. Technical support was provided in the areas of risk communication, infection prevention and control, and risk assessment.

Key Preparedness Activities

The Regional Office:

- Provided technical, operational, and logistic support to six low-income countries and one middle-income country for the deployment of pandemic 2009 H1N1 vaccines and the organization of mass vaccination campaigns for high-risk populations.
- Provided strategic support for the development of a global guideline on event-based risk assessment through participation in the consultative meeting organized by WHO Headquarters in Geneva, Switzerland.
- Produced and distributed a multi-lingual (Arabic, French and English) educational animated film on influenza titled *Protect Yourself from Influenza (H1N1),* which is designed for use

in schools. The Regional Office also developed a computer screen saver under the theme *prevention is better than cure,* as a risk communication product for 2009 H1N1.

- Established a regional stockpile of influenza antiviral drugs (oseltamivir) in the WHO Logistic Hub in Dubai.
- Provided a complete investigation kit containing PPE, bio-packaging materials, viral transport media (VTM) and other essential supplies. These kits were deployed to each of the WHO Country Offices to support in-country field investigation for clusters of cases of ILI and SARI.
- Launched a joint collaborative work to finalize the assessment manual for Patient Safety Friendly Hospital Initiative (PSFHI). A toolkit on measuring infection prevention and control practices in health care settings for epidemic and pandemic-prone acute respiratory disease is being developed.

Training

The Eastern Mediterranean Regional Office of WHO conducted the following training activities in 2010 under the cooperative agreement:

- A regional training workshop on field investigation and response to outbreaks from influenza and other epidemic prone respiratory infections in Beirut, Lebanon. The 44 participants were trained on outbreak investigation and response to clusters of SARI or death during the influenza season.
- Two cycles of a training course on influenza virus sequencing were offered to the established NICs in the Region at the NAMRU-3 laboratory in Cairo, Egypt in April 2010.
- WHO EMRO and NAMRU-3 jointly conducted training courses to build and strengthen diagnostic capacity for isolation, typing, and sub-typing of influenza viruses using tissue culture and haemagglutination. Two virologists each from the NICs of Egypt, Iran, Morocco, Oman, Pakistan and Tunisia attended these training courses.

2009 H1N1 Activities, FY 2010

Throughout the FY 2010, the Regional Office extended technical support to all the countries in the Region for improving public health response to the pandemic influenza, particularly in the areas of clinical management, community mitigation measures, risk communication, vaccine deployment and field investigation.

Key 2009 H1N1 Activities, 2010

The Regional Office:

- Documented the process of its emergency operations response undertaken in response to 2009 H1N1. The resulting report identified the key institutional strengths and weaknesses of its strategic health operational response.
- Provided technical support to Afghanistan, Djibouti, Pakistan, Somalia, Sudan, Yemen and OpT for deployment of 2009 H1N1 vaccines.
- Established a regional stockpile of influenza specific antiviral drugs (oseltamivir), which was intended to ensure timely access for all the 22 countries in the Region to strategic antiviral supplies.
- WHO EMRO provided appropriate equipment and logistics supplies to all the WHO Country Offices in the Region to facilitate in-country investigation and risk assessment missions for 2009 H1N1.

Other Notable Achievements in FY 2010

- The Regional Office publishes a weekly epidemiological report to inform the Member States of the evolution of pandemic influenza as well as of other public health emergencies of potential concern in the region. This is the third year of uninterrupted publication.
- The Regional Office extended technical assistance to conduct a training of trainers (ToT) course on field investigation of influenza and other epidemic prone acute respiratory diseases in south Sudan. Thirty-five state level surveillance officers of the Government of South Sudan (GoSS) attended this training course.
- Seven out of the 12 NICs in the Eastern Mediterranean Region participated in the WHO EQAP with notable results.

Special Influenza Projects

The Regional Office, along with CDC-Atlanta, extended technical support to the health authorities of Kingdom of Saudi Arabia during the Hajj 2010 for strengthening field surveillance for influenza and other epidemic-prone respiratory infections during mass gatherings, using the Field Adapted Surveillance Toolkit (FAST) in conjunction with an enhanced routine disease surveillance system.

Principal Collaborators

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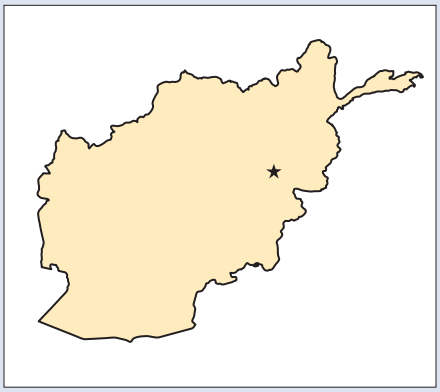
Afghanistan



- **Capital:** Kabul
- **Area:** 652,230 sq km
- **Population:** 29,835,392 (July 2011 est.)
- **Age Structure:** 0-14 years: 42.3% (male 6,464,070/female 6,149,468); 15-64 years: 55.3% (male 8,460,486/female 8,031,968); 65 years and over: 2.4% (male 349,349/female 380,051) (2011 est.)
- **Life Expectancy at Birth:** Total population: 45.02 years; male: 44.79 years; female: 45.25 years (2011 est.)
- **Infant Mortality Rate:** Total: 149.2 deaths/1,000 live births; male: 152.75 deaths/1,000 live births; female: 145.47 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 28.1%; male: 43.1%; female: 12.6% (2000 est.)
- **GDP:** $29.81 billion (2010 est.)
- **GDP per Capita:** $1,000 (2010 est.)

U.S. CDC Direct Country Support

The Islamic Republic of Afghanistan received cooperative agreement funding from the U.S.CDC for surveillance and response to avian and pandemic influenza in 2006. FY 2010 was the fifth year of cooperative agreement funding. These funds support the Afghan Public Health Institute (APHI), located in the Afghanistan Ministry of Public Health (MOPH), in planning and conducting pandemic preparedness and response, ILI and SARI surveillance, laboratory capacity building, health education, and training activities.

Surveillance

The primary surveillance system used in Afghanistan for disease surveillance is the Disease Early Warning System (DEWS) that was established in December, 2006, with funding from WHO and USAID. DEWS collects data for 15 reportable diseases in the country, including influenza. Specimen collection for ILI is mandatory in all provinces. Currently, regional DEWS officers submit weekly data to APHI from over 250 surveillance sentinel sites covering the 34 provinces in the country.

Key Surveillance Activities

- The weekly reporting rate for the regional DEWS officers is greater than 98%.
- SARI surveillance has been established at military and police hospitals; this data is included in the weekly DEWS report.
- There is daily electronic collection and reporting of ARI cases and deaths from all 34 provinces.

Save As...

Laboratory

The virology laboratory of the Central Public Health Laboratory (CPHL) was designated as a National Influenza Center (NIC) in 2009. The NIC is capable of performing RT-PCR, virus isolation and subtyping using HAI.

- CPHL processed 2,172 ILI specimens.
- Nine hundred fifty-three specimens were positive for 2009 H1N1.

Preparedness

The national preparedness plan was approved by MOPH in 2009. The plan was developed with input from health sector stakeholders and used during the 2009 H1N1 pandemic period. The existing National Emergency Response Commission coordinated the response to the 2009 pandemic.

Key Preparedness Activities

- Fifty rapid response team members from 11 provinces were trained or retrained to respond to outbreaks.
- PPE kits, VTM, and 10,000 courses of Tamiflu were purchased and available for use, especially during outbreak investigations.

Training

Afghanistan hosted the following training activities in 2010:

- Twenty-five MOPH managers attended an intermediate-level epidemiology training program.
- More than 4,200 health care workers were trained on influenza case detection, reporting, and disease management.

2009 H1N1 Activities, FY 2010

The Command and Control Center in the MOPH was activated during the pandemic. Three established hotlines were open for calls and questions from the community.

Key 2009 H1N1 Activities, 2010

- A toolkit for surveillance, case detection, and the management of pandemic 2009 H1N1 was developed and distributed to 15,000 health care workers in the provinces.
- A booklet on influenza prevention was developed by APHI and made available to pilgrims making the Hajj.
- A 2009 H1N1 flu vaccination campaign for health workers was conducted in 34 provinces.
- A campaign to vaccinate Hajj pilgrims for seasonal influenza was initiated.

Other Notable Achievements in FY 2010

- Two influenza isolation wards were established in the Indira Gandi Hospital and the Infectious Diseases Hospital in Kabul.
- A stock room at APHI was renovated to assure the safe storage of supplies and equipment related to influenza and DEWS.

Save As...

Principal Collaborators

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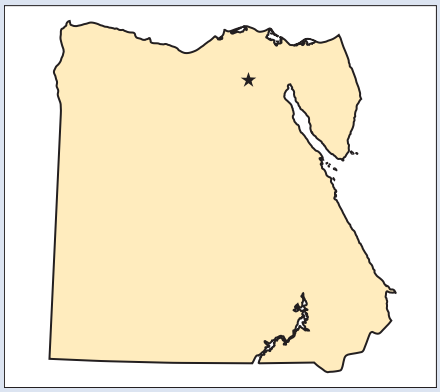
A view of Badakhshan Province, northeastern Afghanistan.

Arab Republic of Egypt



- **Capital:** Cairo
- **Area:** 1,001,450 sq km
- **Population:** 82,079,636 (July 2011 est.)
- **Age Structure:** 0-14 years: 32.7% (male 13,725,282/female 13,112,157); 15-64 years: 62.8% (male 26,187,921/female 25,353,947); 65 years and over: 4.5% (male 1,669,313/female 2,031,016) (2011 est.)
- **Life Expectancy at Birth:** total population: 72.66 years; male: 70.07 years; female: 75.38 years (2011 est.)
- **Infant Mortality Rate:** Total: 25.2 deaths/1,000 live births; male: 26.8 deaths/1,000 live births; female: 23.52 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 71.4%; male: 83%; female: 59.4% (2005 est.)
- **GDP:** $500.9 billion (2010 est.)

U.S. CDC Direct Country Support

The Ministry of Health and Populations (MOHP) in the Arab Republic of Egypt was awarded funding in 2009 for the cooperative agreement *Surveillance and Response to Avian and Pandemic Influenza*. Beginning in 2009, the funding was used to build laboratory and epidemiology capacity for influenza surveillance. The goals of the project are to prevent the emergence and spread of a pandemic influenza virus, to reduce morbidity and mortality caused by influenza viruses, and to improve the state of preparedness and the quality of response to an influenza pandemic. MOHP collaborates with Naval Medical Research Unit No. 3 (NAMRU-3) in Cairo and WHO EMRO to review and enhance ongoing national surveillance activities.

Surveillance

Egypt has multiple activities for influenza within the surveillance system. General influenza surveillance takes place in all government hospitals (up to 450 hospitals) and about 5,000 outpatient health clinics. Sentinel surveillance for ILI was established in 1999 in eight sites in outpatient clinics of selected fever and chest hospitals. Sentinel surveillance for SARI began in 2009 and occurs in eight sites in the inpatient wards of selected fever hospitals. Both ILI and SARI sentinel surveillance have been implemented and continue in collaboration with NAMRU-3. Avian influenza surveillance started in early 2006. Surveillance also occurs for suspected novel influenza viruses and pneumonia. Influenza surveillance data from hospitals throughout 29 governorate surveillance units is collated and then pooled and submitted electronically to the central Epidemiologic Surveillance Unit (ESU).

Key Surveillance Activities

- A weekly report is generated from surveillance data for pneumonia, avian influenza, and 2009 H1N1.
- A weekly report is also generated from sentinel SARI and ILI surveillance data and distributed to designated persons within the MOHP and to regional epidemiologists.

Laboratory

The Central Public Health Laboratory (CPHL) serves as the NIC and provides laboratory support to the ESU for surveillance activities related to human influenza in Egypt. Four of the eight sentinel hospitals have subnational laboratories that perform RT-PCR testing for influenza. It is expected that two additional sub-national laboratories will begin functioning in 2011.

Key Laboratory Activities

- CPHL has the capacity to detect and subtype seasonal, H5N1, and 2009 H1N1 influenza viruses using both molecular and culture-based techniques; culture is only used for viral isolation with specimens collected for ILI and SARI surveillance purposes.
- Laboratory staff routinely provide training and offer technical support to the sub-national laboratories.

Preparedness

The MOHP has devoted time and resources to establishing and building capacity of rapid response teams (RRTs) to investigate and implement control measures to combat zoonotic transmission of H5N1, and to contain and mitigate pandemic influenza.

Key Preparedness Activities

- RRTs from all levels (central, governorate and district) were trained on the preparedness guidelines outlined in the national preparedness pandemic plan.
- Six thousand five hundred PPE sets were procured and stored for immediate use.

Training

The MOHP conducted the following trainings in FY 2010:

- Four training courses were implemented for 164 participants (84 physicians and 80 nurses) to improve the awareness of physicians and nurses working in the pandemic.
- Twelve training courses on enhancing human surveillance for H5N1 influenza infection were conducted for 381 participants in ten governorates.
- Three hundred and fourteen training courses were implemented for surveillance teams in 14 governorates considered to be high risk.
- Training courses were held to improve capacity or immediate reporting and rapid response to sporadic cases or clusters of illness, including nine training courses for 325 participants from the 29 governorates of Egypt.
- Training to improve the quality of infection control practices at all MOHP hospitals down to the district level was provided for infection control practitioners.

2009 H1N1 Activities, FY 2010

- H5N1 surveillance and detection was enhanced throughout the country with direction from the MOHP.

- 2009 H1N1 influenza data was integrated into the established surveillance data collection system.
- A comprehensive national surveillance plan for ILI, SARI, and pneumonia was integrated into ongoing surveillance activities.
- Epidemiologists from ESU followed the global epidemiology situation daily and provided reports to MOHP.
- National and international data was reviewed and analyzed.

Hajj Pilgrim Measures

- Health fitness certificates were issued by MOPH for each person wanting to make the Hajj pilgrimage.
- Pilgrims were vaccinated with 2009 H1N1vaccine and/or seasonal vaccine that included the 2009 H1N1 strain.
- The MOPH offered health education for pilgrims.

Traditional sailing craft near a modern city in Egypt.

Vaccine Deployment

- The MOPH provided 300,000 doses of seasonal influenza vaccine for pilgrims and health care workers.
- MOPH contracted for five million doses of 2009 H1N1 vaccine, which they made available from October 2009 to March 2010.
- The MOPH deployed approximately two million doses of 2009 H1N1 vaccine during FY 2010. Some of those people vaccinated included pilgrims, primary school students, and health care practitioners.

Other Notable Achievements in FY 2010

- A project coordinator was hired and technical support staff was appointed to support the influenza project.

Special Influenza Project

- Population-based surveillance for SARI (with plans to expand to include ILI) is being conducted in Damanhour, Behera Governorate in conjunction with NAMRU-3.

Principal Collaborators

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GDD-Egypt

The GDD (Global Disease Detection) Regional Center in Egypt (GDD-Egypt) was established in 2006 as an extension of an established agreement between the U.S. CDC, WHO EMRO, and U.S. Naval Medical Research Unit No. 3 (NAMRU-3) to develop national and regional resources to control and combat infectious diseases that are the leading cause of death, disability, and illness in the region.

Coverage

GDD-Egypt has provided support to more than 20 countries in the AFR, EMR, and EUR from its base at NAMRU-3. It is also the platform for much of 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.

GDD-Egypt activities include:

- Outbreak Response.
- Pathogen Discovery.
- Training.
- Surveillance.
- Networking.

Effect

In 2010, the GDD Regional Center in Egypt discovered one pathogen new to the region and increased their laboratory testing capacity by 17%. GDD-Egypt trained 14 FETP graduates and more than 2,400 participants in short-term regional and national trainings. GDD-Egypt responded to 21 outbreaks; each outbreak involved laboratory support and was responded to in less than 24 hours. GDD-Egypt provided 100% of the laboratory support.

In-Country Field Staff

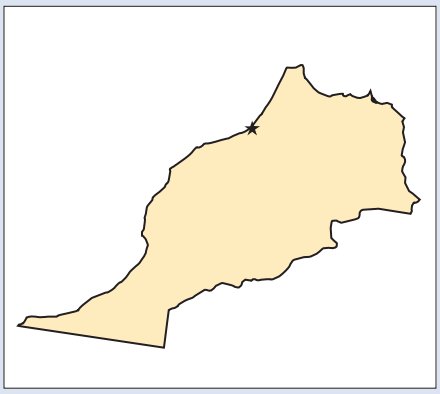
Erica Dueger, DVM, PhD
Egypt GDD Regional Center Director

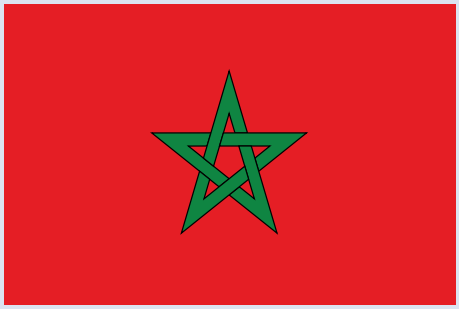
Principal U.S. CDC Program Collaborations In-Country

- Influenza Division International Program
- International Emerging Infections Program
- Field Epidemiology and Laboratory Training Program

Save As...

Morocco





- **Capital:** Rabat
- **Area:** 446,550 sq km
- **Population:** 31,968,361 (July 2011 est.)
- **Age Structure:** 0-14 years: 27.8% (male 4,514,623/female 4,382,487); 15-64 years: 66.1% (male 10,335,931/female 10,785,380); 65 years and over: 6.1% (male 881,622/female 1,068,318) (2011 est.)
- **Life Expectancy at Birth:** total population: 75.9 years; male: 72.84 years; female: 79.11 years (2011 est.)
- **Infant Mortality Rate:** total: 27.53 deaths/1,000 live births; male: 32.32 deaths/1,000 live births; female: 22.51 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** total population: 52.3%; male: 65.7%; female: 39.6% (2004 census)
- **GDP:** $153.8 billion (2010 est.)
- **GDP per Capita:** $4,900 (2010 est.)

U.S. CDC Direct Country Support

The Kingdom of Morocco's National Institute of Hygiene (NIH) is both the NIC and the recipient of U.S. CDC's cooperative agreement for influenza surveillance titled *Strengthening Influenza Surveillance Networks in Morocco*. NIH was initially funded in 2006 to strengthen laboratory and epidemiology capacity for influenza surveillance.

NIH developed a web-based database to collect both epidemiologic and laboratory information related to ILI and SARI. The NIH collaborates with the MOH epidemiological disease and surveillance units on influenza surveillance activities in the 16 administrative regions in Morocco.

Surveillance

The Morocco MOH uses multiple surveillance systems to characterize the epidemiology of pandemic influenza. These systems include those established to track seasonal influenza. SARI is tracked through a network of 16 regional hospitals where syndromic and virologic data is collected. ILI is tracked through a network of 380 health units and network of 110 private physicians. Sixteen of the health units collect both syndromic and virologic data.

The internet database developed by NIH provides instant notification of influenza activity. Influenza data is entered into the database by the sentinel sites and the NIC.

Key Surveillance Activities

- Non-seasonal 2009 H1N1 flu was made a notifiable disease during the pandemic, until October 31, 2009.

Save As...

- Deaths related to 2009 H1N1 were investigated and reported.
- During the 2009-10 influenza season, 1,219 cases of 2009 H1N1-associated ILI were identified, along with 342 cases of SARI, and 64 fatal cases. All were identified through the established sentinel surveillance system.

Crowds in Djemma El Fna Square, Marrakech, Morocco.

Laboratory

The Morocco surveillance network includes one NIC and 16 regional laboratories. The NIC has the capacity to carry out real-time PCR testing, virus culturing, HAI testing, and DFA testing. Four regional laboratories are equipped with PCR machines.

Key Laboratory Activities

- The project assures laboratory functioning by regularly ordering laboratory consumables and standards reagents, such as immunofluoresence (IFA) and PCR regents for the NIC and influenza network laboratories.
- Six biosafety cabinets were purchased for regional laboratories.
- Morocco participated in the CDC/APHL Influenza Laboratory Capacity Review.

Preparedness

In response to the threat of 2009 H1N1 virus, Morocco's MOH implemented unprecedented influenza surveillance in May 2009 in order to detect the introduction of pandemic H1N1 influenza and to monitor its spread and impact on public health in Morocco.

Key Preparedness Activities

- The national public health preparedness plan was updated during the 2009 H1N1 pandemic.
- Pandemic preparedness guidelines were developed and used to guide 2009 H1N1 pandemic response activities.

Training

The Morocco NIH hosted the following training activities in 2010:

- On-site technical assistance and hands-on training for regional laboratory staff in real-time PCR diagnostics.
- Supervision and monitoring visits to ensure the functioning of the sentinel surveillance system and the quality of the surveillance data.

2009 H1N1 Activities, FY 2010

The national preparedness plan was activated during the pandemic. The NIC played a key role in the overall response to the pandemic throughout the country. NIH worked collaboratively with other agencies within the MOH to provide accurate data analysis for the pandemic response.

Key 2009 H1N1 Activities, 2010

- The NIC quickly handled the surge in testing for 2009 H1N1 by real-time PCR and provided in-country training for the regional laboratories for 2009 H1N1 testing.
- The role of RT-PCR diagnosis for the 2009 H1N1 pandemic was decentralized to four regional laboratories which allowed the NIC to concentrate on confirmation testing and virus isolation.

Other Notable Achievements in FY 2010

- The sentinel SARI and ILI surveillance system is fully operational in all sixteen regions of the country.
- The CDC/APHL Laboratory Capacity Review Tool was used to conduct an NIC capacity assessment in 2010.
- CDC monitoring and evaluation and surveillance system tools were used to evaluate preparedness planning in Morocco and in the MOH influenza surveillance system.

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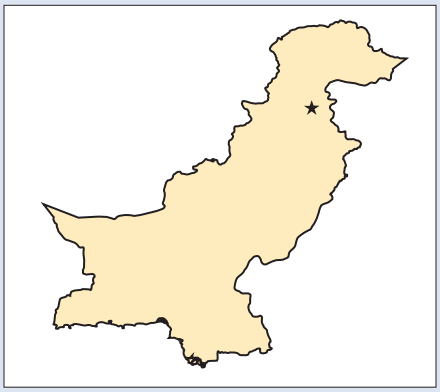
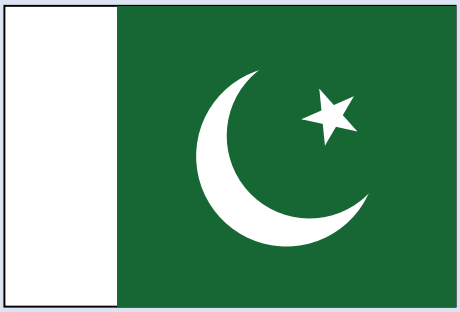
Pakistan





- **Capital:** Islamabad
- **Area:** 796,095 sq km
- **Population:** 187,342,721 (July 2011 est.)
- **Age Structure:** 0-14 years: 35.4% (male 34,093,853/female 32,278,462); 15-64 years: 60.4% (male 58,401,016/female 54,671,873); 65 years and over: 4.2% (male 3,739,647/female 4,157,870) (2011 est.)
- **Life Expectancy at Birth:** Total population: 65.99 years; male: 64.18 years; female: 67.9 years (2011 est.)
- **Infant Mortality Rate:** Total: 63.26 deaths/1,000 live births; male: 66.52 deaths/1,000 live births; female: 59.85 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 49.9%; male: 63%; female: 36% (2005 est.)
- **GDP:** $451.2 billion (2010 est.)
- **GDP per Capita:** $2,400 (2010 est.)

U.S. CDC Direct Country Support

The first year of funding from the cooperative agreement *Developing Sustainable Influenza Surveillance Networks and Response to Avian and Pandemic Influenza* supports the development of a state-of-the-art laboratory at designated sentinel sites in Pakistan for rapid confirmation of human and novel influenza cases. Funding also supports activities aimed at pandemic influenza preparedness through improved national influenza surveillance as well as the development of a national vaccine policy. Significant progress has been made in light of continuing social and political challenges. Five sentinel sites are located in outpatient departments of major tertiary care hospitals in four provinces and the federal capital, Islamabad. Sites were selected on the basis of a representative geographic distribution, high population density, and patient turnover rate.

All sentinel sites are operational after biosafety enhancements, installation of lab equipment, and basic training of physicians for collection of epidemiological data and samples from ILI and SARI cases. Relevant standard operating procedures (SOPs) and protocols for laboratory techniques have been developed as per U.S. CDC protocols.

Surveillance

There was no sentinel site lab-based influenza surveillance prior to the cooperative agreement. Currently, five sentinel sites are reporting ILI/SARI cases to the Pakistan National Institute of Health (NIH).

Key Surveillance Activities

- Laboratory-based surveillance for ILI and SARI cases has been activated at five sentinel sites through both active and passive case finding.

- Rapid response teams have been trained and activated for timely response.
- Case definitions, SOPs for sampling, storage, and sample transportation have been developed and periodically reviewed based on the emerging situation.
- VTM is dispatched to provincial health departments and high-risk districts on a regular basis.
- Seasonal influenza vaccine has been procured and administered to personnel engaged in influenza surveillance.
- Sentinel site and rapid response trainings were conducted in Hayatabad Medical Complex (HMC) and in the newly evaluated sentinel site at Gilgit-Baltistan. Evaluation at another proposed site at Azad Jammu Kashmir (AJK) is under process.
- Epidemiological data on ILI and SARI is being submitted to FluID.

Laboratory

The first CDC cooperative agreement (2004-2009) envisaged the establishment of a network of five key laboratories for lab-based influenza surveillance. The network consists of the central laboratory at NIH, which is engaged in virus isolation and molecular diagnosis of influenza viruses and sentinel influenza labs at the four provincial capitals. The Sindh sentinel laboratory at Civil hospital in Karachi started processing samples in 2010, and three other existing sentinel site laboratories routinely process specimens and send aliquots to NIH for confirmation and tissue culture. Under the second cooperative agreement with CDC, three additional sentinel influenza labs are planned at Multan (Punjab), Gilgit (Baltistan) and AJK. The preliminary evaluation of the designated sentinel site at Gilgit was completed in 2010.

Key Laboratory Activities

- From the five sentinel surveillance sites, 1,086 samples were processed and reported in a timely manner.
- Logistic and technical support was provided to sentinel influenza laboratories.
- Seasonal and pandemic virologic data were consistently shared online via submission to GISN using FluNet.
- Development of a manual containing the influenza diagnostic protocols for distribution to various laboratories is ongoing.

Preparedness

The national preparedness plan for prevention and control of avian and pandemic influenza, established at NIH, was developed by the multi-sectoral National Expert Committee in 2005. Based on this document, the MOH implemented a National Programme for Prevention and Control of Avian and Pandemic Influenza in 2006. Some of the Programme's major components include emergency response, clinical health services, antiviral medicines, vaccine, containment and quarantine, and communication. Influenza surveillance has been strengthened through the cohesive efforts of the MOH and the NIH lab-based project.

Training

- Physicians, public health professionals and lab personnel have been trained via a training program that was conducted throughout Pakistan.
- Seven surveillance trainings were conducted for 93 sentinel site physicians.

- Rapid response training was conducted and attended by 26 persons in Gilgit District, a district considered at high risk for influenza transmission.
- Twenty-eight laboratory staff members at sentinel sites received PCR training.

2009 H1N1 Activities, FY 2010

The provincial influenza laboratories have strengthened the influenza surveillance and response network across Pakistan. The NIC also maintains a collaboration with the WHO, Navy Medical Research Unit No. 3 (NAMRU-3), and CDC. Since August 2010 (post-pandemic), 169 cases of now-seasonal 2009 H1N1 influenza have been detected from over 400 samples received across Pakistan.

Key 2009 H1N1 Activities, 2010

Some of steps taken by the Government of Pakistan/MOH for prevention and control of pandemic influenza include:

- Relevant health education material and guidelines have been distribution to all sentinel sites.
- PPE kits have been dispatched from the National Influenza Project to the provincial health departments, Islamabad Capital Territory (ICT), AJK, Federally Administered Northern Areas (NA) and Federally Administered Tribal Areas.
- Oseltamivir (Tamiflu) has been prepositioned in the high-risk districts from the national pool.
- Regular meetings have been conducted with both electronic and print media for effective dissemination of information about influenza.
- Guidelines on influenza management and algorithms for management of adults and children have been dispatched to all lab focal persons of sentinel sites.
- Public health specialists from provincial health departments have become members on the rapid response teams of the Ministry of Food, Agriculture and Livestock (MinFAL).
- SOPs for surveillance and rapid response to human cases of pandemic influenza have been sent to the provincial health departments and regional health departments of AJK and NA.
- A SOP for collection, storage and transportation of specimen was dispatched to all high-risk districts.
- Training of public health and health care professionals for surveillance of human cases and use of PPE has been conducted both through FELTP Pakistan and the National Influenza Project.
- In order to strengthen influenza surveillance, the provincial and regional health departments have been asked to designate district surveillance officers.

Special Influenza Projects

Funds from the Department of State Biosecurity Engagement Program were used to supplement biosafety and biosecurity needs at two provincial sentinel surveillance sites and the BSL-3 laboratory. These additional resources procured real-time PCR machines, biosafety cabinets, ultra-low temperature freezers, and PPE.

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WHO European Region (EUR)

WHO European Region (EUR) Overview

The WHO Regional Office for Europe (WHO EURO) and the European Center for Disease Control (ECDC) work collaboratively to support public health programs in 53 Member States in Europe. There are five bilateral Influenza cooperative agreements that support influenza activity in Eastern Europe, the Caucus region, and Central Asia. These cooperative agreements are with Ministries of Health or other institutions to work with CDC to build capacity to routinely identify, diagnose, and respond to seasonal and pandemic influenza.

CDC direct country support through cooperative agreements is established in the following countries:

- Armenia.
- Georgia.
- Kazakhstan.
- Moldova.
- Ukraine (through Program for Appropriate Technology in Health – PATH).

In addition, CDC supports WHO EURO via a cooperative agreement to provide technical and coordination support to Member States. This cooperative agreement also supports influenza activities in Romania and Kyrgyzstan.

The core activities of these bilateral agreements are:

- To build sustainable national capacity for the detection, identification and response to seasonal, avian, and novel influenza.
- To develop interagency pandemic preparedness plans.
- To strengthen capacity for integrated laboratory and epidemiologic surveillance for ILI and SARI, which includes making routine contributions to WHO Global Influenza Surveillance Network (GISN) and implementing International Health Regulations (IHR).
- To develop and train local rapid response and containment teams.

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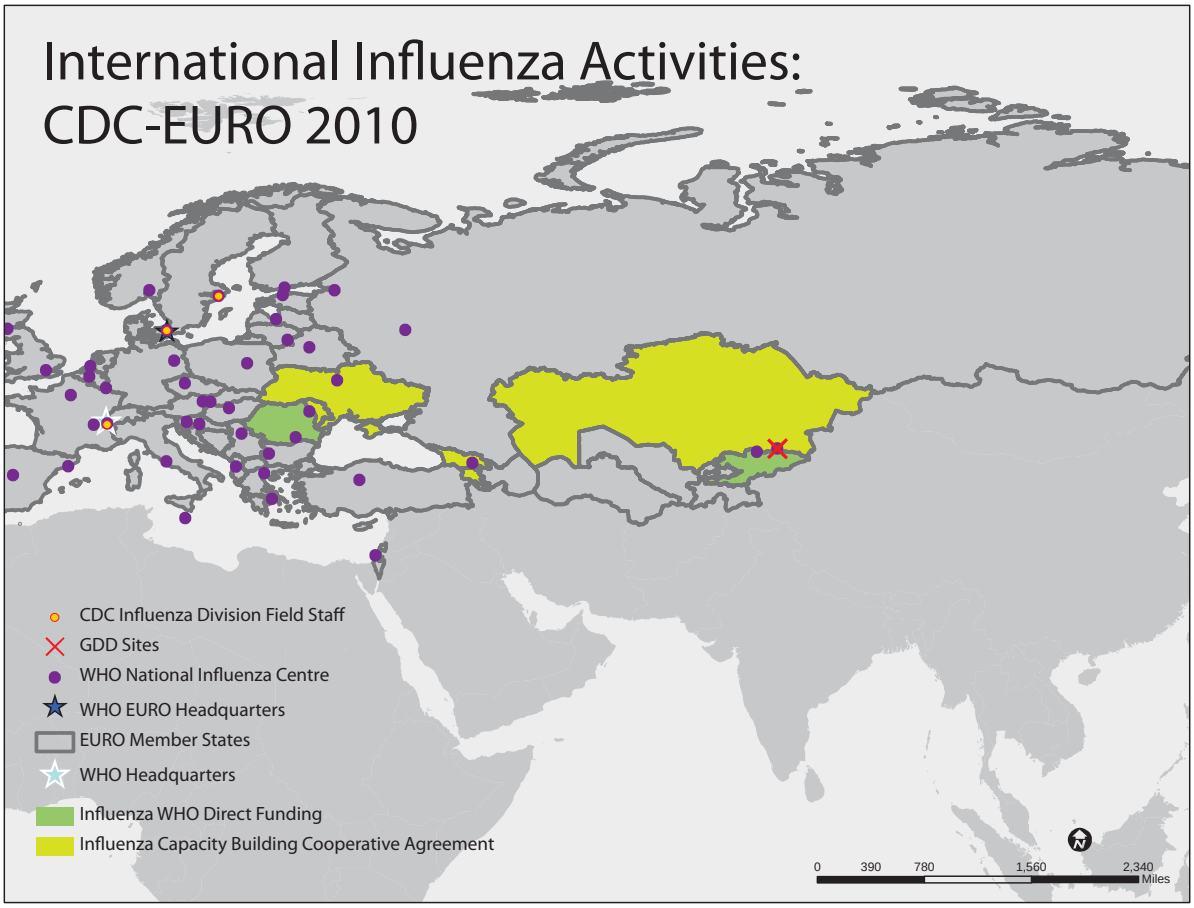
WHO European Regional Office (EURO)



U.S. CDC Direct Support

The WHO Regional Office for Europe (WHO EURO) is one of six WHO Regional Offices around the world. It serves the WHO European Region, which comprises 53 countries, covering a geographical area from the Atlantic to the Pacific Oceans. WHO EURO collaborates with a range of public health stakeholders in the region and globally, to ensure that coordinated action is taken to develop and implement efficient health policies and to strengthen health systems. WHO EURO is made up of public health, scientific and technical experts who are based in the main office in Copenhagen, Denmark, in five out-posted centers and in 29 Country Offices. The Influenza and other Respiratory Pathogens (IRP) program team, within the Division of Communicable Diseases and the Environment, WHO EURO, works collaboratively with the U.S. CDC to strengthen influenza virological and epidemiological surveillance across the region, to support the early warning infrastructure that is necessary for Member States to meet International Health Regulation (2005) (IHR) core capacities, and to enhance pandemic preparedness, the clinical management of influenza, and emergency response.

The CDC and WHO EURO are currently in the fifth year of collaboration on the cooperative agreement *Surveillance and Response to Avian and Pandemic Influenza by Regional Offices of the WHO.* The principle objectives of this collaboration have been to implement a coordinated plan to improve laboratory capacity in Member State NICs, to establish and enhance sentinel outpatient surveillance for ILI and ARI, to establish sentinel surveillance for SARI hospitalizations, to enhance detection and response to outbreaks of novel influenza and other pathogens with pandemic potential in humans, and to support pandemic planning and containment efforts in the Region. With support from this collaboration and coordination with the European Centre for Disease Prevention and Control (ECDC),

WHO EURO also maintains a regional platform for influenza surveillance called EuroFlu (www.euroflu.org), which represents the Region's population of 883 million people. EuroFlu provides weekly updates on the Region's influenza situation, contributes data and reports to the annual determination of vaccine content, and provides relevant and timely situational awareness on influenza to health professionals and the general public. The weekly bulletin and user platform are both available in Russian. WHO EURO also coordinates activities with CDC, especially with regard to CDC implementation of direct cooperative agreement relationships with Armenia, Georgia, Kazakhstan, Republic of Moldova, Romania and Ukraine.

Surveillance

The IRP program team's surveillance mission is focused on enhancing traditional virological and epidemiological surveillance, establishing new monitoring systems for severe influenza, and working directly and continuously with Member States to use surveillance data to estimate the burden of influenza and to inform influenza prevention and control programs.

Key Surveillance Activities

- WHO EURO hosted the annual influenza surveillance meeting for WHO European Regional Member States in Brasov, Romania in September 2010. The Member States reviewed surveillance data, shared experiences from the 2009-2010 season, and set surveillance priorities for the upcoming year, including strengthening systems to routinely monitor severe influenza.
- Surveillance data reported to the EuroFlu platform were comprehensively analyzed and an overview of the 2009-2010 pandemic season was created, detailing the timing and progression of the influenza season, the intensity of influenza activity in relation to historical data, risk factors from data on severe cases reported to EuroFlu, characteristics of circulating viruses, and surveillance priorities for the upcoming year. A report of these analyses was released on the WHO EURO public web site.
- An evaluation of the EuroFlu weekly influenza bulletin was undertaken. All respondents were very satisfied (47%) or satisfied (53%) with the overall content of the bulletin. Suggestions to improve the bulletin included more information on vaccines, inclusion other respiratory viruses, more information on severe disease, and simplification of virological data presentation. The results of the evaluation were released on the WHO EURO public web site, and have directly informed EuroFlu work priorities for the current fiscal year.
- The EuroFlu platform was expanded to monitor and report surveillance data for sentinel SARI surveillance.
- Throughout the 2009-2010 pandemic influenza season an average of 46 Member States in the WHO European Region contributed weekly data to the EuroFlu regional surveillance platform. Automatic data transfers were established between EuroFlu and the Tessy surveillance platform at the ECDC as well as with FluID, the platform that is being developed by the Global Influenza Programme at WHO Headquarters in Geneva.
- IRP staff undertook multiple missions to Member States, including visits to Romania, the Russian Federation, Serbia, Tajikistan, Turkey, and Ukraine, in order to enhance national virological and epidemiological surveillance.

Laboratory

The IRP currently implements multiple activities to support and strengthen influenza laboratory capacity throughout the Region. These activities include undertaking missions and training activities to ensure that existing NICs expand and improve upon current molecular and virological diagnostic capacities, implement laboratory quality programmes (including ongoing participation in WHO EQAP), and adhere to international biosafety and biosecurity practices. There are ten Member States in the Region that do not have a WHO-recognized NIC. WHO EURO coordinates with the WHO Global Influenza Program when assessing whether national influenza laboratories are in compliance with WHO terms of reference and if they are eligible to become WHO-recognized NICs. The IRP program team works to better ensure that international transport of influenza specimens within the WHO European Region adheres to international safety standards, and one staff of the IRP is a certified trainer in the shipment of infectious substances. Finally, the IRP works closely with the WHO Lyon Office to enhance regional laboratory capacity to meet IHR core capacity and early warning needs.

Key Laboratory Activities

- A document describing the process of how NICs obtain recognition by WHO has been published. It includes the WHO/Europe Laboratory Assessment Tool (LAT) for NIC. A pilot was performed in Malta in July, 2009, and the results were communicated to the network during the Annual Meeting in Brasov, Romania, September, 2009.
- The WHO CC London continued to support WHO EURO activities. Staff from several NICs were trained for a period of two weeks at the WHO CC London in a range of techniques. Between January 2009 and December 2010, at least 145 shipments of influenza specimens and viruses from at least 25 countries were performed using the Shipment Fund Project with support from WHO EURO. Results from analyses were fed back to the laboratories and it was ensured that the data were submitted to EuroFlu. The WHO CC London has been part of the EuroFlu bulletin team since early 2009 and provides advice on the virological components of the EuroFlu platform.
- The IRP continued to support the Cantacuzino Institute in Romania as a sub-regional influenza reference center for southeastern European countries. The NIC Cantacuzino Institute continues to support the growth and autonomy of national laboratories in Albania and Republic of Moldova as their own sentinel surveillance systems grow, and report data to the EuroFlu surveillance platform.
- A curriculum for laboratory management in relation to the establishment of core capacities requirements detailed in the IHR was developed by WHO in collaboration with CDC and the Clinical and Laboratory Standards Institute.
- NICs throughout the region were supported in their participation in a global EQA Program for the molecular diagnosis of influenza A (H5N1, seasonal influenza H3N2 and H1N1, influenza B, and 2009 H1N1). Fifty-two laboratories in 43 Member States participated.

Preparedness

The IRP continues to review the experience of the 2009-2010 influenza season to improve local preparedness and response not only to influenza, but to other threats as well.

Key Preparedness Activities

- Between April and July, 2010, IRP staff completed visits to seven countries (Armenia, Bosnia and Herzegovina, Denmark, Germany, Portugal, Switzerland and Uzbekistan) and interviewed stakeholder groups from the national, regional and local level in each country in order to evaluate how pandemic preparedness aided the response to the 2009 H1N1 pandemic. In

October 2010, countries participating in the evaluation attended a workshop to discuss findings and future WHO activities and guidance. This resulted in a set of recommendations for good practice in pandemic planning, which has been published on the WHO EURO website.

- Drawing on lessons learned, WHO EURO has developed a framework and a tool for countries to perform their own national evaluation of the pandemic response.

2009 H1N1 Activities, FY 2010

- The WHO/IRP response to the pandemic involved activities in surveillance and reporting, laboratory capacity support, clinical support, pandemic vaccine deployment and outbreak response. The EuroFlu platform was rapidly modified to include reporting on influenza activity due to the 2009 H1N1 virus.
- Two workshops for pandemic vaccine deployment covering all 53 Member States were held in 2009.
- WHO EURO coordinated pandemic communications with WHO Country Offices, European Commission, the ECDC, and other partners.
- Throughout the 2009-2010 pandemic influenza season, the IRP in coordination with CDC-Atlanta assured that needed diagnostic kits remained available to NICs in the region. Using the WHO Shipment Fund Project, from September, 2009, to April, 2010, 26 Member States made 43 shipments to WHO CCs.
- IRP and CDC staff collaborated with MOH officials during the pandemic response in Ukraine.
- Throughout the 2009-2010 pandemic season, IRP convened video conferences to share best practices in influenza clinical management among critical care doctors. These were undertaken in Russian and English.
- A survey on seasonal vaccine use in the Region is currently ongoing.

Other Notable Achievements in FY 2010

- WHO EURO released recommendations for influenza vaccination during the 2010/2011 winter season. The recommendations provide advice to Member States about specific risk groups to be targeted for vaccination, the influenza viruses to be included in vaccine, and vaccine safety.
- WHO EURO, in collaboration with the Vaccine European New Integrated Collaboration Effort (VENICE) project and the ECDC, issued a survey on pandemic vaccine deployment in selected WHO Regional Member States. All 29 eligible countries responded to the survey. The reported vaccination coverage varied across countries from 0.4% to 59% for the entire population (n=22); 2.6% to 68% for health care workers (n=12); 0% to 58% for pregnant women (n=11); 0.2% to 74% for children (n=11). Twenty-two countries prioritized vaccination for those in risk or target groups.

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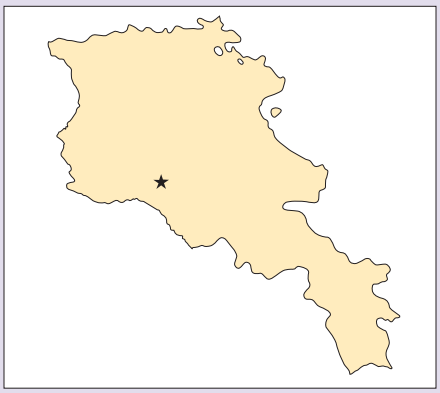
Save As...

Armenia



- **Capital:** Yerevan
- **Area:** 29,743 sq km
- **Population:** 2,967,975 (July 2011 est.)
- **Age Structure:** 0-14 years: 17.6% (male 279,304/female 242,621); 15-64 years: 72.4% (male 1,006,312/female 1,141,430); 65 years and over: 10.1% (male 112,947/female 185,361) (2011 est.)
- **Life Expectancy at Birth:** Total population: 73.23 years; male: 69.59 years/female: 77.31 years (2011 est.)
- **Infant Mortality Rate:** total: 18.85 deaths/1,000 live births; male: 23.38 deaths/1,000 live births; female: 13.75 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 99.4%; male: 99.7%; female: 99.2% (2001 census)
- **GDP:** $17.27 billion (2010 est.)
- **GDP per Capita:** $5,800 (2010 est.)

U.S. CDC Direct Country Support

Armenia was funded under the cooperative agreement *Surveillance and Response to Avian and Pandemic Influenza* in 2006 to enhance and strengthen the epidemiological and laboratory capacity for influenza surveillance in the country. This was enacted through the implementation of an influenza epidemiological surveillance scheme and national standards that were developed and approved by the MOH. Armenia has attained the appropriate laboratory and diagnostic capacity to rapidly detect suspected cases of avian and pandemic influenza, to run sentinel surveillance for seasonal influenza, and to operate laboratory testing according to the developed influenza sentinel surveillance scheme. This is the fifth year of funding.

Surveillance

Sentinel surveillance has been established in three sites: Yerevan City, Lori Marz, and Syunik Marz. The sentinel site in Syunik Marz became operational during this fiscal year. The three sites were selected to represent geographical and sociocultural differences across Armenia.

Key Surveillance Activities

- Epidemiologists from Yerevan and Vanadzor City made supervisory visits to influenza sentinel sites in those cities.
- Local experts and epidemiologists updated the influenza sentinel surveillance standard following WHO requirements and CDC recommendations.
- A team of medical doctors, nurses, and epidemiologists were selected to participate in influenza

Save As...

surveillance in Syunik Marz. Roles and responsibilities were developed by the MOH with input from local experts.

- National guidelines for infection control of influenza were developed by local experts according to WHO and CDC guidelines.
- Local specialists along with MOH staff developed the procedural bylaw and the statute for the code of work for sanitary-quarantine border posts (SQP), according to IHR requirements.
- Internet connectivity was established for the National Influenza Team, the regional centers of the State Hygiene and Anti-Epidemic Inspectorate, PCR laboratories, and sanitary-quarantine border posts, for about 35 connections in total.
- Subscriptions to relevant periodicals and scientific magazines on epidemiology, public health, and virology were purchased for the library/training room established at the State Hygiene and Anti-Epidemic Inspectorate.

Laboratory

There are three laboratories that support the sentinel surveillance network: the national laboratory at CDC/Yerevan and the PCR laboratories in Lori and Syunik Marzes. Marz and MOH virologists familiar with national surveillance standards and laboratory diagnostics serve as focal points for the sentinel surveillance network.

Key Laboratory Activities

- The MOH procured laboratory reagents, PPE, and other laboratory supplies and equipment for the implementation of influenza sentinel surveillance.
- CDC/Yerevan Laboratory and Lori Marz PCR laboratories were operational during the influenza season. Both laboratories tested 500 samples from sentinel sites in Yerevan City and Lori Marz.
- CDC/Yerevan Laboratory participated in the CDC-Atlanta/APHL laboratory assessment review.

Training

Armenia hosted the following trainings in FY2010:

- Influenza sentinel surveillance training for 36 medical doctors, nurses, and epidemiologists from Yerevan City and Lori and Syunik Marzes sentinel sites.
- Training on the updated influenza sentinel surveillance standard for 85 medical doctors, nurses, and epidemiologists from sentinel sites in Yerevan and Lori and Syunik Marzes.

2009 H1N1 Activities, FY 2010

The MOH established the operational committee for pandemic 2009 H1N1. Through this committee, all WHO recommendations were translated and disseminated to medical personnel. The national pandemic preparedness plan was activated when the pandemic was announced.

Key 2009 H1N1 Activities, 2010

- Procedures were enhanced in all sanitary-quarantine border posts for early detection of suspected patients and for early detection of cases of 2009 H1N1.
- Five infrared imagers were procured, installed and implemented at five sanitary border posts around the country, including at the border post at the Zvartnots International Airport.

- The MOH conducted an intensive media campaign in order to adequately inform the population about appropriate measures to prevent influenza and what to do if the symptoms occur (TV interviews, video, billboards, articles and web sites).
- Surveillance for early detection and treatment of ILI, ARI and pneumonia was enhanced, and daily pneumonia monitoring was included.
- Appropriate preventive measures were implemented in special population groups, including school-age children, military, police, and prisoners.

Other Notable Achievements in FY 2010

- The regulation "Influenza and other Acute Respiratory Diseases Surveillance in Armenia" that standardizes the implementation of sentinel surveillance in Armenia was written and approved.
- Syunik Marz sentinel surveillance site became operational.

Special Influenza Projects

- With the support of the WHO Country Office, rapid response teams were assembled and trained. The training was conducted November 4 – 9, 2010, with participation from 94 experts from infectious disease hospitals, emergency care departments, and outpatient clinics (including epidemiologists, medical doctors, and managers).
- Armenia was selected for and participated in an evaluation of the response to pandemic 2009 H1N1 by WHO EURO and University of Nottingham.

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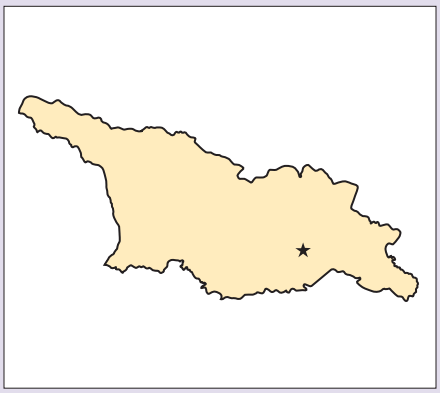

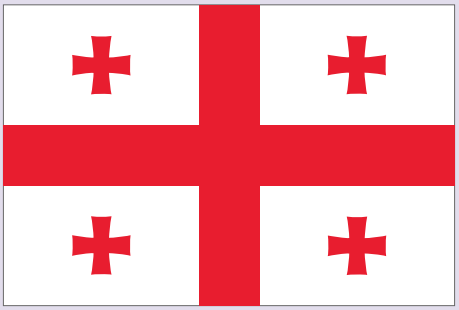

- **Capital:** T'bilisi
- **Area:** 69,700 sq km
- **Population:** 4,585,874 (July 2011 est.)
- **Age Structure:** 0-14 years: 15.6% (male 383,856/female 333,617); 15-64 years: 68.3% (male 1,511,844/female 1,620,727); 65 years and over: 16% (male 293,143/female 442,687) (2011 est.)
- **Life Expectancy at Birth:** total population: 77.12 years; male: 73.8 years; female: 80.82 years (2011 est.)
- **Infant Mortality Rate:** total: 15.17 deaths/1,000 live births; male: 17.1 deaths/1,000 live births; female: 13.02 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 100%; male: 100%; female: 100% (2004 est.)
- **GDP:** $22.32 billion (2010 est.)
- **GDP per Capita:** $4,800 (2010 est.)

U.S. CDC Direct Country Support

This is the fifth year of the cooperative agreement with the Georgia National Center for Disease Control and Public Health (NCDC). The agreement began in 2006. Since the cooperative agreement began, the influenza surveillance system of the Republic of Georgia has been greatly strengthened, in both the epidemiology and laboratory components of the system.

There are two goals for the fifth year of the project. The first goal is to ensure sufficient laboratory and diagnostic capacity for routine surveillance of ILI in order to provide rapid confirmation of cases of avian influenza in humans. The second goal is to ensure sufficient epidemiological capacity and infrastructure for rapid reporting of highly pathogenic avian influenza cases in humans and the early recognition of changes in the pattern of influenza virus during outbreaks. This includes the strengthening of the surveillance system for timely detection of seasonal and avian influenza outbreaks, and the rapid detection of an outbreak of pathogenic influenza strains and ongoing monitoring of seasonal strains.

Surveillance

All activities conducted during FY 2009 became a platform for the 2009 H1N1 pandemic period in Georgia. Monitoring the existing surveillance system gave the NCDC the opportunity to assess the knowledge of health care providers regarding influenza, pandemic 2009 H1N1 influenza, infection control, and influenza treatment and prevention issues. This information helped the NCDC to prepare training materials on all aspects relevant to these issues.

Key Surveillance Activities

- Data received from sentinel sites and routine surveillance was monitored by the Project Management Unit. The sentinel surveillance system precisely reflected trends reported by the national routine surveillance system.
- NCDC staff monitored 140 health care facilities in ten regions to reveal gaps and challenges in the influenza surveillance system.
- No co-circulation of seasonal influenza viruses was detected from the time the pandemic was declared in Georgia through September 2010.
- Sentinel and non-sentinel sites were provided with all necessary equipment and supplies, including liquid nitrogen, for adequate storage and transportation of collected specimens. A project vehicle transported specimens from sentinel sites to NCDC.
- The NCDC rapid response team, which was established in 2008, was active during the pandemic.

Laboratory

The National Influenza Lab (NIL) was established at NCDC in 2006. Laboratory capacity was strengthened as a result of staff training on RT-PCR testing, virus isolation, and hemagglutination inhibition, and the procurement of essential equipment and supplies.

Key Laboratory Activities

- A total of 5,026 specimens were tested for influenza at NIL from October 2009 to October 2010; 1,270 samples were found to be positive for 2009 H1N1 and seven were positive for influenza B. Fifty 2009 H1N1 positive samples from the 2009-2010 flu season were sent to the WHO CC London for virus isolation, sequencing and resistance screening.
- One specialist from NIL was sent to NIMR to be trained and to conduct full genome sequencing of Georgia influenza viruses. A total of seven isolates were sequenced. Phylogenetic analysis revealed two slightly distinguished influenza strains circulating in Georgia during the 2009-2010 season.
- NIL capacity for influenza surveillance was enhanced with the implementation of gene sequencing at the facility.

Preparedness

A draft of a national preparedness plan was developed in 2006, and approved by the MOH in 2009. This plan was activated during the pandemic with great success. During the pandemic, antiviral medications like Tamiflu and Relenza were free and available for the whole population, with priority given to people with severe cases requiring hospitalization, persons with underlying conditions, and pregnant women. Training conducted for health care providers throughout the country ensured their readiness and preparedness for the pandemic situation.

Key Preparedness Activities

- WHO provided the country with 26,000 doses of Tamiflu in 2009.
- The Georgian Government procured 26,400 doses of Relenza in 2009.
- Distribution and administration of antiviral drugs was performed in accordance with the national preparedness plan.

- In July, 2010, WHO provided Georgia with 100,000 doses of 2009 H1N1 influenza vaccine; the vaccine was free and available for defined risk groups, such as health care providers throughout the country, the elderly in elder care homes, and orphans.

Training

Georgia hosted the following training activities in 2010:

- The 2009 H1N1 pandemic resulted in a change to planned training activities. Instead of training on avian influenza, infection control and PPE use, a workshop titled "H1N1 Influenza Pandemic: Results and Perspectives" was conducted in Batumi, the capital city of the Autonomic Republic of Adjara in September 2010. Representatives from NCDC, Adjara Ministry of Health, Adjara regional and rayonal centers of public health, and epidemiologists and infectious disease doctors from leading hospitals participated in the workshop.
- During monitoring visits to sentinel surveillance sites, on-site surveillance training was conducted for epidemiologists responsible for patient registration and reporting in order to improve their skills and to strengthen the system.

The village of Gergeti, with Mt Kazbegi in the background, lies in the Greater Caucasus mountain range in the Mtskheta-Mtianeti region, northeastern Georgia.

2009 H1N1 Activities, FY 2010

The pandemic 2009 H1N1 situation confirmed the necessity and importance of having strong influenza surveillance in the country in order to detect cases as soon as possible, to detect in-country transmission of the pandemic influenza virus, and to monitor the transmission trends in the population.

After WHO declared the 2009 H1N1 pandemic, the NCDC began weekly reporting to the MOH. Also, leaflets describing influenza symptoms and recommended actions to take in case of symptoms were distributed at the borders. These measures were instrumental in leading to the detection of the first case of pandemic 2009 H1N1 by the sentinel surveillance system, and gave the country time to activate pandemic preparedness measures. Testing for influenza B was limited during the peak of the pandemic since both PCR machines available at the laboratory were extremely busy. This critical situation with the equipment revealed the necessity of enhancing laboratory PCR capacity. Subsequently, a 96-well plate real-time PCR machine was purchased.

Other Notable Achievements in FY 2010

- Lead NCDC staff attended international conferences and meetings. They participated in the European Scientific Conference on Applied Infectious Disease Epidemiology in Stockholm, the Influenza Regional Symposium Pre-Meeting in Cairo, the 14th International Congress on Infectious Diseases in Miami, FL, the Black Sea meeting in Istanbul, and the International Conference on Emerging Infectious Diseases in Atlanta, Georgia to share surveillance and pandemic experiences from the Republic of Georgia. Staff submitted three poster presentations and one oral presentation.
- Sentinel surveillance proved effective for monitoring the pandemic situation and activating a rapid and adequate response.
- Huge interest from the media and timely information from NCDC was very helpful for allaying the general public's fears.
- All information about pandemic influenza, including guidelines, was posted on the NCDC web site.

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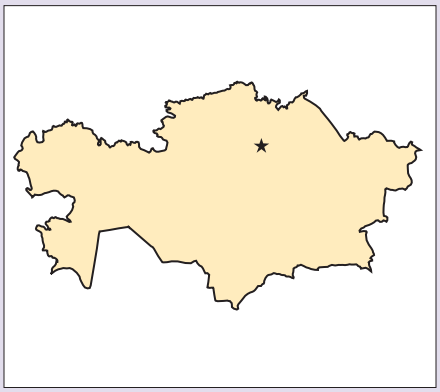
Kazakhstan



- **Capital:** Astana
- **Area:** 2,724,900 sq km
- **Population:** 15,522,373 (July 2011 est.)
- **Age Structure:** 0-14 years: 21.6% (male 1,709,929/female 1,637,132); 15-64 years: 71% (male 5,373,755/female 5,654,461); 65 years and over: 7.4% (male 392,689/female 754,407) (2011 est.)
- **Life Expectancy at Birth:** Total population: 68.51 years; male: 63.24 years; female: 74.08 years (2011 est.)
- **Infant Mortality Rate:** Total: 24.15 deaths/1,000 live births; male: 28.44 deaths/1,000 live births; female: 19.62 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 99.5%; male: 99.8%; female: 99.3% (1999 est.)
- **GDP:** $197.7 billion (2010 est.)
- **GDP per Capita:** $12,800 (2010 est.)

U.S. CDC Direct Country Support

Kazakhstan was funded in 2005 to develop an influenza surveillance network. This is the last year of the cooperative agreement. Routine surveillance of influenza and acute respiratory virus infection (ARVI) has existed in Kazakhstan for more than forty years. A network of seven sentinel surveillance sites has been established in-country, with additional support from USAID and Naval Medical Research Unit No. 3 (NAMRU-3) for ILI and SARI surveillance.

Surveillance

At each sentinel surveillance site, trained epidemiologists and clinicians collect epidemiological and clinical information, as well as nasal and pharyngeal swabs from a sample of patients who meet WHO ILI or SARI case definitions. Epidemiologic data is reported to the Republican Sanitary Epidemiologic Service for analysis. The sentinel surveillance system also provides information to make decisions on the initiation of community mitigation measures.

Key Surveillance Activities

- All seven sites collect epidemiological and clinical information, which is then entered into an EPI-INFO database; data is analyzed and presentations are made at local meetings.
- During the 2009-2010 influenza season, the seven sentinel sites collected information from 517 ILI patients and 500 SARI patients.
- The first cases of 2009 H1N1 influenza were detected in August, 2009, in the Astana City surveillance site by lab specialists trained under the project.

Laboratory

Fourteen oblast (provincial) Sanitary and Surveillance (SES) laboratories and two city SES laboratories are capable of performing virus isolation, immunofluorescence microscopy, and serological investigations. Six oblasts and the NIC are capable of PCR (Rotogene) testing using either CDC/WHO-provided kits or Russian Amplisense test kits.

Key Laboratory Activities

- Five oblast sentinel laboratories performed PCR testing of flu samples for the first time in FY2010; three labs at Taldy-Kurgan, Astana, and Petropavlovsk had positivity rates of 22%, 17.2%, and 16% respectively.
- Positivity rates for SARI patients were higher: 26% among all SARI patients. The highest rates were from two laboratories, Taldy-Kurgan (45%) and Petropavlovsk (39.5%).
- The first 12 cases of the 2009 H1N1 were diagnosed by PCR in Astana sentinel laboratory and confirmed in the Kazak NIC.
- Two Rotorgene PCR machines were ordered for the sentinel sites at Uralsk and Taraz.

Preparedness

The national pandemic plan was developed collaboratively with input from local specialists and CDC/Central Asia Regional Office. The Prime Minister signed the plan in August 2009. Tabletop exercises were performed with epidemiologists from all 14 oblasts and two cities in 2009.

Key Preparedness Activities

A one-day meeting was held to address the approaching risk of a pandemic in November 2009. Four people each from 14 oblasts and two cities were invited; participants included epidemiologists, infection disease specialists, laboratorians, and journalists.

Training

The following trainings were hosted or facilitated in Kazakhstan in 2010

- An Epi INFO training was held in February of 2010 for epidemiologists from each sentinel site, which helped them not only to perform better analysis of their own data but to better understand WHO ILI and SARI case definitions.
- A consultant from Interlabservice conducted onsite PCR training in five oblasts sentinel laboratories.
- Two lab specialists from the NIC were sent to Kiev for virus isolation training.
- Alla Mironenko from Kiev, Ukraine trained ten specialists from seven sentinel sites and three specialists from non-sentinel sites on virus isolation.
- Epi INFO training took place in October 2010 to analyze the data from the 2009-2010 season; two epidemiologists from each site attended.

Other Notable Achievements in FY 2010

Two abstracts were submitted and accepted for the Options for the Control of Influenza VII conference in Hong Kong, September 2010.

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GDD-Kazakhstan

The GDD (Global Disease Detection) Regional Center in Kazakhstan (GDD-Kazakhstan) was established in 2008 as an extension of the U.S. CDC's presence and success through the Field Epidemiology Training Program (FETP), which began in 2003. CDC has collaborated with Ministries of Health in Central Asia since 1995 to better recognize and respond to serious public health threats. This alliance has improved laboratory capability for influenza and other communicable diseases, built surveillance systems for acute infectious respiratory illness, and strengthened health institutions at the national, regional, and local levels through training in field epidemiology and outbreak response.

Coverage

GDD-Kazakhstan covers five countries in Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) and has relied heavily on the expertise of U.S. CDC's Influenza Division to link surveillance and laboratory confirmation of new and emerging pathogens.

GDD-Kazakhstan activities include:

- Outbreak Response.
- Pathogen Discovery.
- Training.
- Surveillance.
- Networking.

Effect

In 2010, the GDD Regional Center in Kazakhstan increased their laboratory testing capacity by 10%. GDD-Kazakhstan trained seven FETP graduates and more than 200 participants in short-term regional and national trainings. GDD-Kazakhstan responded to 19 outbreaks, of which 63% were responded to in less than 24 hours.

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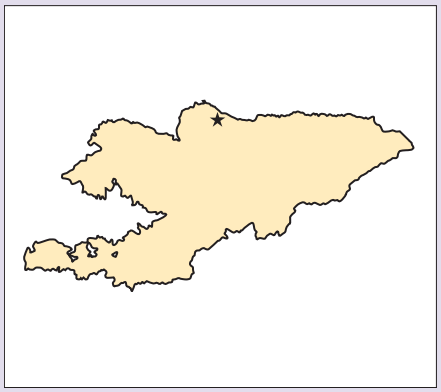
Epidemiologist, Influenza Program

Principal U.S. CDC Program Collaborations In-Country

- Influenza Division International Program
- International Emerging Infections Program
- Field Epidemiology and Laboratory Training Program
- International Emergency Preparedness Program

Kyrgyz Republic



- **Capital:** Bishkek
- **Area:** 199,951 sq km
- **Population:** 5,587,443 (July 2011 est.)
- **Age Structure:** 0-14 years: 29.3% (male 834,024/female 801,750); 15-64 years: 65.4% (male 1,790,534/female 1,865,521); 65 years and over: 5.3% (male 114,200/female 181,414) (2011 est.)
- **Life Expectancy at Birth:** Total population: 70.04 years; male: 66.04 years; female: 74.24 years (2011 est.)
- **Infant Mortality Rate:** Total: 29.27 deaths/1,000 live births; male: 34.01 deaths/1,000 live births; female: 24.28 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 98.7%; male: 99.3%; female: 98.1% (1999 census)
- **GDP:** $11.85 billion (2010 est.)
- **GDP per Capita:** $2,200 (2010 est.)

U.S. CDC Direct Country Support

The Kyrgyz Republic (Kyrgyzstan) MOH does not have a cooperative agreement with U.S. CDC, but works very closely with the Influenza Team at the Global Disease Detection Center in the CDC Central Asia Regional Office (CDC/CAR) based in Almaty, Kazakhstan. The MOH receives support through the CDC cooperative agreement with WHO EURO. The MOH epidemiology department has well-trained epidemiologists and laboratory specialists who work on influenza surveillance in Bishkek and Osh, the two major cities in the country.

Surveillance

Kyrgyzstan has undertaken influenza sentinel surveillance activity since 2008. Surveillance started with the observation of SARI patients in two hospitals in Osh and in the largest infectious disease hospital in Bishkek. There are now two hospitals in each city that are working on SARI surveillance. In 2009, Kyrgyzstan started ILI surveillance of outpatients in two polyclinics in each of these cities. CDC/CAR worked closely with the Kyrgyz sites to provide technical assistance and training to improve the knowledge and skills of epidemiology and laboratory specialists. The Kyrgyz NIC detected the 2009 H1N1 in August 2009. Samples were collected from ILI and SARI patients and confirmed at CDC-Atlanta, Naval Medical Research Unit No. 3 (NAMRU-3) and a laboratory in Novosibirsk, Russia.

Key Surveillance Activities

- Established laboratory surveillance was reconfigured to include epidemiological surveillance, which now allows for the calculation of ILI and SARI rates.
- Laboratory equipment and supplies were purchased and delivered to participating influenza sentinel surveillance sites.

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Laboratory

The laboratory specialists at the NIC in Kyrgyzstan are successfully doing PCR testing on influenza viruses and performing virus isolation. They regularly send their samples to CDC-Atlanta and/or NAMRU-3 for confirmation.

Key Laboratory Activities

- The NIC can now perform PCR and virus isolation.
- Samples are regularly sent to WHO CC Atlanta and NAMRU-3. The rate of confirmation is approximately 95%.
- Plans are in progress to purchase a PCR machine for Bishkek City Sanitary and Epidemiologic Service so that the NIC will work only on confirmation of samples from two sub-regional laboratories.

Preparedness

CDC/CAR together with WHO worked very closely with epidemiologists from Department of State Sanitary and Surveillance (DSSS) on developing a national pandemic plan and the plan was approved by the Kyrgyz MOH in April 2009. The pandemic was announced in Kyrgyz Republic in August 2009.

Key Preparedness Activities

- The national pandemic plan was activated during the pandemic and worked well in some areas; the plan will be reviewed and revised to make improvements based on the pandemic experience.
- Training of epidemiologists and infectious disease specialists was held by local specialists in each region (county) of the country in 2009 for preparation for the pandemic.

Training

Kyrgyzstan hosted the following training activities in 2010:

- During the 2009-10 season, two on-the-job PCR trainings were performed at the Kyrgyz NIC, the Bishkek lab and the Osh sub-regional lab.
- Two lab specialists were sent by CDC/CAR to the WHO-recognized NIC in Kiev, Ukraine to be trained by Dr. Alla Mironenko on virus isolation.
- Analysis of 2009-10 flu season ILI and SARI data from both cities – Osh and Bishkek – was performed during Epi Info training held in August 2010. Presentations based on the analysis were prepared and presented at a meeting in Kyrgyzstan and at the annual WHO EURO flu meeting, which was held in September 2010 in Romania.
- Site trainings were held in Bishkek and Osh to restructure the surveillance system to include both laboratory and epidemiologic components. As a result of the site trainings, Kyrgyz doctors in the ILI and SARI sentinel sites are counting all ILI and SARI cases; they now take ILI specimens for lab investigation based on an established algorithm and collect specimens from SARI cases from all different age groups.

2009 H1N1 Activities, FY 2010

There was intensive work on ILI and SARI surveillance during the pandemic season of 2009-2010. Epidemiological data was collected and entered into the Epi Info database. Specimens were collected

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from patients for laboratory analysis. The NIC received the diagnostic kit for the pandemic virus and successfully utilized the reagents for testing. The positive and unsubtypable samples were sent to CDC-Atlanta for confirmation.

Key 2009 H1N1 Activities, 2010

- The NIC was able to recognize 2009 H1N1; PCR results showed that all positive results were 2009 H1N1 virus.
- All unsubtypable samples were also confirmed at CDC Atlanta as 2009 H1N1 viruses.

Other Notable Achievements in FY 2010

- Four poster presentations on 2009 H1N1 were presented in Atlanta in July 2010 at the meeting for international influenza partners and at the 2010 ICEID meeting.
- An oral presentation on the developing pandemic in Kyrgyzstan was presented at the WHO EURO Regional Meeting at Brasov, Romania in September 2010.
- WHO EURO epidemiologist, Pernille Jorgensen, travelled to Bishkek, Kyrgyzstan for a monitoring and evaluation visit.
- Three Kyrgyz epidemiologists started to work on upgrading their scientific degrees in order to specialize in influenza; CDC and WHO are supportive of these scientific activities.

Special Influenza Projects

- A Kyrgyz Field Training and Epidemiology (FETP) student worked on a special study investigating SARI surveillance in the Republican Infection Disease Hospital in Bishkek. The results of the study helped to understand how SARI surveillance was being conducted in the country, the areas of strengths and weaknesses, and recommendations for improvement.
- A Kyrgyz FETP student performed an additional study in 2010 that resulted in the recognition of a problem with ARI in the Republican Infectious Disease Hospital in Bishkek, especially among children under one year of age. Therefore, two additional studies are currently ongoing in Bishkek: an investigation of influenza and other respiratory viruses among children under one year of age, and; an investigation of influenza and other respiratory viruses and diarrheal pathogens among children one to five years old who have a respiratory infection together with diarrheal infection.

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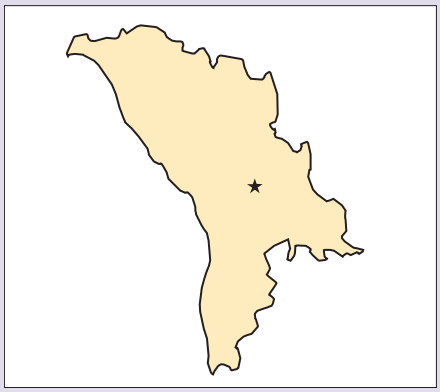
Republic of Moldova



- **Capital:** Chisinau (Kishinev)
- **Area:** 33,851 sq km
- **Population:** 4,314,377 (July 2011 est.)
- **Age Structure:** 0-14 years: 15.5% (male 344,101/female 325,995); 15-64 years: 74% (male 1,550,386/female 1,643,108); 65 years and over: 10.4% (male 164,512/female 286,275) (2011 est.)
- **Life Expectancy at Birth:** Total population: 71.37 years; male: 67.68 years; female: 75.28 years (2011 est.)
- **Infant Mortality Rate:** Total: 12.43 deaths/1,000 live births; male: 13.85 deaths/1,000 live births; female: 10.92 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 99.1%; male: 99.7%; female: 98.6% (2005 est.)
- **GDP:** $11.01 billion (2010 est.)
- **GDP per Capita:** $2,500 (2010 est.)

U.S. CDC Direct Country Support

The cooperative agreement *Enhancing Pandemic Preparedness and Response Capacity in the Republic of Moldova* began in August 2009. FY2010 was the second year of funding through the agreement. The Moldovan MOH is working with U.S. CDC under this agreement to strengthen human and infrastructure capacities for pandemic preparedness, surveillance, monitoring and early response, communication, and infection control.

Cooperative agreement activities were implemented by national counterparts from the ministries of agriculture, information, education, internal affairs, and trade and tourism, in close collaboration with WHO Regional and Country Offices, and other international partners such as the World Bank and UNICEF.

Surveillance

In 2006 the Republic of Moldova implemented hospital-based surveillance in nine sentinel sites, where data was collected on ARI, ILI, and SARI. National counterparts began to update the documents for implementing the integration of laboratory-based surveillance in accordance with recommendations made by CDC on a site visit in May, 2010. The MOH plans to start laboratory-based surveillance in five sites within the CDC cooperative agreement in 2011. The NIC publishes regular surveillance reports regarding epidemiological and laboratory data and reports weekly information through WHO EuroFlu network.

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Key Surveillance Activities

- Guidelines for data collection in the early-warning networks were adapted to international case definitions.
- Guidelines for sample shipment from the sentinel sites to the National Viral Laboratory (NVL) were developed.
- Plans for implementing laboratory-based sentinel-site surveillance are in progress.
- Five sites were chosen to participate in integrating hospital and laboratory-based surveillance.

Laboratory

The NVL for seasonal influenza was renovated for BSL-2 and BSL-2+ capabilities with the financial support of a World Bank project. The laboratory was equipped with new equipment to support these levels of influenza testing. Experts from CDC and WHO assessed laboratory capacity, provided some recommendations for improvement, and provided assistance to the national counterparts in the NVL in their efforts to become a NIC. The NVL uses PCR and virological assay diagnostic techniques.

Key Laboratory Activities

- Standard operating procedures were developed for the shipment of samples from sentinel sites to the NVL.
- Consumables and reagents for diagnosis of SARI were procured.
- Hardware for the reporting of results from the influenza laboratory network at the national level to WHO and other international partners was purchased.

Preparedness

The 2009 H1N1 influenza pandemic revealed challenges and gaps in the *National Pandemic Preparedness Plan (NPPP)* in 2009. Intersectoral interaction, coordination and communication proved to be weaker than expected, and public and private sector organizations and essential services providers were not sufficiently engaged in pandemic preparedness and response. A NPPP working group is in the process of updating the plan to ensure a high-level political commitment and involvement by the whole of society.

Key Preparedness Activities

- An intersectoral working group was established to review and update the NPPP.
- The existing legal framework for pandemic preparedness and sentinel surveillance was adjusted based on the recommendations of the NPPP working group and international experts: 1) case definition guidelines and clinical management protocols were elaborated; 2) a set of documents related to preventive measures was issued; and 3) the process of updating documents for implementing laboratory-based sentinel surveillance was initiated.

Training

The Republic of Moldova hosted the following training activities in 2010:

- A workshop on data collection and analysis of ARI, ILI and SARI data from the sentinel sites, for 50 participants.
- A series of training courses on the surveillance of influenza and pandemic response, for 100 people.

- A workshop on strengthening the informational system for epidemiological alert and sentinel-based surveillance, for 30 participants.
- Regional seminars in the following topics, for 120 participants:
    - Improvement of sample collection by ensuring the shipment to the National Viral Respiratory Lab.
    - Improvement of the process of information collection for SARI and/or severe respiratory disease based on a standard case definition.
    - Strengthening the reporting system of SARI and/or severe respiratory illness by improving the process of preparing and providing regular weekly reports at the national and international levels.
    - Improvements of the storage condition of original clinical materials to ensure cold chain condition was conducted for epidemiologists, laboratory staffs, and clinicians.

2009 H1N1 Activities, FY 2010

The MOH focal point for International Health Regulations (IHR) notified WHO of the number of confirmed cases and deaths due to 2009 H1N1.

Key 2009 H1N1 Activities

- During the 2009 influenza season, 21,904 suspect influenza cases were reported to the MOH; the NVL confirmed 2,590 2009 H1N1 cases.
- During the 2010 pandemic season, 14,091 suspect influenza cases were reported to the MOH, with 143 lab-confirmed 2009 H1N1 cases.
- Cooperative agreement project staff acquired 2009 H1N1 and seasonal influenza test kits from U.S. CDC.
- Project staff and local experts provided technical assistance in strengthening the surveillance and laboratory capacity.
- Project staff, with input from partners, developed guidelines for notifying, investigating and treating cases of 2009 H1N1.

Other Notable Achievements in FY 2010

- The NVL participated in the WHO EQAP for the detection of influenza virus subtypes A and B.
- More than 200 clinical samples were confirmed by the WHO CC London. The WHO Shipment Funds Project covered the transportation cost.

Special Influenza Projects

The Avian Influenza Control and Human Pandemic Preparedness and Response (AIHP) project financed by World Bank started in Moldova in 2006. The project is a part of the Global Program for Avian Influenza Control and Human Pandemic Preparedness and Response (GPAI). Laboratory staff were trained in influenza surveillance methods, infection control, clinical management of patients, pandemic response, sample collection, biosafety measures, and virus isolation. An intensive care unit was built and equipped with specialized medical equipment and furniture.

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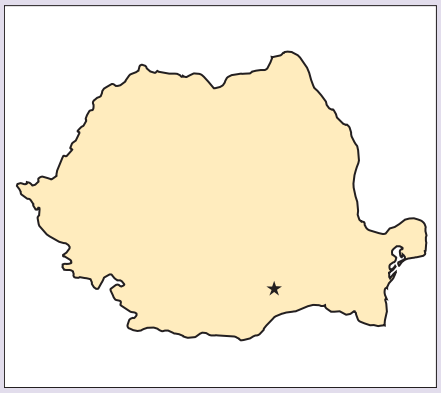
Romania



- **Capital:** Bucharest
- **Area:** 238,391 sq km
- **Population:** 21,904,551 (July 2011 est.)
- **Age Structure:** 0-14 years: 14.8% (male 1,667,894/female 1,579,458); 15-64 years: 70.4% (male 7,684,514/female 7,725,957); 65 years and over: 14.8% (male 1,314,132/female 1,932,596) (2011 est.)
- **Life Expectancy at Birth:** total population: 73.98 years; male: 70.5 years; female: 77.66 years (2011 est.)
- **Infant Mortality Rate:** total: 11.02 deaths/1,000 live births; male: 12.44 deaths/1,000 live births; female: 9.52 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** total population: 97.3%; male: 98.4%; female: 96.3% (2002 census)
- **GDP:** $253.3 billion (2010 est.)
- **GDP per Capita:** $11,500 (2010 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 the CDC cooperative agreement with WHO EURO. The National Professional Officer (NPO) assigned to the WHO Country Office in Bucharest works collaboratively with officials from the MOH, the National Institute of Public Health (NIPH), and the National Institute for Research and Development in Microbiology and Immunology Cantacuzino (NIRDMI Cantacuzino) to facilitate the implementation of influenza activities. The NIPH is the designated NIC in Romania.

Surveillance

ILI and ARI sentinel surveillance is organized in 21 out of 42 districts of Romania. In each district there are 12 voluntary family doctors (general practitioners) and in the Bucharest municipality there are 30 sentinel family doctors. The doctors swab ILI cases following a case definition and sampling algorithm. They report ILI and ARI cases on a weekly basis to the designated epidemiologist from the district public health department. The sentinel population for influenza surveillance is more than 2% of the country's population, and the 285 sentinel physicians represent over 1% of the total number of family doctors of the country. Each sentinel district reports data to the National Public Health Institute (NPHI).

Key Surveillance Activities

- SARI surveillance began in ten Romanian hospitals in five districts in October 2009. SARI surveillance expanded to 26 hospitals in nine districts in October 2010.
- The hospital epidemiologists for nosocomial infections control accepted the responsibility for SARI surveillance at the designated sentinel surveillance sites.

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Laboratory

The NIRDMI Cantacuzino is the only laboratory that performs confirmatory ILI and SARI testing on suspected influenza case samples in Romania. During the 2009-2010 pandemic, approximately 13,200 samples for ILI and approximately 360 samples for SARI were tested. Maximum laboratory testing capacity is about 200 samples per day. Four regional laboratories have been upgraded and at least two are performing RT-PCR.

Key Laboratory Activities

- NIRDMI Cantacuzino conducts molecular diagnostics, virus isolation, antigenic characterization, genetic and phenotypic assessment of antiviral sensitivity, and sequencing of influenza viruses.
- NIRDMI Cantacuzino provides both national and regional support for training, specimen testing/ confirmation, and quality control.

Preparedness

The national preparedness plan was revised in June 2009. The plan was reviewed and revised again in March 2010 to incorporate lessons learned during the pandemic.

Key Preparedness Activities

The national preparedness plan was updated in the following areas:

- clinical and laboratory management of cases (including intensive care).
- domestic pandemic vaccine production and distribution.
- antiviral therapy and antibiotic therapy of bacterial complication.
- non-pharmaceutical measures.
- communication.
- inter-sectorial intervention planning.

Training

Romania hosted the following training activities in 2010:

- In June, epidemiologists from the National Center of Disease Control (NCDC)-NIPH, the MOH and NIRDMI Cantacuzino held two, one-day SARI sentinel surveillance trainings for epidemiologists from five districts and over 120 medical staff from 12 infectious diseases and pediatric hospitals.
- Epidemiologists from NCDC-NIPH and the MOH and virologists from NIRDMI Cantacuzino trained medical staff from 26 infectious diseases and pediatric hospitals and epidemiologists from nine districts selected for SARI sentinel surveillance. Sessions consisted of one day of on-site training in June 2010, and a one-day training session in September 2010, with over 60 participants at each session.
- Epidemiologists from NCDC-NIPH and the MOH and virologists from NIRDMI Cantacuzino trained family doctors and epidemiologists on ILI and ARI in two sessions; the sessions were held in June and September of 2010 and each had over 200 participants.
- Epidemiologists from NCDC-NIPH and the MOH and virologists from NIRDMI Cantacuzino visited the sentinel sites (primarily SARI sites) and conducted monitoring and evaluation.

- Sentinel site family physicians and epidemiologists were trained on the topic of samples collection, transport and storage in June and September 2010.
- ILI molecular diagnostic and antigenic characterization training was conducted for eight participants from Republic of Moldova in June and September 2010.
- ILI molecular diagnostic training for ten participants from Romania and Republic of Moldova was conducted in September 2010.

Prahova county sentinel physicians attend training on influenza, acute respiratory infections and SARI surveillance. Bucharest, Romania.

2009 H1N1 Activities, FY 2010

In 2010, the NIRDMI Cantacuzino participated in ILI surveillance throughout Romania, and SARI surveillance from ten hospitals in five districts during the pandemic period. NIRDMI Cantacuzino continued to play an important role in supporting influenza surveillance regionally.

Key 2009 H1N1 Activities, 2010

- NIC Cantacuzino supported Albania by testing ILI samples during the pandemic.
- The Republic of Moldova received support for antigenic typing and subtyping of isolates and training of specialists.

Other Notable Achievements in FY 2010

- The NIC was involved in clinical trials (involving both adults and children) of pandemic vaccine manufactured in NIRDMI Cantacuzino.
- Laboratory tests for immunogenicity and persistence of antibodies were conducted during the study.

- NIC Cantacuzino participated in the training of family physicians, epidemiologists and laboratory specialists.

Special Influenza Projects

- NIRDMI Cantacuzino was the recipient of the WHO influenza vaccine production capacity building grant.
- NIC Cantacuzino participated in the European Multicenter project I-MOVE (2008-2009 and 2009-2010) coordinated by EpiConcept and financed by the ECDC case-control study measuring the effectiveness of pandemic and seasonal influenza vaccine.

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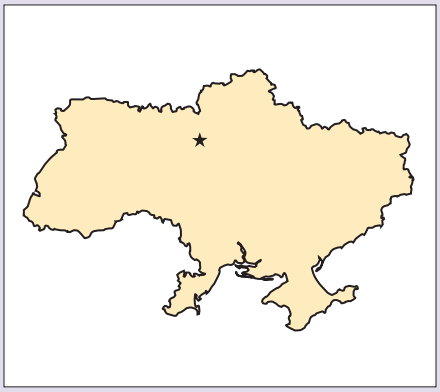
Ukraine



- **Capital:** Kyiv (Kiev)
- **Area:** 603,550 sq km
- **Population:** 45,134,707 (July 2011 est.)
- **Age Structure:** 0-14 years: 13.7% (male 3,186,606/female 3,014,069); 15-64 years: 70.8% (male 15,282,749/female 16,673,641); 65 years and over: 15.5% (male 2,294,777/female 4,682,865) (2011 est.)
- **Life Expectancy at Birth:** Total population: 68.58 years; male: 62.79 years; female: 74.75 years (2011 est.)
- **Infant Mortality Rate:** Total: 8.54 deaths/1,000 live births; male: 10.71 deaths/1,000 live births; female: 6.23 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 99.4%; male: 99.7%; female: 99.2% (2001 census)
- **GDP:** $306.3 billion (2010 est.)
- **GDP per Capita:** $6,700 (2010 est.)

U.S. CDC Direct Country Support

FY 2010 was the fifth year of the cooperative agreement *Influenza Surveillance and Pandemic Preparedness in Ukraine*. The U.S. CDC has provided funds to the Program for Appropriate Technology in Health (PATH) to assist 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 of Ukraine that outline planning and organization measures to combat pandemic influenza.
- Enhancing the nationwide early warning system and epidemiological capacity to detect and respond to human illness caused by 2009 H1N1 virus infections or infections from other respiratory pathogens with pandemic potential.

Surveillance

MOH and PATH have established a fully functioning sentinel influenza surveillance system in Kiev, Odessa, Dnepropetrovsk and Khmelnitsky and developed a website to support electronic reporting, data analysis, presentation, and other aspects of the system. The sentinel surveillance network includes 18 hospitals and polyclinics. Data findings suggest that in the 2009-2010 season, 27% of ILI and 39% of

SARI cases were caused by influenza, and 2009 H1N1 was responsible for 99% of the confirmed cases. Information on seasonal and pandemic influenza is routinely submitted to EuroFlu.

Key Surveillance Activities

The Ministry of Health and PATH coordinated the following activities:

- A fourth sentinel site (Khmelnitsky) was added to the surveillance system.
- NIC and MOH updated the national guidelines for sentinel surveillance in partnership with, WHO and CDC.
- NIC added new features and analyses to the electronic data system. These include: incidence by age group; risk factors; efficiency of laboratory testing by method and by specimen collection day; timeliness of data reporting and lists of missing test results.
- Reporting timeliness and data quality were improved at all sites.
- The surveillance system was evaluated to identify areas for priority attention in the next year.

Laboratory

Funding from the partnership between CDC, PATH and the Ukraine MOH continued to support the NIC in Kiev and four regional virologic laboratories in the sentinel sites with equipment, reagents, consumables and other items to maintain optimal functionality of the labs. These laboratories can perform PCR and virus isolation in cell culture. Samples from Ukraine are routinely submitted to the WHO CC Atlanta and the WHO CC London.

Key Laboratory Activities

- Continued supporting labs with equipment and consumables.
- Continued participation in the WHO GISN.
- Trained sentinel site virologists in influenza virus isolation and identification, and real-time PCR investigation.
- Tested 2,400 SARI and ILI cases in the sentinel sites during the 2009-2010 season: 36% were 2009 H1N1 positive.

Preparedness

The partnership on pandemic preparedness between the Ukraine MOH, PATH, CDC, and WHO has resulted in the development of the national guidelines for health services of Ukraine that outlines planning and organization measures to combat pandemic influenza. 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, and to guide the MOH pandemic 2009 H1N1 influenza response activities during the 2009-2010 pandemic surge.

Key Preparedness Activities

- Assessed national capabilities for pandemic preparedness and response together with the CDC using the CDC monitoring and evaluation tool to optimize planning.
- Carried out pandemic preparedness exercises in Ukraine and two countries in the region.
- The guidelines were activated and steered the MOH pandemic preparedness and response activities during the pandemic.

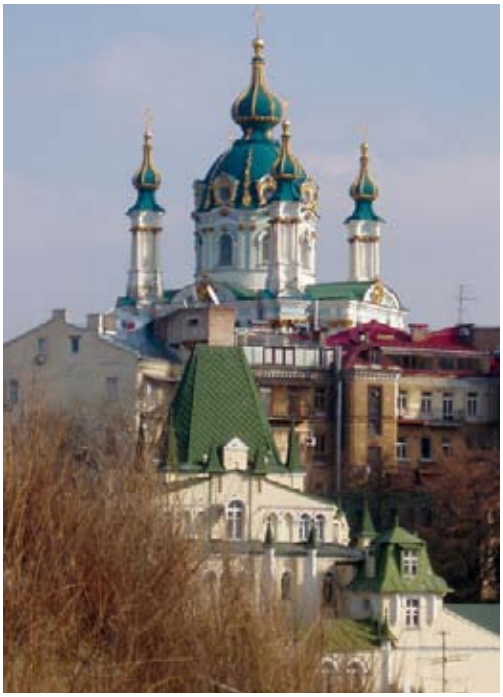
Training

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 information into preparedness and response activities. In 2010, the following trainings were organized in Ukraine:

- Training of four regional Sanitary Epidemiological Service (SES) virologists in influenza virus isolation and identification at the NIC.
- Eight training workshops for 120 health staff involved in sentinel surveillance work in all four sites.
- Two pandemic preparedness exercises for members of regional committees.
- Representatives of the NIC and PATH also participated in the CDC and WHO influenza surveillance and influenza burden of disease meetings in Cairo, Egypt, Atlanta, Georgia, Brasov, Romania, and Tunis, Tunisia.

2009 H1N1 Activities, FY 2010

- MOH, NIC, SES, and PATH staff were trained through the partnership to provide technical guidance to health workers nationwide.
- Influenza pandemic preparedness and influenza outbreak response guidelines developed in partnership with PATH and CDC were used to guide response activities in the country.
- Laboratory equipment and consumables purchased through the partnership were used to detect 2009 H1N1 cases.
- The sentinel surveillance system operating in four sites complemented routine ARI surveillance designed to monitor the 2009 pandemic.
- The partners analyzed lessons learned during the pandemic to optimize future planning.



A view of St. Andrew's Church constructed 1747-1754, Kiev, Ukraine.

Other Notable Achievements in FY 2010

- The sentinel SARI and ILI surveillance system is now fully operational in all sites.
- CDC-led assessment of core national capabilities for pandemic influenza preparedness and response demonstrated significant improvement in country planning and pandemic response in the past two years.
- Lessons learned from developing a new sentinel influenza surveillance system in Ukraine and results of the above assessment were presented by the NIC, PATH and CDC at the Options for the Control of Influenza VII conference in Hong Kong; three abstracts for poster presentations were accepted.
- The partners began developing a sustainability plan to coordinate and address transitioning of the project.

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WHO Region of the Americas (AMR)

WHO Region of the Americas (AMR) Overview

Currently there are five bilateral influenza cooperative agreements in the Region of the Americas. These agreements with Ministries of Health (MOHs) or institutions designated by the MOHs work with PAHO and U.S. CDC to build capacity to routinely identify and respond to seasonal and novel influenza strains across the Americas.

CDC direct country support via cooperative agreements is established in the following countries:

- Argentina.
- Brazil.
- Mexico.
- Paraguay.
- Peru.

In addition, CDC supports the WHO Pan-America Health Office (PAHO) via a cooperative agreement. CDC also supports activities with the Center for Central America and Panama program (CDC-CAP) at the CDC GDD (Global Disease Detection) site in Guatemala. These activities support programs in eight Central American/Caribbean countries including Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, and Dominican Republic.

CDC staff visit an influenza sentinel surveillance site based at the San Jeronimo Health Center in the city of Cusco, Southeastern Peru. From left to right: Joel Montgomery, Ann Moen, Marc-Alain Widdowson, and Tomas Rodriguez.

The core activities of our bilateral agreements and technical assistance are:

- To build sustainable national capacity to identify and respond to seasonal influenza, pandemic influenza and other emerging diseases in accordance with International Health Regulations (2005).
- To make routine contributions of surveillance and virology data to the WHO Global Influenza Surveillance Network (GISN).
- To increase the geographic reach of WHO GISN.
- To provide earlier access to critical virus isolates from humans and birds for the WHO GISN.
- To increase the numbers of shipments and influenza isolates provided by local influenza labs for analysis by WHO Collaborating Centers.
- To develop sustainable epidemiologic and virologic surveillance systems for severe influenza in order to gain understanding of the disease and economic burden caused by influenza and other respiratory viruses.
- To sustain and leverage quality sentinel surveillance and study cohorts to explore the potential cost-effectiveness of expanding vaccination and incorporating new delivery mechanisms, formulations, and novel influenza vaccines in the PAHO Region.

In additional to our bi-lateral work, we also partner with the Naval Medical Research Unit No. 6 (NAMRU-6) in Lima, Peru, to jointly support South American countries that are starting influenza surveillance.

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Pan American Health Organization (PAHO)

U.S. CDC Direct Country Support

The Pan American Health Organization (PAHO) promotes the development of National Influenza Pandemic Preparedness Plans (NIPPs) and supports all Member States in this effort. The *Generic Protocol for Influenza Surveillance (GPIS)* was developed by the U.S. CDC and PAHO to standardize influenza surveillance throughout the Region. It has been a model for other WHO Regions. In addition to the development of NIPPPs, the goal of the technical cooperation is to strengthen countries' core capacities for surveillance and response while preparing for disease-specific requirements, as mandated by the WHO in their International Health Regulations (2005).

In late April 2009, a novel influenza A virus capable of infecting humans was detected in North America. This particular H1N1 strain had not circulated previously in humans and demonstrated high

person-to-person transmissibility. From its initial focus in North America, the virus spread worldwide, resulting, by the end of the pandemic, in 18,449 deaths, of which 8,557 were in the Region of the Americas.

The emergence and circulation of this novel virus in the Region of the Americas resulted in a shift in technical cooperation from preparedness to response and mitigation. The pandemic allowed for countries and PAHO to test the systems that had been implemented for preparedness, surveillance, and response, over the prior years and identify gaps.

There were several key lessons learned during the pandemic— that surveillance of severe acute respiratory diseases must be strengthened, that laboratory staff need the technical skills to provide basic analysis and interpretation of their laboratory data, and that alternate sources of mortality data, such as death certificates, can provide the much needed regional-estimates of influenza disease burden.

Surveillance

Considering these lessons learned during the 2009 pandemic, PAHO directed its technical cooperation to address these gaps. First, from the surveillance standpoint, it was determined that there needed to be increased importance given to the detection of unusual health events and surveillance of severe respiratory disease cases. This was due to the fact that these cases, in a hospital setting, are easier to capture, that they are smaller in number than the milder ambulatory cases, and that during a pandemic, information about severe cases is of paramount importance for making decisions about response. The first step taken was to draft a guideline that utilized as its backbone, the PAHO-CDC *Generic Protocol for Influenza Surveillance,* but focused on strengthening SARI surveillance and expanding it beyond selected sentinel sites. This protocol was entitled, *PAHO Protocol for Nationwide Enhanced SARI Surveillance*. Next, the tasks of sensitizing the countries and implementing the protocol proved to be relatively easy, as countries had identified this lack of data on severe cases to be important and were eager to improve their SARI surveillance. In 2010, this protocol was implemented in selected Caribbean countries, through technical cooperation with CAREC and also in the Southern Cone in Uruguay. Key to the success of this strategy is an information system that allows for easy data capture and dissemination and minimizes double data entry. To that end, PAHO has been working with an information systems engineer to develop a system that allows for data entry, linkage between hospital (i.e. clinical-epidemiologic) and laboratory (i.e. virologic) data, and generates automated data outputs. This information system was implemented in Uruguay in 2010 and is currently being modified for use in other countries. Finally, in terms of long-term sustainability of this SARI surveillance, it was important to consider how to integrate this surveillance with other surveillance programs. To that end, given that many hospitals are currently building programs of health-care associated infection (HAI) surveillance and mandatory reportable disease surveillance, it made sense to consider incorporating SARI surveillance as part of these activities and to raise awareness among all health care workers about the need to report any unusual health event that might signal nosocomial spread, an outbreak ongoing in the surrounding community/catchment area of the facility, (an) imported case(s) and that deserve immediate investigation and implementation of control measures. This concept is being developed by promoting the idea that hospitals should develop departments of epidemiology and surveillance, under which all of these activities would fall.

Key Surveillance Activities

- Guidelines for detection, assessment, and reporting of unusual health events have been developed and disseminated in 14 countries in the Region, and implemented in 11 of them.
- Online information system to monitor SARI cases in 100% of hospitals with intensive care units and 80% of hospitals overall in Uruguay. (https://trantor.msp.gub.uy/epidemiologia/servlet/iraggrafmenu)

- SARI surveillance established in the national hospital in Barbados, Dominica, Jamaica, St Lucia, St Vincent and the Grenadines, Trinidad and Tobago and weekly laboratory and clinical data are being provided to CAREC/PAHO.

Laboratory

From the laboratory standpoint, considering the challenges faced during the pandemic, technical cooperation was directed to improve the capacity in the laboratory to process specimens for real-time RT-PCR, through the purchase of automated extractors and vacuum extractors. Additionally, as laboratory staff were not equipped to analyze and disseminate their data, PAHO, in collaboration with the University of North Carolina at Chapel Hill, developed a 2.5-day training course on epidemiologic analyses of influenza laboratory data. More than 45 persons, representing all PAHO sub-regions, were trained as part of this course, and the course is currently available online in both English and Spanish. Additionally, PAHO has continued to support the strengthening of laboratory capacity for the diagnosis of influenza and other respiratory viruses, including through the limited decentralization of real-time RT-PCR for influenza, through refresher courses for real-time RT-PCR and immunofluorescence, and through participation in the WHO EQAP. Through these activities, PAHO has continued to work to strengthen the regional laboratory network, which now consists of 23 NICs in Latin America and the Caribbean.

Key Laboratory Activities

- Developed a 2.5 day training course in collaboration with the University of North Carolina at Chapel Hill to train laboratory staff in the analysis and dissemination of influenza laboratory data.
    - Course available online (http://cphp.sph.unc.edu/paho/precurso.html).
    - Trained 50 persons from each of the four sub-regions.
- Fifteen Qiacubes purchased to automate the extraction procedure for real-time RT-PCR.

Preparedness

Due to the 2009 H1N1 pandemic, PAHO activated its Emergency Operation Center (EOC) in Washington, D.C., to coordinate activities and deploy rapid response teams into the Region. The EOC served as the point of contact for communication between technical areas and MOHs. PAHO has supported all countries' efforts to create situation rooms and EOCs to centralize data and coordinate national actions.

Key Preparedness Activities

- Rapid response missions were deployed to Bolivia, Nicaragua, Guatemala, Ecuador, Paraguay and Dominican Republic.
- PAHO developed education materials on infection control for the influenza pandemic and disseminated these to Spanish and English speaking countries.
- PAHO developed guidelines on epidemiological surveillance of health care-associated infections and provided these to all partner countries.

Training

PAHO hosted the following trainings in FY 2010:

- Three two-day training courses on epidemiologic analyses of laboratory data were held in Washington, D.C., for epidemiologists and laboratory staff from Central America, the Andean region, and the Southern Cone. In total, about 30 persons were trained.

- A two-day training course was held in the Caribbean to train epidemiologists and laboratory staff on epidemiologic analyses of laboratory data. In total, about 20 persons were trained. The course is available online in English and Spanish.

2009 H1N1 Activities, FY 2010

The emergence of 2009 H1N1 sparked a demand for direct support from the member countries. Technical cooperation has continued to promote integrated strategies of capacity building, planning tools, and simulation exercises.

Key 2009 H1N1 Activities

- As a way of supporting country messaging, consistency, and communication coordination, PAHO worked with the countries to implement knowledge, aptitude and practice studies.
- Based on past 2009 H1N1 activities, PAHO has developed online risk communication courses in Spanish and English.

Special Influenza Projects

- PAHO has supported all countries in the introduction of the pandemic influenza vaccine and has developed technical guidelines for the use of the pandemic vaccine. Twenty-two countries and territories received pandemic influenza vaccine and approximately 50 million doses were used.
- Another goal is to enhance development of technical and financial assistance to the Caribbean and Southern Cone countries in South America. These regions have epidemiology departments that are chronically under-staffed.

Public Health Importance

- PAHO continues to be a leader in promoting the standardized improvements to influenza surveillance that are needed to better understand the transmission of influenza in the Region and to fulfill International Health Regulations 2005 requirements.
- PAHO is a critical partner in better understanding influenza vaccine utilization, coverage, and needs in the Region.
- CDC anticipates working closely with PAHO during the coming years to continue to streamline and standardize influenza surveillance and vaccination policies using evidenced-based data gathered in partnership with regional countries.

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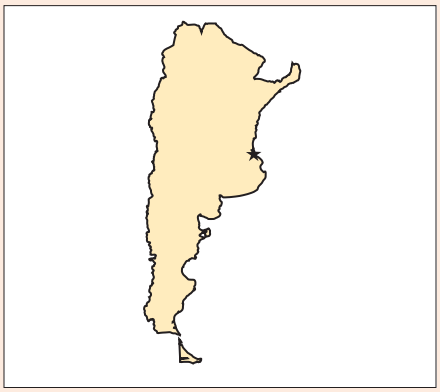
Argentina



- **Capital:** Buenos Aires
- **Area:** 2,780,400 sq km
- **Population:** 41,769,726 (July 2011 est.)
- **Age Structure:** 0-14 years: 25.4% (male 5,429,488/female 5,181,289); 15-64 years: 63.6% (male 13,253,468/female 13,301,530); 65 years and over: 11% (male 1,897,144/female 2,706,807) (2011 est.)
- **Life Expectancy at Birth:** Total population: 76.95 years; male: 73.71 years; female: 80.36 years (2011 est.)
- **Infant Mortality Rate:** Total: 10.81 deaths/1,000 live births; male: 12.08 deaths/1,000 live births; female: 9.48 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 97.2%; male: 97.2%; female: 97.2% (2001 census)
- **GDP:** $596 billion (2010 est.)
- **GDP per Capita:** $14,700 (2010 est.)

U.S. CDC Direct Country Support

Funded through a cooperative agreement by the U.S. CDC since September 2006, Argentina has strengthened its influenza surveillance system by systematically adding well-functioning sentinel surveillance sites in key provinces and developing an on-line surveillance reporting and analysis system. During 2010, CDC funding also supported a review of the epidemiology and laboratory network protocols. Based on this needs-assessment, CDC funds were used to purchase RT-PCR supplies and reagents for reference laboratories.

Argentina has three regional NICs, and its virologic surveillance network consists of over 60 laboratories in both public and private health care settings. Each NIC works with sentinel units located within local provincial health authorities to conduct virologic and epidemiologic surveillance. The NICs perform virus isolation with typing and subtyping of isolates and share virus isolates with the WHO Collaborating Center in Atlanta.

Surveillance

The Argentina MOH adopted the CDC/Pan American Health Organization (PAHO) influenza surveillance generic protocol, which it helped to draft, as their template for surveillance throughout their provinces. Epidemiologic surveillance has improved with the implementation of the National Health Surveillance System. Currently Argentina has 29 sentinel sites (one per province) that provide information to the three NICs. Argentina also developed an internet database that provides instant notification of their influenza activity. These data are summarized weekly and disseminated to stakeholders.

Key Surveillance Activities

- The MOH Epidemiology Directorate increased the number of sentinel sites collecting quality epidemiology and viral data from 19 to 29 sites to provide better geographic representation of viral activity throughout Argentina.
- The MOH Epidemiology Directorate improved their web management system for sentinel data collection, analyses and weekly dissemination to stakeholders.
- The MOH increased the number of joint collaborations with the Ministry of Agriculture.
- The MOH has actively collaborated with local academic and provincial partners, PAHO, and CDC to better understand the clinical manifestations of 2009 H1N1, estimate the burden of seasonal and pandemic influenza disease, and evaluate the impact of the influenza vaccine program. These valuable lines of inquiry that leverage data collected by sophisticated surveillance systems have thus far yielded one manuscript that is currently in clearance and two that are in development. The findings of these investigations are anticipated to help guide national and regional influenza prevention.

Laboratory

There are three NIC laboratories in Argentina. The main laboratory (Malbrán) is in Buenos Aires; the other two laboratories are in Mar del Plata (north) and Cordoba (south). The Malbrán laboratory receives specimens primarily from Buenos Aires where approximately one third of the country's population resides. The laboratories in Cordoba and Mar del Plata primarily receive samples from neighboring provinces. There are 60 additional laboratories in the network that perform influenza testing, of which 30 have PCR capability.

Key Laboratory Activities

- During June 2010, Malbrán staff trained representatives from 12 laboratories on how to use their recently acquired PCR instrumentation.
- Argentina laboratory staff also participated in Panel 9 WHO Proficiency Testing Program quality assurance verifications.
- NIC laboratory staff evaluated their protocols, data management, and reporting protocols, which helped to improve their processes and identify needed reagents, equipment and supplies.

Preparedness

The MOH established a specific pandemic influenza situation room and an influenza pandemic emergency operation center, which is equipped with desktop and notebook computers, and an LCD-TV to display and interpret large amounts of data. The emergency operating center serves as a contingency center to guide supply logistics of disposable PPE, pharmaceuticals (e.g. antivirals), and laboratories reagents and supplies.

Key Preparedness Activities

- The MOH established an epidemiology expert advisory committee that provides input into their pandemic emergency plan.
- Surveillance reviews have increased the quality and geographic representativeness of epidemiology and virology data generated by sentinel sites throughout the country.
- Laboratory review and improvements have allowed the NICs to streamline processes, identify weaknesses in the reagent supply chain and increase the amount of data they are able to process for subsequent public health emergencies of international concern.

- Domestic investigations into clinical management, influenza burden, and vaccine program impact have provided the MOH and the PAHO office in Argentina with valuable insight about needed risk communication messages, prioritization of risk groups, and potential impact of interventions.

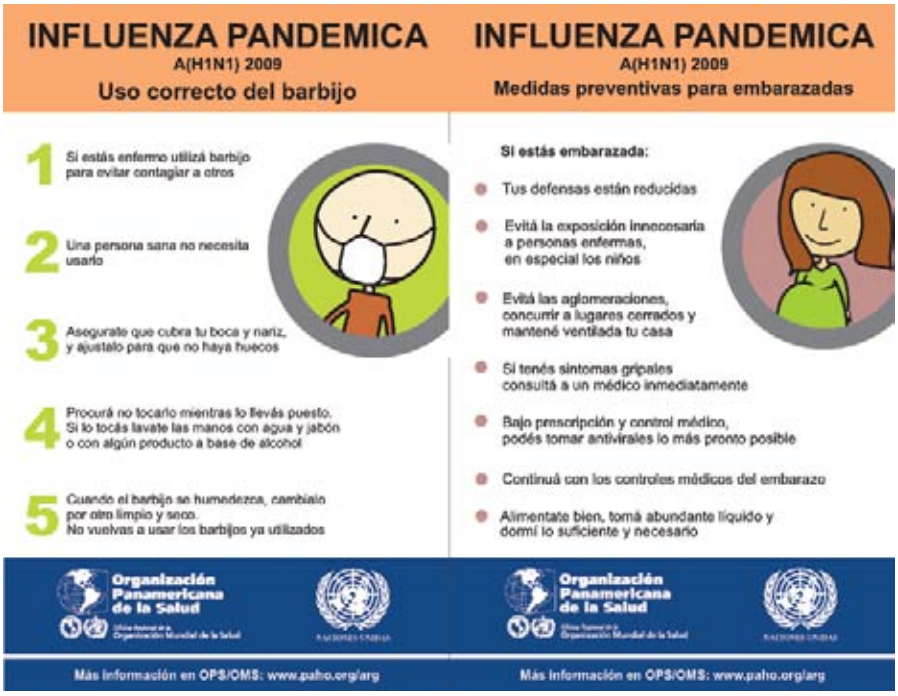
Training

The following trainings were held in Argentina in FY 2010:

- Argentina trained 24 provincial and local hospital health care providers on the latest influenza clinical management guidelines.
- Argentina has developed a local communication training workshop to improve communication activities during any future pandemic among their 24 provinces. The workshops were developed based on lessons learned during the pandemic.
- NIC staff trained laboratory staff from 12 provincial laboratories on the use of RT-PCR.

2009 H1N1 Activities, FY 2010

During FY 2010, among other activities, Argentina took some important steps with regard to better estimating the burden of influenza. The MOH developed a three-city study that took place in Santa Fe, Tucuman and Mar del Plata to determine the burden of seasonal influenza in order to help with prevention efforts. Specialized computer software to identify any respiratory illness causing deaths in hospitals was also developed by the MOH.



A colorful example of the health communication materials that were distributed in Argentina during the 2009 H1N1 pandemic.

Key 2009 H1N1 Activities, 2010

- With technical assistance from CDC's Influenza Division, the MOH was able to develop a model concerning influenza-associated diseases. The model was used to estimate the burden of influenza-associated hospitalization and death by age group, sex and country region.
- Based on experience of the 2009 H1N1 pandemic, the laboratories structures were decentralized and strengthened.

Save As...

Other Notable Achievements in FY 2010

- The MOH completed data collection in three key sentinel cities to investigate the burden of 2009 H1N1. A manuscript to disseminate findings to the public health community has been drafted and is currently in circulation among co-investigators.
- The MOH and its academic partners have completed a thorough 2009 H1N1 decedent case series, which is currently in clearance and intended for peer review publication.
- The MOH developed a model which capitalizes on quality mortality and laboratory-confirmed influenza surveillance to estimate the seasonal and pandemic influenza-associated mortality rate. A manuscript to disseminate findings to the public health community has been drafted and is currently in circulation among co-investigators.

Public Health Importance

- Argentina continues to demonstrate leadership in the surveillance of influenza in South America. Argentina collaborates with PAHO and CDC to disseminate lessons learned about influenza surveillance, burden, and prevention in the region.

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Save As...

Brazil

- **Capital:** Brasilia
- **Area:** 8,514,877 sq km
- **Population:** 203,429,773 (July 2011 est.)
- **Age Structure:** 0-14 years: 26.2% (male 27,219,651/female 26,180,040); 15-64 years: 67% (male 67,524,642/female 68,809,357); 65 years and over: 6.7% (male 5,796,433/female 7,899,650) (2011 est.)
- **Life Expectancy at Birth:** total population: 72.53 years; male: 68.97 years; female: 76.27 years (2011 est.)
- **Infant Mortality Rate:** total: 21.17 deaths/1,000 live births; male: 24.63 deaths/1,000 live births; female: 17.53 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** total population: 88.6%; male: 88.4%; female: 88.8% (2004 est.)
- **GDP:** $2.194 trillion (2010 est.)
- **GDP per Capita:** $10,900 (2010 est.)

U.S. CDC Direct Country Support

Brazil launched its national influenza surveillance system in 2000. Brazil has had a cooperative agreement with the CDC since September 2006. In 2010, Brazil developed the fourth version of their influenza pandemic plan, which is based on the lessons learned from the 2009 H1N1 pandemic. Protocols were developed to deal with weaknesses that were discovered during the pandemic, such as specific protocols for actions at ports of entry (i.e. airports and borders) and for clinical management and enhanced influenza surveillance procedures.

Surveillance

Brazil has a surveillance network comprised of 50 Centers on Strategic Information and Rapid Response Health (CIEVS). The Centers are spread throughout all the states of Brazil and in strategic cities. Their aim is to develop activities for crisis management and epidemic emergencies. Currently the MOH has two information systems for influenza, and both are online; the first influenza system, Sinan, is for hospitalization data and the second, Sivep-Gripe, is for sentinel influenza data.

Sentinel surveillance provider units collect clinical samples from suspect cases for laboratory diagnosis and consolidate data from outpatients with ILI. Surveillance is obtained from 63 units, and all states have surveillance for severe cases of influenza. Sivep-Gripe data are simultaneously available at all levels of the surveillance network.

Key Surveillance Activities

The MOH developed the fourth influenza pandemic plan based on the 2009 H1N1 pandemic and included updated guidance for improving communication and coordination from the local level to the national level.

- Brazil developed a routine structure for SARI surveillance.
- Protocols were developed for influenza surveillance at airports and in Brazilian border regions.

Laboratory

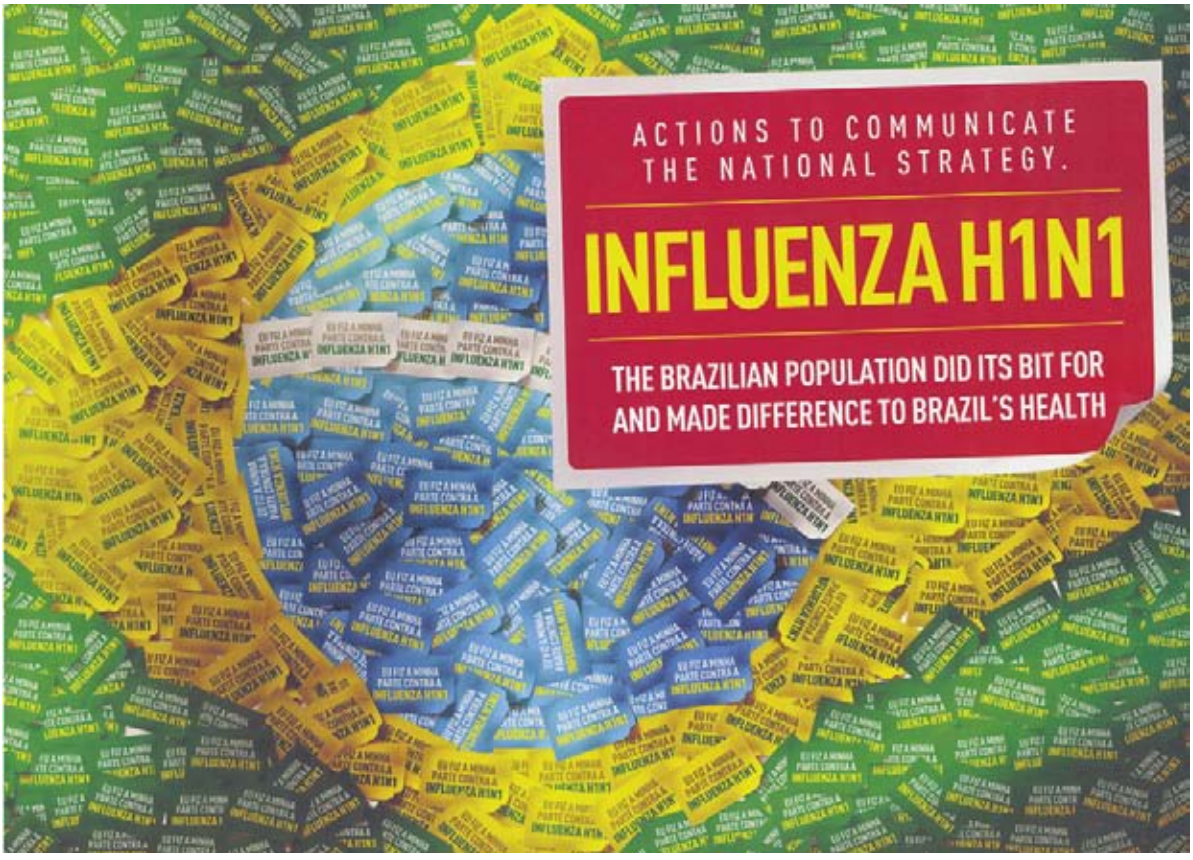
Brazil has three NICs: one each in Rio de Janeiro, Sao Paulo, and Para. There are 27 public health labs (LACEN) in all state capitals, which develop diagnosis for seasonal influenza by immunofluorescence, and then send their samples to regional NICs.

Key Laboratory Activities

- Brazil's NICs routinely isolate viruses, share samples with other international agencies, and provide information to FluNet.
- Brazil's NICs have regular communication with local and regional laboratories to provide technical assistance and monitor influenza testing activities.
- Brazil´s NICs conduct training and provide additional equipment to enhance the diagnostic capacity of their reference laboratories.

Preparedness

Review and adjustment of the fourth version of the national preparedness plan was undertaken with the participation of representatives of 16 agencies that form the National Group Executive. The main purpose of this updated plan is to strengthen federal and local systems to reduce the impact of any future pandemic. The 2010 version of the plan incorporates lessons learned from the 2009 H1N1 pandemic, including the need to engage neighboring countries in joint preparedness planning and border control activities.



The creative front page of Brazil's H1N1 Prevention Campaign Strategy.

Brazil improved their preparedness on a national level by installing videoconference capabilities that allow for simultaneous communication with states and federal districts. Videoconferences were held to assess and coordinate response at the local level. Although improvements were intended for the health sector, the Brazilian preparedness plan to combat pandemic influenza also addresses the role that society and the population play during a pandemic.

Key Preparedness Activities

- Brazil updated influenza pandemic protocols for the following areas: clinical management of severe cases, primary health, epidemiological surveillance, and airports and borders.
- Specific protocols have been designed for actions at ports of entry (i.e. airports and borders) for clinical management and epidemiological surveillance.

Training

The following trainings were held in Brazil in FY 2010:

- The MOH developed a comprehensive peer training activity for professional workers in the following parts of the national health system: basic health, family health, high complexity services, emergency care, rescue, and public education. These professionals then provided the same training to their state partners. The training contains a DVD called *Vademecum Influenza*, with a manual, treatment and clinical management protocols, instructional videos, and scientific papers. This material is the basis for all the regional courses for professional qualification and is available on the MOH web site.
- The NICs provided training in real-time RT-PCR for the 2009 H1N1 influenza diagnosis for the state lab network.
- The Brazil MOH provided train-the-trainer sessions to develop rapid response teams in all states, including remote states.
- The Brazil MOH developed media training on pandemic issues for communication staff in each department at national and local areas.

2009 H1N1 Activities, FY 2010

After the pandemic in 2009, the MOH received additional resources to strengthen the SARI surveillance system in Brazil by reinforcing early warning and surveillance systems.

Key 2009 H1N1 Activities, 2010

- Hospitals were upgraded to continue monitoring and notifying the MOH of SARI cases.
- Brazil's MOH was able to vaccinate 47% of the total population against pandemic influenza through prioritizing risk groups.
- Routine videoconferences with state surveillance coordinators were developed for general discussion about influenza and pandemic preparedness.

Special Influenza Projects

- The MOH has provided a structured audiovisual lab training course related to providing consistency in all laboratory activities in all local and regional laboratories.
- The MOH provided influenza pandemic training for all federal level employees.

Save As...

Public Health Importance

- The MOH developed influenza training in a DVD format entitiled *Vademecum Influenza*. The training contained a manual with treatment and clinical management protocols, instructional videos, and scientific papers.
- The MOH published in the Bulletin Epidemiological Review several papers on the pandemic that provide lessons for future pandemics.

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Save As...

Influenza Program of GDD Response Center for Central America and Panama (GDD-RC/CAP)

U.S. CDC Direct Country Support

Influenza Program activities in Central America and Panama (CDC-CAP) began in July, 2005, and were incorporated into the U.S. CDC GDD Response Center during 2006. Influenza activities occur in eight regional countries: Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama and the Dominican Republic. The main focus of the program has been to build national capacity to detect and respond to avian and pandemic influenza within the framework of preparedness and worldwide response.

Surveillance

Evaluations of the surveillance systems suggested the need to standardize surveillance protocols, in order to improve the quality of data collected at sentinel sites and influenza diagnostic capacity at local laboratories. The full implementation of the generic CDC/PAHO influenza surveillance protocol in 2007 and the implementation of 15 sentinel units and six NICs have contributed to the consolidation of a regional influenza surveillance network.

Key Surveillance Activities

- Influenza surveillance operating procedures have been updated and standardized in sentinel units of all participating countries.
- Systems to capture and manage influenza surveillance data have been implemented in three new countries: Guatemala, Honduras and Costa Rica.
- Two new platforms have been created to register and follow surveillance cases.
- Investigation of outbreaks has been carried out in Santa Ana, El Salvador and Cartago, Costa Rica.
- All professionals working in sentinel surveillance systems in all eight countries have been trained on laboratory and surveillance techniques.

Laboratory

In the context of the influenza pandemic, six out of eight regional countries are now official NICs and play an important role in the WHO Global Influenza Surveillance Network. Seven out of eight National Reference Laboratories (NRLs) have the capacity to identify influenza A and B viruses, adenovirus, parainfluenza 1, 2 and 3, and respiratory syncytial virus.

Key Laboratory Activities

- The immunofluorescence laboratories in ten sentinel units are fully operational according to the developed standard operating procedures.

- CDC-CAP has provided reagents and supplies to these laboratories to further support their influenza surveillance in the region.

Preparedness

The second version of CDC's National Inventory of Core Capabilities for Preparedness and Response for Influenza Pandemic in Central America was administered in June 2010. A combination of previous efforts, incentives and additional resources for the pandemic have allowed breakthroughs in routine influenza surveillance, communications, health sector response, outbreak response and community-based interventions.

Central American countries have adopted seasonal influenza vaccine into their immunization programs targeting different populations for different objectives and achieving variable coverage. The introduction of 2009 H1N1 vaccine in all the eight countries allowed the implementation of new strategies to rapidly detect adverse events potentially associated with the vaccine and to evaluate vaccine effectiveness.

Key Preparedness Activities

- Administered and analyzed the results of the CDC's National Inventory of Core Capabilities for Preparedness and Response for Pandemic Influenza in 2010 for all eight countries of the region. Preliminary results have been presented and discussed with key health authorities in each country.
- Networking between different ministries and departments of health, and other agencies such as PAHO and Council of Ministers of Health of Central America (COMISCA) has been enabled and supported.
- National health authorities used their national experience in influenza preparedness and response to improve organization and implementation capacities to comply with International Health Regulations.
- CDC-CAP has continued to work with all countries to advocate for increased funding for the seasonal vaccine and for the harmonization of immunization policies against influenza.
- CDC-CAP has continued to update their vaccination strategies based on vaccination program experiences in El Salvador and Nicaragua.
- CDC-CAP has developed an active surveillance of adverse effects potentially attributed to the 2009 H1N1 influenza vaccine in cohorts in El Salvador and Costa Rica.
- Evaluation of the cost-effectiveness of the 2010 seasonal influenza vaccine has been completed in El Salvador.

Training

The Influenza Program for Central America hosted the following training activities during 2010:

- Two training courses on influenza were conducted jointly with the Regional Health Care Training Center of Gorgas Memorial Institute where 105 health professionals from eight countries attended.
- Eight health professionals from Dominican Republic, Costa Rica, Honduras, El Salvador and Guatemala were enrolled in the advanced level (Master of Field Epidemiology) of the Field Epidemiology Training Program (FETP), and have completed all modules.
- A comprehensive training module on public health surveillance for rapid response teams and other key health professionals was developed; it is now available for all countries.

- The third of a series of training workshops for health professionals from the eight countries was completed. The workshop provided a forum for the 30 participants to discuss risk communications during public health emergencies.
- Three training workshops were held on time-series analysis for surveillance staff at the ministries of health in Guatemala and Nicaragua, and the Costa Rica Social Security Fund during which 29 persons were trained.
- Two regional workshops were held on scientific writing, systematization of surveillance data and influenza prevention for the staff of the El Salvador MOH and the Costa Rican Social Security Fund.

2009 H1N1 Activities, FY 2010

Technical assistance for the improvement of the early warning systems, laboratory capacity to detect novel influenza viruses, and implementation of the influenza surveillance generic protocol were provided to facilitate the implementation of the International Health Regulations, 2005, in the region.

Key 2009 H1N1 Activities, 2010

- Technical assistance was provided through the COMISCA to design and implement an integrated health information system to support integrated surveillance in the region.
- Technical assistance was provided to members of the WHO Global Outbreak Alert and Response Network (GOARN) team for response during the 2009 H1N1 pandemic.

Other Notable Achievements in FY 2010

- The clinical and epidemiological profile of laboratory-confirmed, 2009 H1N1 cases was characterized in patients who were infected in Central America.
- The excess of SARI hospital mortality in 2009 in Guatemala, El Salvador, Nicaragua, and all hospitals of the Social Security in Costa Rica was described.
- The CDC/APHL International Laboratory Capacity Review was implemented at each NRL and was completed in June 2010.
- The influenza seasonality model in El Salvador was developed and established, showing a Southern Hemisphere pattern during 2003–2009.
- The analysis of influenza burden of disease using data from the sentinel sites of El Salvador was carried out and completed.

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A poster encouraging kids to wash their hands, used in Ecuador during the H1N1 pandemic.

GDD-Guatemala

The GDD (Global Disease Detection) Regional Center in Guatemala (GDD-Guatemala) was established in 2006, building on U.S. CDC's more than 30 year history of programs, activities, and partnerships in Central America, the Dominican Republic, and Panama. Together with partners, including PAHO, CDC has helped the region detect and respond to serious public health threats, including influenza, diarrheal and neurological diseases, and febrile illnesses, such as rickettsia and dengue.

Coverage

GDD-Guatemala covers eight countries: Guatemala, Belize, Honduras, Dominican Republic, Nicaragua, El Salvador, Costa Rica, and Panama. The influenza program subsidizes an epidemiologist in each of the eight Central America and Panama (CAP) region 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 with measurable successes on the basis of PAHO's evaluation metrics.

GDD-Guatemala activities include:

- Outbreak Response.
- Pathogen Discovery.
- Training.
- Surveillance.
- Networking.

Effect

In 2010, the GDD Regional Center in Guatemala increased their laboratory testing capacity by 22%. GDD-Guatemala trained 11 FETP graduates and more than 4,000 participants in short-term regional and national trainings. GDD-Guatemala responded to 24 outbreaks. Of those 24 outbreaks, GDD-Guatemala provided laboratory support for 71% and yielded a confirmed cause.

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Influenza Lead

Principal U.S. CDC Program Collaborations In-Country

- Influenza Division International Program
- International Emerging Infections Program
- Field Epidemiology and Laboratory Training Program
- Laboratory Systems Development Program
- International Emergency Preparedness Program

Mexico

- **Capital:** Mexico City (Distrito Federal)
- **Area:** 1,964,375 sq km
- **Population:** 113,724,226 (July 2011 est.)
- **Age Structure:** 0-14 years: 28.2% (male 16,395,974/female 15,714,182); 15-64 years: 65.2% (male 35,842,495/female 38,309,528); 65 years and over: 6.6% (male 3,348,495/female 4,113,552) (2011 est.)
- **Life Expectancy at Birth:** Total population: 76.47 years; male: 73.65 years; female: 79.43 years (2011 est.)
- **Infant Mortality Rate:** Total: 17.29 deaths/1,000 live births; male: 19.14 deaths/1,000 live births; female: 15.36 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 86.1%; male: 86.9%; female: 85.3% (2005 Census)
- **GDP:** $1.56 trillion (2010 est.)
- **GDP per Capita:** $13,800 (2010 est.)

U.S. CDC Direct Country Support

Since September 2006, the U.S. CDC has supported influenza surveillance in Mexico through a cooperative agreement. The agreement has helped to strengthen federal and regional influenza surveillance sites by funding training, equipment and coordination of activities of laboratories and epidemiology units. The Mexican National Laboratory Network consists of a National Influenza Center (InDRE) that coordinates training, quality control and reporting for 31 state laboratories. The cooperative agreement has assisted Mexico's Ministry of Health (MOH) by increasing influenza laboratory capacity in Mexican states and improving diagnostic protocols.

Mexico's outbreak response begins with local level investigations that are then assisted, if needed, by the Mexican Federal MOH. This response system was instrumental during the pandemic and remains the cornerstone of bi-national collaboration during the investigation of public health events of international concern.

Surveillance

Mexico's influenza surveillance system is based on local sentinel sites that are spread out in all 31 states. Over the course of the CDC cooperative agreement the surveillance network has grown; it started with less than 100 sites and now has grown to 739 units. The purpose of the units is to collect influenza samples from hospitals and community health centers to monitor influenza strains. Epidemiologic and laboratory data are collected at the local level and sent to centralized databases that facilitate rapid analyses, interpretation, and response to influenza activity throughout the country.

Key Surveillance Activities

- The MOH develops a weekly newsletter that is distributed to the national epidemiological network.
- The MOH developed and sustained a web-based laboratory and clinical-epidemiological reporting system that facilitates rapid identification of unusual activity and response to potential public health events of international concern.
- An updated national plan for influenza preparedness was developed to include inter-agency coordination activities with the Mexico MOH, Army, Navy, and the Ministries of Agriculture, Communication and Transportation.
- Based on lessons learned from the 2009 H1N1 pandemic, the MOH has updated and improved the quality of data that is collected in the Mexican National Influenza Surveillance System.

Laboratory

InDRE serves as a full-service national public health laboratory, performing surveillance and diagnostic testing for a broad range of agents and diseases, including respiratory viruses, rabies and arboviruses. As Mexico's NIC, InDRE cultures influenza viruses, conducts PCR testing for respiratory samples and sequences viral isolates. InDRE also provides oversight and proficiency testing for the national network of laboratories.

Key Laboratory Activities

- InDRE has the capacity to do full antigenic and genetic characterization of influenza viruses, and has the capacity to isolate influenza viruses.
- The MOH has developed an online platform to centralize data access and improve the communication system between the 31 state laboratories and InDRE.

Preparedness

The national influenza preparedness plan was updated after the 2009 H1N1 pandemic. The National Laboratory Network was fully strengthened with diagnosis protocols based in IFA, RT-PCR, real-time RT-PCR and viral culturing. Mexico is part of the North American Plan for Animal and Pandemic Influenza (NAPAPI), in partnership with Canada and the United States. In December 2010, Mexico hosted the ministerial meeting of the Global Health Security Initiative, where post-pandemic lessons were reviewed.

Key Preparedness Activities

- The national preparedness plan has been updated to include the coordination of local and state plans and activities.
- There are now 31 state preparedness plans that work together and are accessible through the internet, as is the national plan.
- Each state in Mexico has a rapid response team that is equipped and includes medical doctors, an epidemiologist, and laboratory staff.
- The MOH has a memorandum of understanding and agreement with major pharmaceutical companies to store and distribute antiviral medications.
- During the pandemic, there was successful distribution of antiviral medications to states and institutions.

Training

Mexico's MOH hosted the following training activities in 2010:

- Updated National Laboratory Network influenza leaders with regard to pandemic coordination.
- Held refresher courses on epidemiologic analysis with the National Institute of Public Health for local health departments.
- Developed an Incident Command System basic course to provide technical assistance to all 32 State Health Secretaries, in cooperation with the Public Health Agency of Canada.

A gorge in the state of Nuevo Leon, northeast Mexico.

2009 H1N1 Activities, FY 2010

In Mexico, the General Health Council declared the 2009 H1N1 pandemic to be over in June 2010. Many lessons were learned from the pandemic that will aid in preparing for any future public health emergencies. The preparedness activities involved important mobilization of resources, the organization of different activities and the coordination of many partners. As an example, collaboration was forged between local and state health departments along the U.S.-Mexico border region through coordinating and sharing supplies, personnel, and lab testing.

Key 2009 H1N1 Activities, 2010

- Coordinated activities were developed during the pandemic that became part of the government's daily activities, including regular meetings between the Health Secretary and Agriculture Secretary.
- In preparation for possible future pandemics and to assess the impact of 2009 H1N1 monovalent vaccine on the population, Mexico MOH staff attended and participated in a WHO/PAHO decision modeling workshop and a CDC influenza modeling workshop.

Special Influenza Projects

- Mexico completed analysis of data from an influenza seroprevalence survey aimed at estimating the burden of disease during the pandemic.
- Mexico plans to merge animal and human influenza epidemic surveillance activities in an effort to integrate their surveillance strategies.
- Laboratorians are integrating seroprevalence activities into the country's routine surveillance reports.

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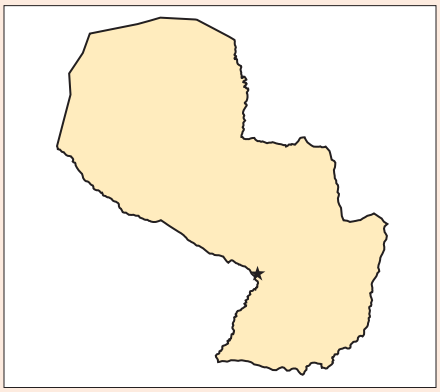
Paraguay



- **Capital:** Asunción
- **Area:** 406,752 sq km
- **Population:** 6,459,058 (July 2011 est.)
- **Age Structure:** 0-14 years: 28.5% (male 936,298/female 905,285); 15-64 years: 65.4% (male 2,121,632/female 2,100,740); 65 years and over: 6.1% (male 183,440/female 211,663) (2011 est.)
- **Life Expectancy at Birth:** Total population: 76.19 years; male: 73.59 years; female: 78.93 years (2011 est.)
- **Infant Mortality Rate:** Total: 23.02 deaths/1,000 live births; male: 26.94 deaths/1,000 live births; female: 18.91 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 94%; male: 94.9%; female: 93% (2003 est.)
- **GDP:** $33.27 billion (2010 est.)
- **GDP per Capita:** $4,900 (2010 est.)

U.S. CDC Direct Country Support

Since August 2009, the U.S. CDC has provided funds to the Paraguay Directorate General of Health Surveillance via a cooperative agreement to help the Paraguay MOH strengthen influenza surveillance. These funds are intended to support sub-national influenza preparedness and national communication strategies.

Surveillance

Paraguay has been using the PAHO generic protocol surveillance standards and plan to adopt a new SARI surveillance protocol. Through their 12 sentinel sites, Paraguay collects influenza samples that are sent to their NIC. They continue to prioritize the strengthening of their surveillance at sub-national levels including rural areas.

Key Surveillance Activities

- The number of reporting sentinel sites was increased for ILI and SARI; there are currently five sentinel sites for ILI and 12 sentinel hospitals for SARI.
- Information and data management capacity was improved at each sentinel site.
- The MOH developed national guidelines for ILI and SARI surveillance.
- Information and characterization of the epidemiology of seasonal influenza in Paraguay was improved.

Save As...

- The MOH's communication capacity at local and national level was enhanced via the provision of internet connections and cellular phones at each sentinel site.
- Each sentinel site was visited to oversee the development of their surveillance activities.

Laboratory

In 1998, Central Public Health Laboratory (LCSP) initiated viral isolation in cell culture and became Paraguay's NIC. The laboratory collects samples from each of their l2 sentinel hospital laboratories. With CDC funding and technical assistance, Paraguay has been increasing the capacity of local laboratories to collect and send samples to the NIC. The NIC is capable of performing influenza diagnostics including virus isolation, hemagglutination inhibition assays and real-time RT-PCR for seasonal, 2009 H1N1 and, H5N1 viruses. Paraguay has been working on improving their ability to send samples out of the country.

Key Laboratory Activities

- Sent representative isolates of influenza virus strains to the WHO CC Atlanta for characterization, the selection of vaccine strains for the Southern Hemisphere, and monitoring antiviral drug sensitivity.
- Provided weekly updates on influenza activity in Paraguay to WHO FluNet.
- Participated in the WHO EQAP that demonstrated the competence of the NIC to identify seasonal, 2009 H1N1, and avian influenza in accordance with WHO global standards.
- Developed and enhanced the integrated laboratory surveillance network for influenza. This included improving laboratory infrastructure, training staff, and providing resources for sentinel sites laboratories.
- Provided technical support and confirmatory testing for other influenza laboratories in the country.

Preparedness

Paraguay has rapid response teams at the national level and has been continuing their process of developing rapid response teams at the local area. Allocating staff and equipment to increase their regional area preparedness is a high priority area.

Key Preparedness Activities

- Established a communication network at the sub-national level that included communicators and educators from all eighteen health regions.
- Developed a workshop regarding lessons learned from the pandemic. Workshop objectives included the following: discussion of experiences in the management of the epidemic and lessons learned that would improve performance in future pandemics; evaluation of the response plan and its implementation, and; agreement regarding future development of tools for prevention and guidelines on the containment and mitigation of future pandemics.
- Established a multidisciplinary team of people from national and sub-national levels to analyze the lessons learned from 2009 H1N1. Results of the analysis will be used to develop new operational plans for pandemic preparedness.

Training

- Media spokespersons and national and regional communicators were trained in risk communication.
- Two biochemists from sentinel sites were trained in the technique of IFA for the detection of respiratory viruses.
- The NIC participated in training on IFA and the acquisition of related new equipment, reagents and consumables for the implementation of the technique.
- During July and August, the MOH trained staff to conduct ILI and SARI surveillance, to use analytical tools to perform basic data analysis, and to ship samples correctly.
- Training was provided for rapid response teams at the national and sub-national level.
- Workshops with simulation exercises were provided for six regions, including two at the national level and four at the sub-national level.
- Six NIC professionals were trained in techniques of viral isolation in cell cultures by experts from CDC-Atlanta.
- CDC trained NIC staff and provided technical assistance with regard to the following topics: freezing and thawing of cells, isolation of seasonal influenza, maintenance of cell line, internal quality control, increasing yield of tissue culture, and bio-security management standards.

Other Notable Achievements in FY 2010

- Developed exercises for rapid response teams for outbreaks in two national and four sub-national areas.
- Enhanced epidemiologic research and communication capacity by providing equipment (notebook, global position system devices, digital recorders, and camera), internet connections and cellular phones for each rapid response team.
- Increased the number of sentinel surveillance sites to 20 during the pandemic.
- Published a weekly national influenza bulletin that reported counts and trends of ILI, SARI, deaths, and confirmed influenza cases.

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Peru

- **Capital:** Lima
- **Area:** 1,285,216 sq km
- **Population:** 29,248,943 (July 2011 est.)
- **Age Structure:** 0-14 years: 28.5% (male 4,245,023/female 4,101,220); 15-64 years: 65.1% (male 9,316,128/female 9,722,258); 65 years and over: 6.4% (male 885,703/female 978,611) (2011 est.)
- **Life Expectancy at Birth:** Total population: 72.47 years; male: 70.55 years; female: 74.48 years (2011 est.)
- **Infant Mortality Rate:** Total: 22.18 deaths/1,000 live births; male: 24.49 deaths/1,000 live births; female: 19.77 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 92.9%; male: 96.4%; female: 89.4% (2007 Census)
- **GDP:** $277.2 billion (2010 est.)
- **GDP per Capita:** $9,200 (2010 est.)

U.S. CDC Direct Country Support

Peru is the third largest country in South America, with a population of over 29 million people. Peru is entering their fifth year of the CDC cooperative agreement. Their influenza surveillance system uses sentinel sites to identify ILI and SARI case-patients throughout the country. Laboratory testing for influenza takes place in the 15 regional laboratories, as well as the NIC, located in the National Institute of Health (INS) in Lima. In addition, pneumonia reporting is mandatory for local health care centers.

Surveillance

Since 1998, Peru's Ministry of Health (MOH) has conducted virological surveillance of influenza and other respiratory viruses.

In 2006, to strengthen the national Peruvian surveillance program, the MOH sub-Committee for Influenza Surveillance invited the Virology Department of the U.S. Naval Medical Research Unit No. 6 (NAMRU-6) in Lima to assist in increasing surveillance coverage by establishing new sentinel sites. Since then, NAMRU-6 has augmented the existing program by supporting the collection and processing of samples at new sentinel sites as well as providing these data to the General Directorate of Epidemiology (DGE) and the INS.

Sentinel surveillance has been implemented in 50 health centers throughout the country. This includes both ILI and SARI surveillance. SARI surveillance takes place at 21 sentinel hospitals. Epidemiological and clinical information, as well as nasal or pharyngeal swabs are obtained from case-patients identified through the surveillance system.

Key Surveillance Activities

- A web-based database for submission of laboratory and epidemiologic data was updated by the DGE, INS, and NAMRU-6.
- Burden estimates due to the impact of secondary 2009 H1N1 pandemic are underway, including mortality and hospitalization figures, as well as total number of symptomatic cases. In addition, Peru has used 10 years of syndromic pneumonia and influenza data to estimate the burden of influenza disease among hospitalized children aged less than five years.
- During the 2009 influenza pandemic, INS was in charge of the laboratory diagnosis for the country, NAMRU-6 supported their activities upon request.
- DGE disseminates information to the public and to the national epidemiology network through its website (www.dge.gob.pe) using a virtual situation room (http://www.dge.gob.pe/salasit.php) and posting online reports of the Epidemiology Bulletin (http://www.dge.gob.pe/boletin.php), as well as publications in national and international journals.

Laboratory

Peru has 15 regional laboratories, all of which receive respiratory samples from influenza sentinel sites. Samples are tested by IFA, and those that are positive are then sent to the country's NIC in Lima for testing by RT-PCR. At the NIC, specimens are tested on the same day they are received, and results are reported within 72 hours. Influenza positive samples are also cultured in Madin-Darby Canine Kidney (MDCK) cells. Positive isolates are shared with CDC at least three times per year for further characterization.

Key Laboratory Activities

- The NIC actively participates in WHO global influenza surveillance, submitting virus isolates during the year.
- Laboratory staff at the NIC completed training in preparation for testing to begin at the new BSL-3 laboratory facilities.
- INS has implemented an online lab results reporting system (www.netlab.ins.gob.pe) where the case reporting centers can access the lab results information in real time.

Preparedness

Peru's MOH updated influenza preparedness and response plan has incorporated an animal health component and involves other sectors (i.e. private sector, armed forces and police). This plan was published online and was widely disseminated among government sectors, including those at the regional level.

Key Preparedness Activities

- Peru's MOH updated its pandemic preparedness and response plans and is strengthening both ILI and SARI surveillance implementing daily media monitoring of suspect events and twice daily reporting to the national level.
- Peru implemented a communication preparedness campaign using radio announcements and posters to raise awareness among target audiences (health care workers, general population and poultry workers).

2009 H1N1 Activities, FY 2010

Peru's MOH identified the need to improve communication between the central and regional health departments and therefore acquired additional equipment and services to extend the coverage of communication to sub-regional levels.

Key 2009 H1N1 Activities

- Weekly updates of influenza activity.
- A vaccination campaign against 2009 H1N1 was developed and implemented for high-risk groups.

Special Influenza Projects

Plans for new influenza projects and strengthening of existing projects include the following:

- The MOH has strengthened ILI and SARI sentinel surveillance and a new directive was discussed last week with site coordinators.
- A cohort study of health workers and their families is underway.
- A study to determine factors associated with severe respiratory disease and death related to SARI and influenza is ongoing.
- The MOH is strengthening the local and regional 'Alert – Response' teams.
- The MOH is strengthening diagnostic capabilities at the regional level.

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An airport poster encouraging good cough etiquette during the 2009 H1N1 pandemic, Peru.

WHO South-East Asia Region (SEAR)

WHO South-East Asia Region (SEAR) Overview

The CDC Influenza Division funds eight non-research bilateral influenza cooperative agreements in the South-East Asia Region (SEAR). Cooperative agreements with Ministries of Health (MOHs) or institutions designated by the MOHs build capacity to routinely identify, diagnose, and respond to seasonal, avian and pandemic influenza.

In SEAR, cooperative agreements are established with the following countries and WHO Regional Office:

- Bangladesh.
- India.
- Indonesia (two cooperative agreements).
- Nepal.
- Sri Lanka.
- Thailand.
- WHO South-East Regional Office (SEARO) Headquarters in New Delhi.

In 2009, three countries--India, Indonesia and Thailand—were awarded sustainability grants. The grants support the countries for a second five years. Countries are expected to create and implement a sustainability plan that phases out U.S. government funding, to develop and maintain a surveillance

Backyard chicken. Comilla city, southeastern Bangladesh.

system that allows countries to rapidly detect, identify and respond to seasonal, novel and pandemic influenza and to participate in the WHO Global Influenza Surveillance Network (GISN).

In addition, CDC supports multiple influenza-related research grants in Bangladesh and India.

Core activities include improving laboratory and epidemiologic capacity and infrastructure for influenza virologic and disease surveillance; developing sentinel hospital-based surveillance for ILI and SARI; integrating lab and epidemiologic flu surveillance; developing and maintaining surveillance for cases and clusters of respiratory illnesses; training local rapid response and containment teams; and implementing infection control guidelines in public health care settings for prevention of avian and pandemic flu.

As of FY 2010, all SEAR countries with CDC influenza cooperative agreements had active National Influenza Centers (NICs).

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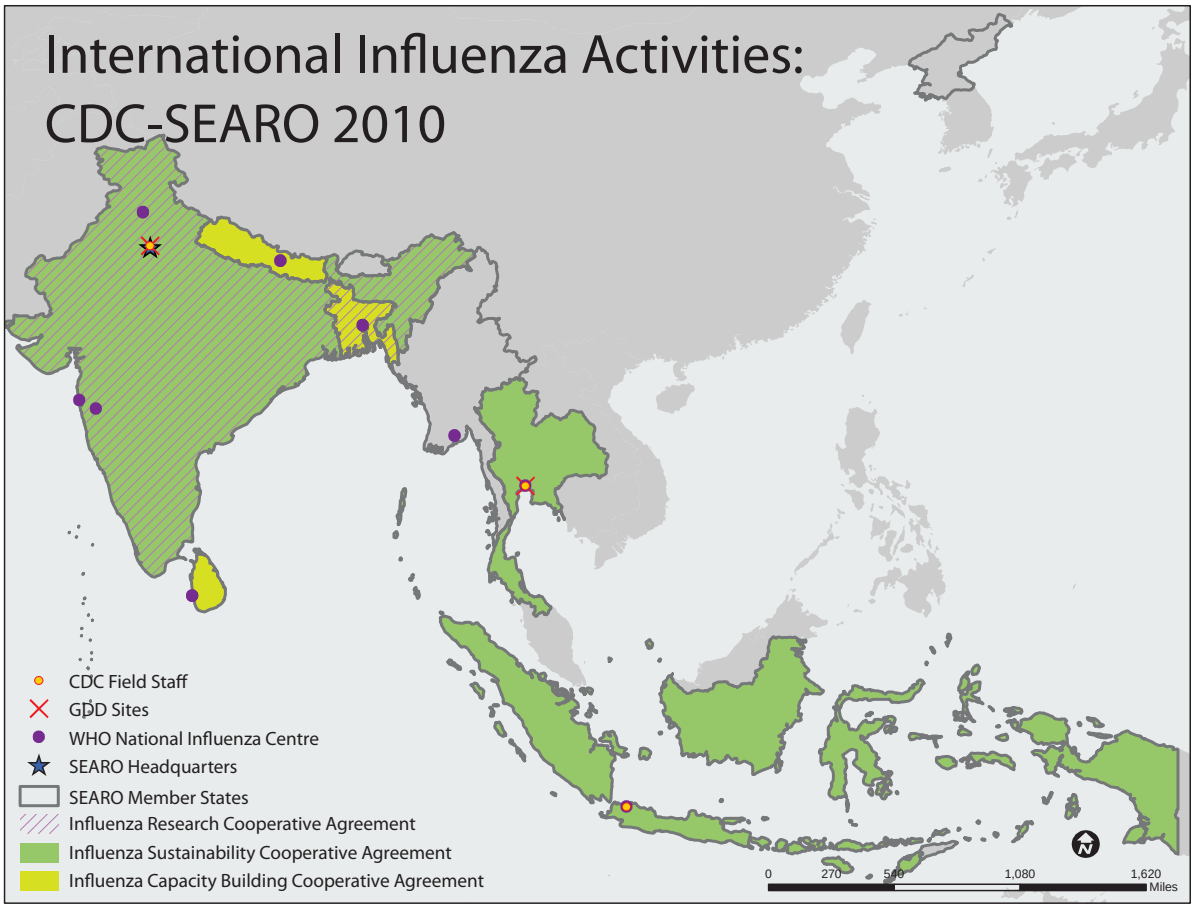
WHO South-East Asia Regional Office (SEARO)



The five-year cooperative agreement *Surveillance and Response to Pandemic and Avian Influenza by Regional Offices of the World Health Organization (WHO)* began in September 2006 and is in its fourth year of a five-year cooperative agreement.

The WHO South-East Asia Regional Office (SEARO) is located in New Delhi, India. The Office serves 11 countries; together their population exceeds 1.7 billion people. Member countries include Bangladesh, Bhutan, DPR Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste. Six of the 11 countries receive CDC Influenza Division cooperative agreement funds: Thailand, Indonesia, Bangladesh, India, Nepal, and Sri Lanka. In 2010, WHO SEARO staff provided training, support and technical assistance to member countries to strengthen preparedness, surveillance and response and laboratory capacity.

In 2011, WHO SEARO will focus on assisting countries with reviewing laws, regulations and policies related to the use of influenza vaccine, building partnerships for regional production of influenza vaccine, enhancing the capacity to monitor respiratory disease activity (including SARI and ILI surveillance) and harmonizing reporting in the Region. WHO SEARO is committed to scaling up regional influenza laboratory diagnostic capacity, improving capacity in monitoring the emergence of drug resistance, and convening an annual regional NIC meeting. WHO SEARO will continue to provide support for infection prevention and control and health care facility preparedness.

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Surveillance

With the exception of Thailand, Indonesia and India, which have a history of conducting virological surveillance to monitor circulating influenza virus strains, there was limited influenza surveillance in the SEAR prior to outbreaks of avian influenza H5N1 and the 2009 H1N1 pandemic. The pandemic drew attention to the need for both virological surveillance and reliable sentinel influenza systems in outpatient and hospital settings to collect epidemiological information on acute respiratory illness. These events have demonstrated the importance of establishing and strengthening influenza surveillance capacity in all countries in the Region.

Key Surveillance Activities

- ILI surveillance was initiated for the first time in two SEAR countries; the Democratic Republic of North Korea and Bhutan.
- Hospital-based SARI surveillance was initiated in Sri Lanka.

Laboratory

Although laboratory capacity is varied across countries, in the past five years laboratory infrastructure and technical capacity has improved throughout the SEAR. There are now eight NICs in the Region. NIV, Pune in India is an H5 reference laboratory and the NIC in Thailand became a WHO Regional Influenza Reference Laboratory for Southeast Asia in 2010.

Key Laboratory Activities

- Several SEAR Member States began to regularly report the number of specimens they tested for influenza and results of that testing by subtype to SEAR and FluNet.
- For the first time, the Maldives established PCR facilities for influenza diagnosis using WHO support. Efforts are being made to establish similar facilities in Bhutan and Timor Leste, the two countries in the Region without the facilities.

Preparedness

By the end of 2006, all countries in SEAR had prepared generic pandemic preparedness plans. By the end of 2008 their plans had been tested in multi-sector tabletop exercises, and rapid response teams had been trained. The pandemic influenza preparedness and response plans were activated during the 2009 H1N1 pandemic. Although these plans were geared towards an H5N1 scenario with anticipation of high mortality, the Member States found them extremely useful in responding to the pandemic. The pandemic also offered an opportunity for Member States and WHO SEARO to assess real-time response to obligations under International Health Regulations (2005).

Key Preparedness Activities

- In December 2009, WHO SEARO, in close collaboration with the Global Influenza Program, brought together the countries of Southeast Asia for a workshop on pandemic influenza preparedness and response. SEAR countries were provided with new pandemic preparedness and response guidelines and guidance documents. Revisions to the national pandemic preparedness plans were discussed, including revisions to sections related to surveillance and response, mass gatherings, logistics and supplies, and clinical management. Future steps for regional pandemic preparedness and response were identified.
- WHO SEARO collaborated with partners in the development of a training package for hospital preparedness and infection control.

Training

SEARO, in conjunction with selected Member States, hosted the following regional and inter-country trainings in FY 2010:

- A regional consultation on vaccine production was held in New Delhi, India in October 2009.
- WHO SEARO, CDC, WHO and India hosted an inter-country train-the-trainers workshop on respiratory infection control and hospital preparedness in New Delhi, India in November 2009.
- The training Regional Pandemic Influenza Preparedness and Response: Lessons Learned was held in Male, Maldives, December 2009.
- In November 2009 and September 2010, regional and country sessions dedicated to training trainers on risk assessment and risk management were conducted.
- Extended training on the use of PCR kits was held in Nepal and the Maldives.
- A regional NIC meeting took place in July 2010.

2009 H1N1 Activities, FY 2010

- WHO SEARO organized a regional meeting of vaccine manufacturers to discuss vaccine production capacity and regulatory agencies.
- WHO SEARO strengthened laboratory diagnostic capacity in the Region.
- WHO SEARO provided support for pandemic influenza vaccine deployment activities.

Special Influenza Projects and Other Notable Achievements in FY 2010

- WHO SEARO convened a regional pandemic preparedness and response meeting to document and share response and control measures that have been implemented during the 2009 H1N1 influenza pandemic in the SEAR.
- WHO SEARO provided technical assistance to Nepal to establish a NIC.
- WHO SEARO supported countries in revising pandemic preparedness and response plans based on experiences and knowledge gained during the pandemic.

Public Health Importance

- Pandemic vaccine provided to nine SEAR countries was used to protect the health of pregnant women, health care workers and other high risk groups.
- Regional training in PCR testing procedures for the diagnosis of influenza strengthened regional laboratory capacity to diagnose other viral illnesses.

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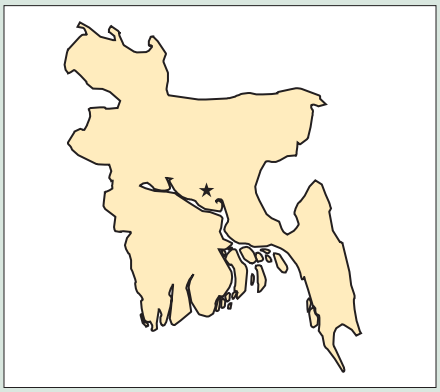
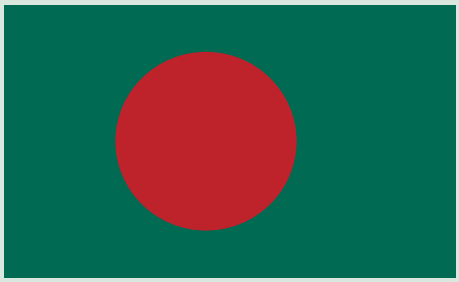
Bangladesh





- **Capital:** Dhaka
- **Area:** 143,998 sq km
- **Population:** 158,570,535 (July 2011 est.)
- **Age Structure:** 0-14 years: 34.3% (male 27,551,594/female 26,776,647); 15-64 years: 61.1% (male 45,956,431/female 50,891,519); 65 years and over: 4.7% (male 3,616,225/female 3,778,119) (2011 est.)
- **Life Expectancy at Birth:** Total population: 69.75 years; male: 67.93 years; female: 71.65 years (2011 est.)
- **Infant Mortality Rate:** Total: 50.73 deaths/1,000 live births; male: 53.23 deaths/1,000 live births; female: 48.13 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 47.9%; male: 54%; female: 41.4% (2001 Census)
- **GDP:** $259.3 billion (2010 est.)
- **GDP per Capita:** $1,700 (2010 est.)

U.S. CDC Direct Country Support

The Institute of Epidemiology, Disease Control, and Research (IEDCR), a part of the Ministry of Health and Family Welfare of the Government of Bangladesh, is in their fifth year of a cooperative agreement that began in 2006. IEDCR is the nation's focal point for conducting disease surveillance and outbreak investigations. Their CDC-funded influenza project concentrates on strengthening disease surveillance, laboratory capacity and pandemic response. IEDCR works closely with the International Centre for Diarrheal Disease Research, Bangladesh (ICDDR,B), which also receives CDC funding to characterize the epidemiology of seasonal influenza and to help identify clusters of SARI and pneumonia that may be of international concern. The two agencies collaborate on surveillance, training and research. Bangladesh has made substantial progress in the field of respiratory illness since the start of the cooperative agreement and collaboration with ICDDR,B and CDC.

Avian influenza outbreaks and the spread of pandemic influenza are of great concern for a country like Bangladesh because of the high population density and frequent interaction between humans and poultry. Bangladesh is a country with over 180 million poultry, 50% of which are raised in backyards. Collaborations on human and animal health also include the Bangladesh Department of Livestock Services (DLS), FAO, WHO and USAID.

Surveillance

CDC funding enabled IEDCR and ICDDR,B to establish Bangladesh's first influenza sentinel sites. Together they have been conducting hospital-based influenza surveillance in 12 tertiary hospitals across the country. Four of these hospitals expanded surveillance in 2008. These data have allowed Bangladesh to estimate its influenza disease and economic burden. In FY 2010, IEDCR expanded their government surveillance system by establishing 14 new national influenza surveillance sites at district hospitals,

raising the total national surveillance sites to 26. The current surveillance identifies cases of SARI, ILI, and severe pneumonia. In addition, an event-based component of the surveillance system identifies clusters of severe disease, and all patients are screened for exposure to sick or dead poultry and tested for H5N1. The system effectively shares staff, resources and data between ICDDR,B and IEDCR, with increasing ownership over time by public health authorities in Bangladesh. This strategy is anticipated to allow for sustainable influenza surveillance by IEDCR, with expanded investigations into disease transmission, burden, and cost-effectiveness of respiratory disease interventions in collaboration with ICDDR,B.

Bangladesh continues to experience outbreaks of highly pathogenic avian influenza (H5N1). DLS, IEDCR, and ICDDR,B conduct surveillance for avian influenza in domestic poultry in Bangladesh. ICDDR,B performs monthly live bird market surveillance at 11 sites and will soon add a twelfth. Also, ICDDR,B performs active surveillance in 32 villages around the country. In addition to surveillance activities, DLS, IEDCR, and ICDDR,B participate in joint avian influenza outbreak investigations.

Key Surveillance Activities

- IEDCR is expanding their web-based disease surveillance reporting, which collects information from 64 districts and over 450 upazila (sub-districts). With this expansion, facilities all over the country will build capacity to submit reports of ILI and SARI electronically.
- Specimens are now collected and tested for influenza virus from 14 new surveillance sites.
- During FY 2010, over 5,000 specimens obtained through surveillance activities were tested for influenza A virus. Influenza A virus subtypes H1N1, H3N2 and 2009 H1N1 as well as influenza B viruses were circulating throughout Bangladesh during that period. There were two separate peaks of influenza activity, one in September 2009 due to the circulation of pandemic 2009 H1N1, and one in July 2010 during the regular influenza season that occurs annually from May through October.
- Data generated by the surveillance system and its associated burden of disease and economic burden studies have allowed the Government of Bangladesh to develop national treatment guidelines for groups at high risk of complications from influenza. These data have also guided pandemic preparedness efforts and informed seasonal influenza prevention strategies.
- Influenza surveillance results are publically reported with monthly updates on the IEDCR website.
- IEDCR and ICDDR,B continue to send detailed surveillance reports to CDC and WHO on a weekly basis during the influenza season.
- Approximately 200 poultry samples tested positive for influenza A virus, of which one fourth were positive for H5 by real-time RT-PCR in the BSL-2 animal virology laboratory at ICDDR,B. The poultry-related work of the DLS and the health sectors in IEDCR has improved communication between the groups and has resulted in routine surveillance among persons who are involved in culling poultry infected with H5N1.

Laboratory

In 2007, IEDCR was nominated as a NIC by the WHO and has contributed specimens to the GISN. An upgrade of IEDCR's BSL-2 laboratory was completed in 2010. State-of-the-art equipment was purchased and the new BSL-2 laboratory is performing real-time and conventional PCR to identify seasonal, pandemic 2009 H1N1, and H5N1 influenza viruses.

Key Laboratory Activities

- With funding from World Bank, IEDCR has installed a prefabricated BSL-3 laboratory, which should be operational in 2011. The BSL-3 facility will enable IEDCR to isolate viruses.
- The BSL-3+ laboratory at ICDDR,B was accredited in July 2010. A new BSL-2 animal laboratory initiated poultry sample testing in November 2009, allowing them to identify outbreaks of avian influenza.
- In 2009, the upgraded IEDCR lab began to test influenza samples. Previously, all influenza samples were tested in the ICDDR,B lab.
- IEDCR and ICDDR,B send subsets of samples, including unsubtypables, to a WHO CC for further characterization.

Preparedness

IEDCR, with key partners, has periodically updated their pandemic response and avian influenza plan with lessons learned from the pandemic.

Key Preparedness Activities

- Standard operating procedures to roll out non-pharmaceutical interventions, triage, and alternate care facilities during a pandemic were updated to reflect lessons learned during the 2009 H1N1 pandemic.
- An emergency operations center (EOC) was recently built and equipped to help centralize a government response during major outbreaks and pandemics.

Training

- During the pandemic, IEDCR routinely trained public health officials and clinical providers from the district and sub-district levels on management of patients with suspected pandemic influenza using evidence-based recommendations generated from collaborative IEDCR, ICDDR,B, and CDC research.
- The Bangladesh Ministry of Environment and Forests, FAO, ICDDR,B, EcoHealth Alliance, and other partners participated in a workshop and training on wild bird capture and sampling for avian influenza.
- ICDDR,B evaluated interventions and trainings by Cooperative for Assistance and Relief Everywhere (CARE) and Stamping out Pandemic and Avian Influenza (STOP AI) on promoting biosecurity and preventing avian influenza in backyard and commercial poultry farms.

2009 H1N1 Activities, FY 2010

During 2010, WHO and other international partners donated 15.5 million doses of monovalent 2009 H1N1 vaccine to Bangladesh in an effort to protect those at highest risk of complications from influenza illness. While the Government of Bangladesh vaccinated the high risk groups, IEDCR, ICDDR,B, and CDC scientists estimated the effectiveness of the vaccine among health care workers.

Key 2009 H1N1 Activities, 2010

- IEDCR and ICDDR,B monitored viral circulation and provided weekly reports to key domestic and international partners.
- Bangladesh supported a 2009 H1N1 vaccination campaign and performed vaccine effectiveness and cost-effectiveness evaluations.
- Bangladesh performed antiviral (oseltamivir) effectiveness studies.

- Messages developed from ICDDR,B's research on respiratory hygiene helped inform the Government of Bangladesh's response to the pandemic.

Special Influenza Projects

- IEDCR, ICDDR,B, and CDC estimated the disease and economic burden of influenza in Bangladesh, generated influenza mortality rates, and piloted scalable non-pharmaceutical interventions to control influenza.
- IEDCR continues to demonstrate its leadership within the Government of Bangladesh to guide the country through the 2009 H1N1 pandemic response.

Other Notable Achievements in FY 2010

IEDCR implemented a system to collect and investigate daily news reports about suspected outbreaks. An early version of this event-based surveillance system can be credited with the early detection of pandemic influenza weeks before the virus was circulating in the general population.

Public Health Importance

- Bangladesh strengthened its communicable disease surveillance system and reporting to increase the timeliness of outbreak response and compliance with International Health Regulations, 2005.
- IEDCR strengthened the laboratory testing capacities at the NIC.
- IEDCR and ICDDR,B estimated disease and economic burden for respiratory viruses, which is anticipated to facilitate priority setting and funding allocation to programs intended to decrease the respiratory disease burden in Bangladesh.

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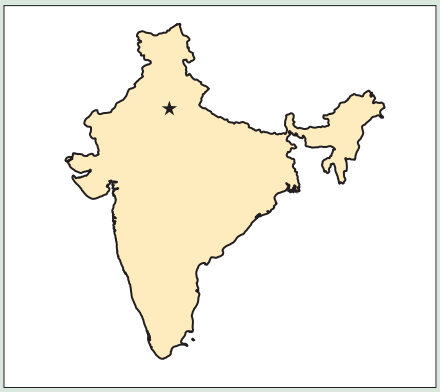
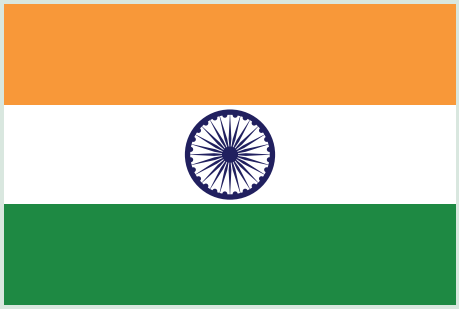
Men traveling to market. Faridpur district, Bangladesh.

India





- **Capital:** New Delhi
- **Area:** 3,287,263 sq km
- **Population:** 1,189,172,906 (July 2011 est.)
- **Age Structure:** 0-14 years: 29.7% (male 187,450,635/female 165,415,758); 15-64 years: 64.9% (male 398,757,331/female 372,719,379); 65 years and over: 5.5% (male 30,831,190/female 33,998,613) (2011 est.)
- **Life Expectancy at Birth:** Total population: 66.8 years; male: 65.77 years; female: 67.95 years (2011 est.)
- **Infant Mortality Rate:** Total: 47.57 deaths/1,000 live births; male: 46.18 deaths/1,000 live births; female: 49.14 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** definition: Total population: 61%; male: 73.4%; female: 47.8% (2001 census)
- **GDP:** $4.046 trillion (2010 est.)
- **GDP per Capita:** $3,400 (2010 est.)

U.S. CDC Direct Country Support

India received their first five-year influenza cooperative agreement in September 2004. In 2009, they received a second award, a five-year sustainability cooperative agreement *Developing Sustainable Influenza Surveillance Networks and Response to Avian and Pandemic Influenza*. India provides a unique setting in which to study influenza transmission and prevalence among various populations because of the socioeconomic, ethnic, and geographic diverse population. The U.S. CDC, in coordination with other U.S. government agencies, supports international response measures for avian and pandemic influenza in India through multiple implementing partners.

India's NIC, located at the National Institute of Virology (NIV), Pune, is part of Indian Council of Medical Research (ICMR), Department of Health Research within the Ministry of Health and Family Affairs (MOHFW). The bilateral agreement between the India NIC and CDC has been ongoing since 2004, and has provided resources for a greatly expanded surveillance system, including surveillance for H5N1 and 2009 H1N1.

Surveillance

ICMR conducts epidemiologic and virologic influenza surveillance in different geographic areas of India by collaborating with ten regional centers. They regularly send viral isolates for antigenic characterization to a WHO CC. Surveillance for seasonal and pandemic influenza allows for the identification of circulating strains, unusual epidemiological trends, and seasonality of influenza in different geographic settings. Since the CDC-ICMR influenza network began in 2004, more than 22,849 specimens have been collected from surveillance sites and almost 600 isolates have been well-characterized.

Key Surveillance Activities

- The influenza network has collected 4,652 respiratory specimens; 580 were influenza positive by real-time PCR. Of these, greater than 100 representative isolates have been characterized, and 54 isolates have been sent to CDC Influenza Division for further antigenic analysis.
- India is analyzing influenza surveillance data in combination with climate, geography, and demographic data to explore trends of influenza seasonality.
- ICMR task force members, together with CDC team members, led an independent review of surveillance network laboratories at Kochi, India, in February, 2010. Written recommendations developed during the review were provided to the principal investigator, followed by an internal network review in mid April at NIV, Pune to implement the recommendations made by the review committee. The recommendations have further strengthened the network operations, including expansion of SARI surveillance sites.
- Dr. M. Chadha, NIV, Pune participated in the WHO Informal Consultation for Improving Influenza Vaccine Virus Selection during June 14-16, 2010 in Geneva, Switzerland.
- Dr. Varsha Potdar, NIV, Pune, participated in a regional workshop on monitoring drug resistance of influenza viruses in August 2010 in Bangkok, Thailand.

Laboratory

The India NIC has worked closely with CDC to establish state-of-the art laboratories. NIC laboratorians have trained extensively with CDC-Atlanta scientists on typing, subtyping, PCR, real-time PCR, and reverse genetics techniques. Notable progress in laboratory surveillance capacity has been achieved over the past five years, and the success of this partnership has led to significant enhancements benefiting both India and the GISN. The Indian influenza surveillance network now includes ten laboratories throughout India.

Staff from CDC, National Institute of Virology, and the King Edwards Memorial Hospital's Vadu Rural Health Program, outside Vadu Hospital near Pune, India. Left to right: Avinash Deoshatwar (NIV), Dipanjan Roy (CDC India), Fatimah Dawood (CDC Atlanta), Pallavi Marathe (Vadu Rural Health Program), Katie Lafond (CDC Atlanta), Karen Siener (CDC Atlanta).

Key Laboratory Activities

- The India NIC provides training and quality control for Indian network members as well as other influenza surveillance laboratories in the Southeast Asia region.
- The CDC Influenza Reagent Resource program provided standard reagents such as HA/HI reagents, and PCR reagents to influenza network laboratories in India.

Preparedness

Many of the preparedness activities related to increased awareness and response to minimize the risk of spread of human infections and disease were carried out with MOHFW and WHO partners prior to 2009. These efforts contributed to India's ability to respond to the 2009 H1N1 pandemic.

Key Preparedness Activities

- CDC provided technical guidance for the development and implementation of training modules for infection control in health care facilities jointly developed by the Indian MOHFW, CDC, and WHO.
- NIV, Pune conducted pandemic influenza awareness programs for physicians.

Training

Indian MOHFW hosted the following training activities in 2010:

- November 4-8, 2009, Respiratory Infection Prevention and Control in Healthcare Facilities was held in New Delhi, India. The training included case management guidelines for avian and pandemic influenza and training in appropriate use of PPE for health care workers.
- April 19-21, 2010, the NIC at NIV conducted a BSL-3 training at Pashan, NIV, Pune.

2009 H1N1 Activities, FY 2010

The ICMR network expanded influenza surveillance to include pandemic 2009 H1N1 surveillance in four centers. The objectives of the surveillance include characterizing influenza virus circulation, providing isolates for vaccine strain selection, and monitoring antiviral drug sensitivity.

Key 2009 H1N1 Activities, 2010

- The NIC at NIV led periodic in-country refresher trainings on pandemic response activities.
- The NIC at NIV conducted full-length sequencing and phylogenetic analysis of Indian 2009 H1N1 isolates and identified that the majority of isolates belonged to the Clade 7 cluster.
- The NIC confirmed that 2009 H1N1 isolates were susceptible to oseltamivir.

Special Influenza Projects

- Influenza projects in FY 2010 included development of broad activities encompassing the epidemiologic, basic and applied research aspects of seasonal and pandemic influenza with multiple partners in India. The ongoing research programs include:
- Evaluation of direct and indirect protection provided by influenza vaccine given to children in India.
- Assessment of population-based incidence of influenza disease burden in rural communities of India.

- Research programs to assess host-viral interacting proteins at the molecular level to better understand the pathogenesis of influenza in different host species.

Other Notable Achievements in FY 2010

- Team members gave more than 24 presentations at three major international conferences.
- Team members received two prestigious International Research Scholarship Awards given by the Options for Control of Influenza VII, Hong Kong, and the Program for Appropriate Technology in Health.
- The influenza network identified greater than 12% influenza positivity in 2010, and demonstrated that novel influenza and influenza type B co-circulated during the rainy and winter seasons in India.
- India conducted an extensive analysis of seasonal influenza surveillance data and documented that influenza seasonality varies according to geographic location and that the peak of influenza activity usually coincides with the rainy season. This observation has implications for the implementation of influenza vaccination programs in India where Northern Hemisphere vaccine is currently imported and given prior to winter season.
- Genetic analysis of HA sequences from influenza type A pandemic H1 (n=11), H3 (n=3), and type B (n= 37) demonstrated that all circulating strains in India clustered with corresponding vaccine strains during 2010.
- Phylogenetic analysis of all eight gene segments of 23 2009 H1N1 identified that Indian isolates belong to clade 7, with great than 99% identity at the amino acid level.
- Active weekly surveillance allowed the program to estimate the incidence rate of 2009 H1N1 to be at least six times higher during the peak pandemic phase (175 cases per 1,000 person-years from Oct 2009–Jan 2010), when compared to seasonal influenza viruses (60 cases per 1,000 person-years).

Participants from the regional workshop on Respiratory Infection Prevention and Control in Healthcare Facilities, New Delhi, November 2009.

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Public Health Importance

CDC activities have focused on supporting pandemic influenza preparedness programs and helping advance the field of influenza research (seasonal avian and pandemic) in India. Outcomes of these collaborative efforts include:

- Quick and timely response to 2009 H1N1; active surveillance allowed for estimation of pandemic influenza incidence rates.
- Presence of strategies related to influenza containment in health care settings after receiving training on respiratory infection control.
- Existence of well-trained, deployable rapid response teams in India.
- Timely availability of seasonal influenza isolates for vaccine strain selection and genetic analysis has revealed that all circulating strains are closely related to the selected global vaccine strains.
- A H5N1 vaccine candidate was created and submitted to the GISN.
- Also, the diagnostic team received the Public Health Impact Award from the National Center for Immunization and Respiratory Diseases, CDC, for work that provided global impact from distribution and on-site testing for 2009 H1N1 (Aug 2010).

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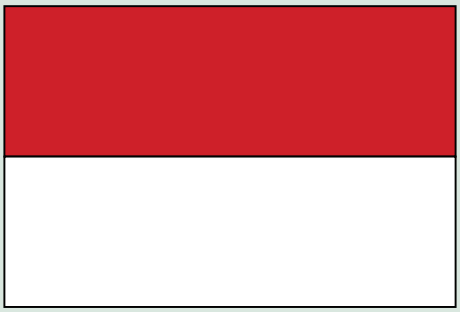
Indonesia



- **Capital:** Jakarta
- **Area:** 1,904,569 sq km
- **Population:** 245,613,043 (July 2011 est.)
- **Age Structure:** 0-14 years: 27.3% (male 34,165,213/female 32,978,841); 15-64 years: 66.5% (male 82,104,636/female 81,263,055); 65 years and over: 6.1% (male 6,654,695/female 8,446,603) (2011 est.)
- **Life Expectancy at Birth:** Total population: 71.33 years; male: 68.8 years; female: 73.99 years (2011 est.)
- **Infant Mortality Rate:** Total: 27.95 deaths/1,000 live births; male: 32.63 deaths/1,000 live births; female: 23.03 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 90.4%; male: 94%; female: 86.8% (2004 est.)
- **GDP:** $1.033 trillion (2010 est.)
- **GDP per Capita:** $4,300 (2010 est.)

U.S. CDC Direct Country Support

The Republic of Indonesia is the world's fourth most populous country. The country is spread over 5,300 km of longitude with over 17,000 islands, 6,000 of which are inhabited. Surveillance for influenza occurs within the MOH.

There are two cooperative agreements between the Indonesian MOH and U.S. CDC. The cooperative agreement *Developing Influenza Surveillance Networks* with the Center for Biomedical and Basic Technology of Health (CBBTH), National Institute of Health Research and Development (NIHRD) began in September 2004 and is in its second year of a sustainability cooperative agreement. The cooperative agreement with the Directorate General of Disease Control and Environmental Health (DG DC&EH) began in September 2006 and is in its fifth and final year. The goal of both agreements is to establish a comprehensive epidemiologic and virologic surveillance system for influenza that can identify and respond to seasonal and avian influenza in a timely manner. Key partners include CDC, WHO and USAID.

Surveillance

In FY 2010, NIHRD oversaw ILI surveillance in a representative network of 20 primary care facilities across Indonesia. Between January and October 2010, 2,770 ILI specimens were collected from 20 sites; 20% were positive for influenza.

Key Surveillance Activities

- In 2010, NIHRD began to regularly upload data on WHO FluNet.
- DG DC&EH expanded the country's Early Warning and Response System (EWARS) for 22 priority diseases including ILI, pneumonia, and avian influenza to three provinces: North Sulawesi, West Kalimantan, and South Kalimantan. In 2011, EWARS, with funding from CDC, MOH and other donors, will be expanded to additional provinces.

Laboratory

The Center for Biomedical and Basic Technology of Health in NIHRD was designated a WHO NIC in 1975. A newly constructed laboratory with an entire floor dedicated to influenza and a BSL-3 facility has recently been certified. Currently, NIHRD performs molecular analysis and real-time and conventional RT PCR and sequencing. NIHRD also provides laboratory testing and support to DG DC&EH for avian influenza surveillance activities.

Key Laboratory Activities

- In 2010, NIHRD, in collaboration with USAID Deliver and CDC, conducted a laboratory logistics assessment. With this information USAID designed a laboratory logistics management system and prepared a laboratory logistics standard operating procedure (SOP). SOP trainings and socialization were then conducted in four regional laboratories. The project will be rolled out in other sentinel sites and laboratories at the end of 2010.
- A network of four regional laboratories performs ILI real-time PCR testing.
- NIHRD participated in a CDC lab assessment where a number of recommendations were made.

Preparedness

After the 2009 H1N1 pandemic, the national influenza pandemic preparedness plan was reviewed and updated. Given the wide scale H5N1 epizoonotic in Indonesia and the continued occurrence of H5N1 infection in humans, epicenter containment and pandemic preparedness are a high priority. The MOH continued to train private and public health doctors in diagnosing and treating avian influenza infection in Sumatra. MOH, veterinary and livestock services and the Health Promotion Centre are working together to develop written guidance related to managing suspected avian influenza cases.

Training

Using CDC funds, the MOH conducted several training activities in 2010:

- EWARS surveillance training was held in North Sumatra, West Kalimantan and South Kalimantan.
- Laboratory logistics training was held in DKI Jakarta, South Sulawesi, Bali, and Central Java.
- Influenza BSL-2 and BSL-3 safety training for personnel working with human influenza viruses was conducted by CDC.
- DG DC&EH conducted trainings in several provinces on avian influenza case definition and detection for doctors in health centers and private practices.
- NIHRD is hosting a national meeting with international partners in early 2011 to develop a strategic plan for surveillance activities of the NIC.

2009 H1N1 Activities, FY 2010

- NIHRD monitored the pandemic 2009 H1N1 ILI network.
- DG DC&EH conducted trainings which provided pandemic response guidance and treatment recommendations.

Special Influenza Projects

An enhanced surveillance project for avian and seasonal influenza in East Jakarta is being planned. The project will be managed by the zoonosis sub-directorate in collaboration with the Ministry of Agriculture, WHO, FAO, and CDC-Atlanta. The project focuses on the human and animal interface and identifying sources of H5N1 infection. Human disease surveillance will be conducted in four primary care facilities and six hospitals and the MOH will conduct enhanced surveillance among poultry throughout the market chain.

Public Health Importance

- Since the inter-sectoral local government team in Bali was trained in pandemic influenza outbreaks and response, collaboration has improved between the health sector and other sectors. This is seen in their response to other outbreaks, such as suspected rabies.
- The port health offices and referral hospitals have learned from the influenza pandemic response experience and are now better able to quickly put a screening system in place at the port.

Birds sold as pets at the Pasar Burung Jatinegara Market. Jakarta, Indonesia.

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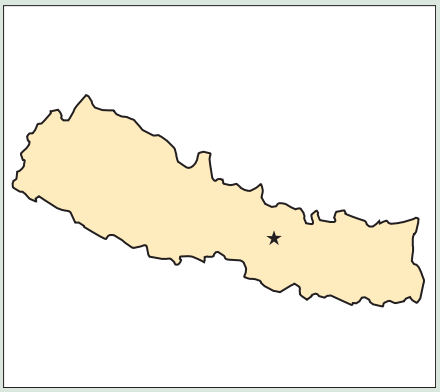
Nepal



- **Capital:** Kathmandu
- **Area:** 147,181 sq km
- **Population:** 29,391,883 (July 2011 est.)
- **Age Structure:** 0-14 years: 34.6% (male 5,177,264/female 4,983,864); 15-64 years: 61.1% (male 8,607,338/female 9,344,537); 65 years and over: 4.4% (male 597,628/female 681,252) (2011 est.)
- **Life Expectancy at Birth:** Total population: 66.16 years; male: 64.94 years; female: 67.44 years (2011 est.)
- **Infant Mortality Rate:** Total: 44.54 deaths/1,000 live births; male: 44.54 deaths/1,000 live births; female: 44.55 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 48.6%; male: 62.7%; female: 34.9% (2001 census)
- **GDP:** $35.31 billion (2010 est.)
- **GDP per Capita:** $1,200 (2010 est.)

U.S. CDC Direct Country Support

Nepal is a mountainous country where transportation is a challenge. Most of the population lives in rural areas and many are dependent on poultry and animal farming. Nepal's Patan Academy of Health Sciences (PAHS), a public health science university at Patan Hospital, was awarded their first influenza cooperative agreement in September 2009. Key goals of the Influenza Pandemic Preparedness and Response Project (IPPRP) include supporting Nepal's Ministry of Health and Population (MOHP) in establishing routine influenza virologic and epidemiologic surveillance in three sentinel hospitals, characterizing circulating influenza viruses, understanding the pattern of respiratory illness in the country, and supporting the MOHP in outbreak management. Although Nepal has experienced H5N1 avian outbreaks, no human cases have been detected to date.

The grantee works closely with the National Public Health Laboratory (NPHL), MOHP, Walter Reed Research Unit Nepal (WARUN), WHO, and USAID, all of which are based in Katmandu Valley, Nepal.

Surveillance

With CDC funds PAHS established their first influenza sentinel site at Patan Hospital in January 2010. A new collaboration between PAHS, NPHL, and WARUN will establish a network of 10 sentinel sites around the country. PAHS will be responsible for collecting epidemiologic data and specimens from three sites, NPHL will be responsible for collecting from five new sites, and WARUN will be responsible for collecting from their two existing sites. PAHS, NPHL, and WARUN are working closely with MOPH's Epidemiology and Disease Control Division to design the new surveillance system. Surveillance forms and protocols have been developed with technical assistance from the CDC and are currently being tested.

Key Surveillance Activities

- Patan Hospital started SARI surveillance in 2010 and collects specimens and key information from all hospitalized SARI cases. ILI epidemiologic data has been collected since January 2010 and ILI specimen collection started in January 2011.
- Plans are in place to start similar influenza surveillance in early 2011 in Western Nepal at Nepalgunj Medical College Hospital and in eastern Nepal at BP Koirala Institute of Health Sciences (BPKIHS).
- For ILI cases, PAHS and NPHL are setting up a system to collect and report to the MOPH the total number of outpatients seen, the proportion of ILI by age and gender and the number and percent of cases testing positive. For SARI cases, PAHS and NPHL will collect and report information that includes the number of cases by age and gender, the total number of hospital inpatients, the proportion of SARI cases and the number of deaths due to SARI.

Laboratory

NPHL became a WHO NIC in 2010. The World Bank provided funds to expand the NPHL laboratory to include additional BSL-2 laboratory space and equipment, with some specifically for influenza. The laboratory maintains conventional and real-time RT-PCR machines. In their new virology laboratory, NPHL plans to start culturing cells and isolating viruses.

Key Laboratory Activities

- PAHS hired a virologist and is using CDC funds to purchase equipment needed for their new molecular laboratory, including their first real-time and conventional PCR machines. They plan to start testing SARI and ILI specimen samples in early to mid 2011. Until then Patan Hospital will send all samples to NPHL.
- NPHL participated in the CDC/APHL Influenza Laboratory Capacity Review in which CDC provided technical assistance and provided recommendations on the new laboratory layouts at NPHL and Patan Hospital.
- To date, testing has been limited to 2009 H1N1. With assistance from CDC, NPHL and the Patan laboratory will be able to start testing for influenza A H1, H3, H5 and B in 2011.
- NPHL has tested 31 SARI samples from Patan Hospital; five samples were positive for 2009 H1N1.

Preparedness

In 2006 Nepal prepared and endorsed a joint national health and agriculture avian and pandemic influenza preparedness and response plan. That same year Nepal wrote an operational plan for 2007-2011, detailing separate implementation plans for human and animal health. The country plans to update the national plan in 2011 with lessons learned from managing the 2009 H1N1 pandemic.

Key Preparedness Activities

- PAHS is a member of the National Risk Communication Technical Committee.
- PAHS is participating in risk communication activities along with the MOHP.
- PAHS conducted the CDC Influenza Division Core Capabilities for Pandemic Influenza review and plans to look closely at the areas in which they are strongest and weakest.

View of the Himalayas. Nepal.

Training

Nepal hosted the following training activities in FY 2010:

- With NPHL and WARUN, PAHS held an orientation meeting for clinicians and laboratory personnel from all ten sentinel sites.
- In January 2011, NPHL and Patan staff visited sentinel sites to review influenza protocol for collecting and sending data and specimens.

2009 H1N1 Activities, FY 2010

Influenza testing was set up during the 2009 H1N1 pandemic in October 2009. The NPHL NIC was the only laboratory in Nepal capable of testing for 2009 H1N1.

Key 2009 H1N1 Activities, 2010

- Patan Hospital established an isolation room in its ICU for suspected SARI cases.
- Patan Hospital, under the leadership of its director, formed a committee to provide technical and managerial support for ongoing surveillance activities in the hospital.

Other Notable Achievements in FY 2010

- Government and nongovernment partners held a three-day event to review ongoing health risk communication activities and strategies. PAHS is collaborating with the Department of Health Services to design, produce and distribute messages and materials to educate the public and health care workers about influenza prevention and response.
- The MOHP formed a high level committee, led by the Secretary of Health, which meets every six months to review the progress of PAHS's influenza project and to provide guidance and support.

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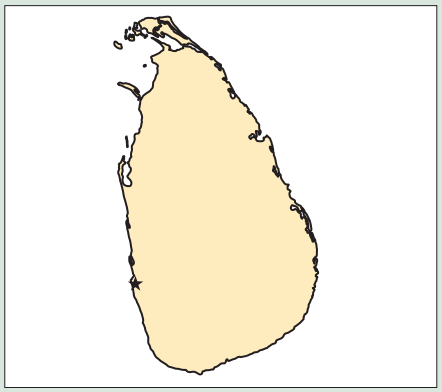
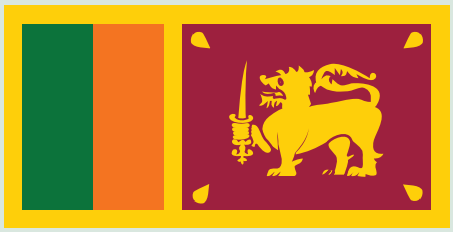
Sri Lanka





- **Capital:** Colombo
- **Area:** 65,610 sq km
- **Population:** 21,283,913 (July 2011 est.)
- **Age Structure:** 0-14 years: 24.9% (male 2,705,953/female 2,599,717); 15-64 years: 67.2% (male 6,993,668/female 7,313,440); 65 years and over: 7.9% (male 720,219/female 950,916) (2011 est.)
- **Life Expectancy at Birth:** total population: 75.73 years; male: 72.21 years; female: 79.38 years (2011 est.)
- **Infant Mortality Rate:** total: 9.7 deaths/1,000 live births; male: 10.68 deaths/1,000 live births; female: 8.68 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** total population: 90.7%; male: 92.3%; female: 89.1% (2001 census)
- **GDP:** $104.7 billion (2010 est.)
- **GDP per Capita:** $4,900 (2010 est.)

U.S. CDC Direct Country Support

Sri Lanka is a developing nation with a sound public and curative health infrastructure. The Epidemiology Unit of the MOH, which is the government agency responsible for communicable disease surveillance, control and prevention, was awarded their first cooperative agreement in September 2009. The agreement is currently in its second year. The program's goal is to build the country's capacity to detect and respond to pandemic threats by building routine influenza surveillance, laboratory, planning and communications capacities.

Key collaborating partners include the Medical Research Institute (MRI), the national laboratory which serves as the country's NIC, the Health Education and Promotion Bureau and the Department of Animal Production and Health.

Surveillance

Human and animal influenza surveillance in Sri Lanka began in 2005 as part of their avian influenza preparedness program. With World Bank funding, the MOH established 20 sentinel hospitals, each of which set up ILI surveillance. CDC funds are now used to help maintain the ILI surveillance and carry out SARI surveillance in three of the 20 sentinel sites.

Key Surveillance Activities

- Three sentinel hospitals began targeted SARI surveillance in 2010.
- In order to strengthen the surveillance program, the Epidemiology Unit provided all ILI surveillance sites with infrared digital thermometers and cold carriers to transport specimens.

- The Epidemiology Unit directly supervised ILI surveillance at selected sentinel hospitals through review visits.
- Sri Lanka regularly enters virological data on WHO FluNet.

Laboratory

MRI was designated a WHO NIC in 1968. MRI also functions as the main national diagnostic laboratory in the MOH. The NIC has capacity to conduct real-time RT-PCR and viral isolation. Two laboratories, one in central and one in south Sri Lanka, will be trained to perform influenza testing in 2011. Due to limited resources they will perform immunofluorscence.

Key Laboratory Activities

- NIC processed 1,372 ILI samples and 2,322 SARI samples in 2010 and handled a very high workload during both waves of the pandemic.
- MRI characterizes the influenza type and subtype of seasonal/circulating influenza viruses as well as influenza A (H5) using real-time RT-PCR and conventional PCR.
- The NIC submits seasonal influenza samples to WHO CCs twice a year and fulfills NIC requirements as outlined by the WHO.
- The NIC participated in a CDC/APHL Laboratory Review. The lab is in the process of using CDC funds to purchase equipment and supplies recommended by CDC and APHL in the review.

Preparedness

The *National Influenza Preparedness Plan (NIPP)* was drafted in 2005 and revised once in 2006. Updates for the Plan are underway, following the two waves of the pandemic; the updated version will include a business continuity plan.

Key Preparedness Activities

- Epidemiologists at central and regional levels held regular capacity-building sessions.
- An operational cell that handles activities related to influenza preparedness began its work at the Epidemiology Unit with programme assistants, data entry operators and IT professionals.
- The grantee began to develop a web-based data linking system between the Epidemiology Unit and NIC.
- The National Technical Committee on Influenza Preparedness held monthly meetings to plan the country response to the second wave of the pandemic.

Training

The Epidemiology Unit hosted the following training activities in 2010:

- Health care workers in sentinel hospitals were trained in pandemic preparedness and the NIPP.
- Infection control nursing officers who are responsible for ILI and SARI surveillance at sentinel hospitals were trained in laboratory and epidemiological components of ILI and SARI surveillance.
- Regional epidemiologists attended trainings on field epidemiology, including influenza surveillance and pandemic preparedness.

- Hospital administrators and senior medical officers in outpatient departments from all sentinel hospitals attended training sessions on the importance of ILI surveillance and pandemic preparedness.
- In 2011, the Epidemiology Unit plans to train regional rapid response teams in outbreak investigations and pandemic response.

2009 H1N1 Activities, FY 2010

The first wave of the pandemic waned by February. Sri Lanka had reported a total of 642 confirmed cases and 48 deaths. The second wave appeared in late September. By the end of 2010, an additional 458 confirmed cases and 24 deaths had been reported. All response activities were coordinated by the Epidemiology Unit.

Key 2009 H1N1 Activities, 2010

- The Epidemiology Unit revised management guidelines, updated hospital staff and supplied urgent consumables to health care institutions.
- The NIC was responsible for testing all samples that arrived from throughout the country during the pandemic periods.
- During the second wave of the pandemic, the Health Education Bureau educated the public using materials developed for the first wave.

Other Notable Achievements in FY 2010

- The Epidemiology Unit and NIC together revived the routine ILI surveillance activities in the sentinel hospitals after they had collapsed during the first wave of the pandemic.
- Routine ILI surveillance in one of the hospitals detected the second wave of the pandemic in the last week of September.
- Three ILI sentinel surveillance hospitals formally began SARI surveillance activities.

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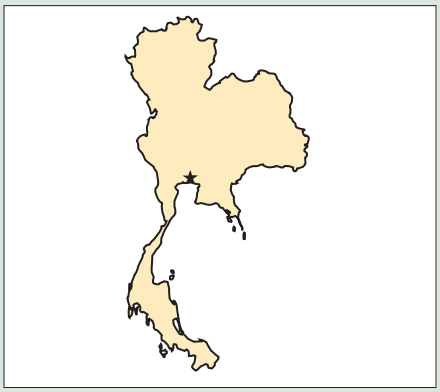
Save As...

Thailand



- **Capital:** Bangkok
- **Area:** .513,120 sq km
- **Population:** 66,720,153 (July 2011 est.)
- **Age Structure:** 0-14 years: 19.9% (male 6,779,723/female 6,466,625); 15-64 years: 70.9% (male 23,410,091/female 23,913,499); 65 years and over: 9.2% (male 2,778,012/female 3,372,203) (2011 est.)
- **Life Expectancy at Birth:** Total population: 73.6 years; male: 71.24 years; female: 76.08 years (2011 est.)
- **Infant Mortality Rate:** Total: 16.39 deaths/1,000 live births; male: 17.38 deaths/1,000 live births; female: 15.35 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 92.6%; male: 94.9%; female: 90.5% (2000 census)
- **GDP:** $580.3 billion (2010 est.)
- **GDP per Capita:** $8,700 (2010 est.)

U.S. CDC Direct Country Support

The Thai National Institute of Health (NIH) in the Department of Medical Sciences at the Ministry of Public Health (MOPH) was awarded their first five-year influenza cooperative agreement in 2004. In September 2009, they received a second award, a five-year sustainability cooperative agreement *Strengthening Thailand's Influenza Surveillance Network to Support Influenza Control Policy and Improve Pandemic Preparedness*. The program's goal is to establish a sustainable influenza surveillance system that can detect and identify circulating influenza viruses and effectively respond to outbreaks.

NIH works closely with the Department of Disease Control, Bureau of Epidemiology (BOE) and Bureau of Emerging Infectious Diseases in the MOPH. U.S. CDC supports a wide range of influenza activities in Thailand including sentinel and population-based surveillance, training and applied research.

Surveillance

There were four ILI sentinel sites prior to the CDC cooperative agreement. Since the CDC grant began in 2004, NIH expanded the number of sites to 11, three of which now also conduct surveillance for SARI in hospitalized patients. More recently, the BOE established an additional 13 sites, expanding the surveillance system to 24 sites throughout the country's five regions and the Bangkok Metropolitan area.

Key Surveillance Activities

- The 11 sentinel NIH sites tested 3,095 ILI specimens; 704 (23%) were positive for influenza viruses and 63% of those were positive for 2009 H1N1.

Save As...

- NIH hosted an annual project meeting on sentinel hospital influenza surveillance to review and improve the harmonized virological and epidemiological influenza surveillance systems.
- MOPH continued to support efforts to link human and animal influenza surveillance data.

Laboratory

The NIC, housed at NIH, was recognized by WHO in 1972. Thailand NIC staff is skilled at detecting influenza viruses and can process up to 50 samples per day. To improve efficiency, real-time RT-PCR is the primary means of identifying influenza viruses, and 20% of the positive samples are grown in culture and sequenced for further characterization. There is a network of 14 participating Regional Medical Science Centers, all of which can perform RT-PCR diagnostics for influenza viruses. In July 2010, the NIC became a WHO Regional Influenza Reference Laboratory for Southeast Asia.

Key Laboratory Activities

- CDC and NIH conducted a review of the influenza virus diagnostic capacity at NIH.
- NIH continued to build capacity for the network of influenza laboratories by improving university and private laboratory capacity through proficiency testing and bio-safety training.
- NIH continued to submit specimens to a WHO Collaborating Center twice a year.
- NIC developed a standard operating procedure for guidance in detecting influenza viruses by real-time RT-PCR for the 14 regional laboratories.

Preparedness

The National Strategic Plan for Avian Influenza Control and Pandemic Preparedness in Thailand, 2005-2007, was revised and is now called *The Second National Strategic Plan for Prevention and Control of Avian Influenza and Preparedness for Influenza Pandemic, 2008-2010.* Thailand is drafting a new version that will be broader and cover threats from emerging infections in general.

Key Preparedness Activities

- MOPH conducted their second national inventory of core capacities for pandemic influenza preparedness and response in September 2010. The review showed the strongest capabilities in the areas of laboratory capacity, routine influenza surveillance and in-country planning.
- Each province conducted an annual exercise of the pandemic preparedness plan.
- MOPH published *Self-Learning Guide for Business Continuity Plan for Pandemic Influenza Preparedness 2009* (Thai and English).

Panel discussion at the Sentinel Hospital Influenza Surveillance Project Meeting. Chiang Rai, Thailand.

- MOPH published *Guideline for Tabletop Exercise on Influenza Pandemic Preparedness at the Provincial Level for Exercise Organizers and Facilitators 2010* (Thai and English).

Training

Thailand hosted the following training activities in FY 2010:

- A workshop on the diagnosis, treatment and prevention of human influenza for health professionals.
- Training in cell culture techniques and viral isolation of influenza and other respiratory viruses in February 2010.
- The First Annual National Seminar on the Diagnosis and Clinical Management of Seasonal Influenza and Pandemic Influenza A (H1N1) 2009 (700 people attended).
- Three train-the-trainer sessions related to infection control (228 people attended).

2009 H1N1 Activities, FY 2010

Since the introduction of 2009 H1N1 virus into Thailand in May 2009, the MOPH has continued to aggressively track the virus. Since 2008, Thailand has made aggressive efforts to prevent influenza illness through implementation of vaccine policy.

Key 2009 H1N1 Activities, 2010

- NIH continued to test a portion of influenza viruses, including 2009 H1N1 viruses, for antiviral resistance.
- NIC/NIH and the Thai Department of Disease Control completed national guidelines (available in Thai) on molecular testing of 2009 H1N1 which were used to train medical technologists and laboratory technicians from 25 regional hospitals. Consequently, laboratories at four regional hospitals and one private laboratory received accreditation from the Thai Bureau of Laboratory Quality Standard.
- Vaccine recommendations that were expanded during the pandemic remain in effect for seasonal influenza and are subject to future review.

Special Influenza Projects

- Thailand is conducting a Phase 3 clinical trial of a locally produced live-attenuated influenza vaccine.
- CDC maintains a Global Disease Detection (GDD) program and International Emerging Infections Program (IEIP) in Thailand and has had a CDC influenza epidemiologist in Thailand since 2007. The IEIP influenza-related projects include working with the Thai BOE to conduct surveillance for influenza-pneumonia hospitalizations in two provinces; that work has enabled Thailand to estimate influenza disease burden.

Other Notable Achievements in FY 2010

- The Weekly Epidemiology Surveillance Report (WESR) combines virological and epidemiological surveillance data. ILI data and laboratory results are analyzed weekly and reported on the website, www.thainihnic.org. The network system allows for rapid reporting and easy accessibility for partners.
- Over two million doses of trivalent seasonal influenza vaccine were purchased by the government and supplied to high risk groups.

Public Health Importance

- Disease burden data has been used to help identify target groups for influenza vaccination and to estimate the potential impact of influenza vaccine in Thailand. In 2008, the MOPH

recommended seasonal influenza vaccination for persons 65 years and older with underlying medical conditions. In 2009, during the 2009 H1N1 pandemic, influenza vaccine policy in Thailand was expanded again to align the country with global recommendations for the pandemic vaccine. The changes remained in place for seasonal influenza vaccination in 2010 and are subject to future review.

- The capacity built for detection of influenza viruses has contributed to the detection of other respiratory viruses such as adenoviruses, human metapneumovirus, human parainfluenzaviuses and respiratory syncytial virus.
- Lessons learned from the 2009 H1N1 pandemic are being used to help Thailand better prepare for future disasters.
- Having an antiviral resistance monitoring system in place enables the country to determine a medication's effectiveness and to establish appropriate protocols for distribution.
- The increased laboratory capacity enables Thailand to quickly recognize and respond to emerging infectious diseases such as 2009 H1N1.

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Save As...

GDD-Thailand

The GDD (Global Disease Detection) Regional Center in Thailand (GDD-Thailand) was established in 2004, building on existing support from national and regional partners to support essential public health functions to rapidly detect and respond to Southeast Asia's emerging and reemerging infectious disease threats. These health threats range from pneumonia, including influenza and pandemic influenza threats, to hand, foot and mouth disease, tuberculosis, and zoonotic diseases. CDC has worked with the Ministry of Public Health (MOPH) and other key institutions in Thailand since 1980 to address the major public health challenges of the country, and increasingly, the region.

Coverage

GDD-Thailand is connected by field activities throughout the Southeast Asia region and is founded on a history of collaboration that dates back to 1980 when the world's first Field Epidemiology Training Program (FETP) was established. This foundation has provided some of the most innovative public health work in the world, including the first site of CDC's International Emerging Infections Program (IEIP) in 2001 and support for responses to the 2001 U.S. anthrax events, SARS, and the subsequent threat of avian influenza.

GDD-Thailand activities include:

- Outbreak Response.
- Pathogen Discovery.
- Training.
- Surveillance.
- Networking.

Effect

In 2010, the GDD Regional Center in Thailand discovered three pathogens new to the region and increased their laboratory testing capacity by 17%. GDD-Thailand trained 11 FETP graduates and more than 2,700 participants in short-term regional and national trainings. GDD-Thailand responded to 16 outbreaks. Of those 16 outbreaks, GDD-Thailand responded to 94% in less than 24 hours and provided laboratory support that subsequently yielded a confirmed cause for 75%.

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Influenza Lead

Principal U.S. CDC Program Collaborations In-Country

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- Field Epidemiology and Laboratory Training Program
- Laboratory Systems Development Program
- International Emergency Preparedness Program

Save As...

WHO Western Pacific Region (WPR)

WHO Western Pacific Region (WPR) Overview

Currently there are seven bilateral influenza cooperative agreements in the Western Pacific Region of Asia. These agreements with Ministries of Health (MOH) or institutions designated by the MOH work with CDC to build capacity to routinely identify, diagnose, and respond to seasonal and pandemic influenza.

CDC direct country support via cooperative agreements is established in the following countries:

- Cambodia.
- China.
- Mongolia.
- Secretariat of the Pacific Community (SPC).
- Philippines.
- Vietnam (2 agreements).

In addition, CDC supports the WHO Western Pacific Regional Office (WPRO) via a cooperative agreement. Through this cooperative agreement, CDC indirectly provides assistance to the following countries in collaboration with WHO:

- Fiji.
- Laos.
- Papua New Guinea.

Boats along the Yangtze River in China's heartland.

The core activities of CDCs Influenza Division's bilateral agreements and technical assistance are:

- To build sustainable national capacity for seasonal influenza, pandemic influenza and other emerging diseases and preparedness for implementation of the International Health Regulations (IHR).
- To make routine contributions of surveillance data to the WHO Global Influenza Surveillance Network (GISN).
- To increase the geographic reach of the WHO GISN.
- To provide earlier access to critical virus isolates from humans and birds for the WHO GISN.
- To increase the numbers of shipments and influenza isolates provided by WPR influenza labs for analysis by WHO Collaborating Centers.
- To develop sustainable epidemiologic and virologic surveillance systems for severe influenza, in order to gain understanding of the burden of disease from influenza in the WPR.

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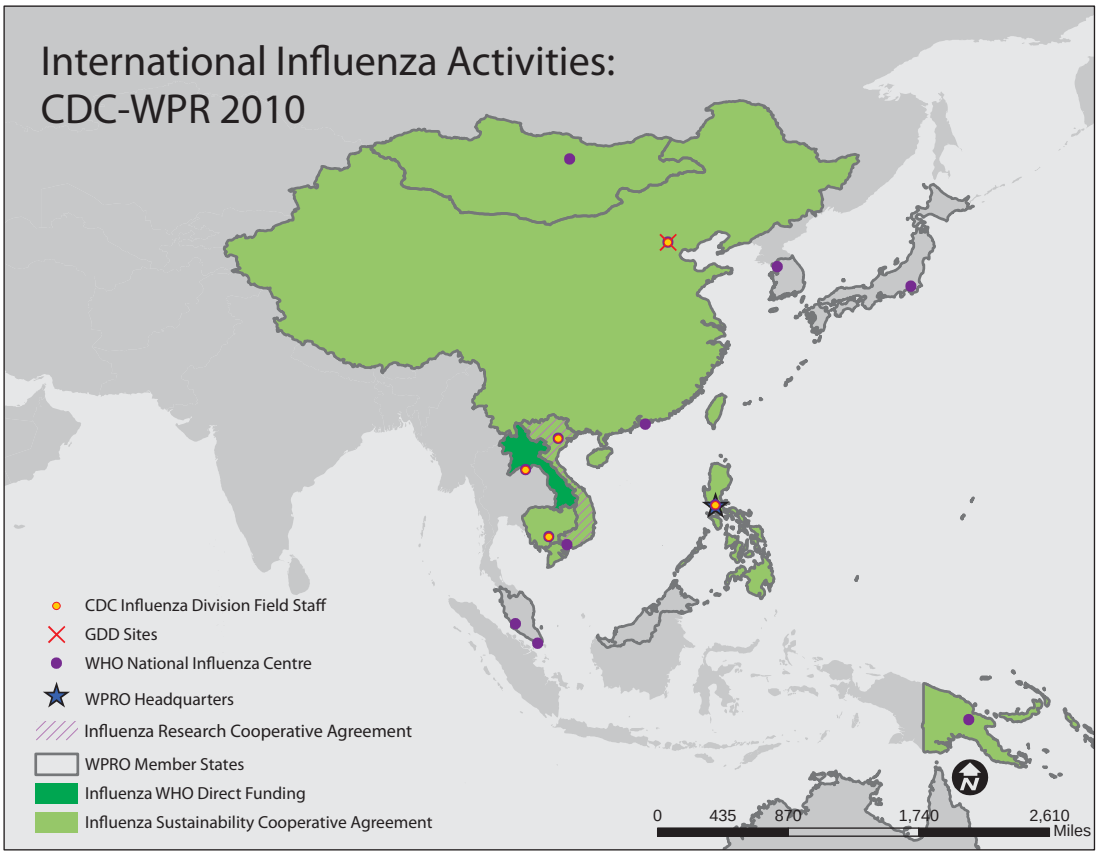
Save As...

WHO Western Pacific Regional Office (WPRO)



U.S. CDC Direct Region Support

The WHO Western Pacific Regional Office (WPRO) is located in Manila, the Philippines. The Office serves 37 countries and areas that contain approximately 1.6 billion people, nearly one-third of the world's population. The Region stretches over a vast area, from China in the north and west, to New Zealand in the south, and French Polynesia in the east. One of the most diverse of the WHO Regions, the Western Pacific Region (WPR) constitutes some of the world's least developed countries as well as the most rapidly emerging economies. It includes highly-developed countries such as Australia, Japan, New Zealand, the Republic of Korea and Singapore; and fast-growing economies such as China and Vietnam.

In recent years, the Region has been an epicenter for emerging diseases, resulting in significant impacts on health, social and economic development. Protecting the Region from acute public health threats is, therefore, a top priority. The Asia Pacific Strategy for Emerging Diseases (APSED) was launched in 2005 as a common strategic framework for countries and areas of the Region to strengthen their capacity to manage and respond to emerging disease threats, including influenza pandemics. APSED, which is endorsed by Member States through the Regional Committee, has served as a road map to guide countries and areas in the Region towards fulfilling IHR core capacity requirements, thus ensuring regional and global health security.

The five-year cooperative agreement between U.S. CDC and WHO WPRO that began in September 2006 has supported the implementation of APSED through three pillars of work: preparedness and

Save As...

communications, surveillance and detection, and response and containment. The agreement also includes funds directed to Member States through WHO Country Offices in Cambodia, China, Federated States of Micronesia, Fiji, Lao People's Democratic Republic (Lao PDR), and Papua New Guinea.

Surveillance

The availability of data from most of the countries and areas in the Western Pacific Region during the 2009 H1N1 influenza pandemic is a testament to the great strides made across the Region in terms of strengthening surveillance systems, including the establishment of laboratory facilities for case confirmation.

Key Surveillance Activities

- WHO WPRO supported the Fourth Meeting of the National Influenza Centres of the Western Pacific Region in Manila, Philippines, June 2010.
- WHO WPRO supported the technical officer for surveillance and response in Papua New Guinea.
- WHO WPRO supported technical staff in Fiji and the Federated States of Micronesia in their support of the NIC in Fiji (Mataika House) and the rolling out syndromic surveillance in the Pacific.

Cambodia

The number of ILI sentinel sites stabilized at eight sites. The following activities were supported to strengthen ILI surveillance:

- Refresher training for staff from ILI sentinel sites.
- Supervision of ILI sentinel sites by U.S. CDC-supported WHO staff along with MOH staff.
- Publication of quarterly and annual reports from the ILI surveillance system.

China

- Weekly data collection and analysis activities at the China NIC were supported throughout the year.

Lao PDR

- The WHO continues to support an electronic indicator-based surveillance tool (Lao EWARN) at central and provincial levels.
- An established ILI project has existed since 2006; currently there are seven sentinel sites in three central hospitals and four provincial hospitals.
- SARI sentinel sites were established in one central hospital and three provincial hospitals in collaboration with the Surveillance and Investigation of epidemic situation in South East Asia (SISEA) project in 2010.

Vietnam

- Supervision of surveillance sites was supported.

Laboratory

During FY 2010, the National Centre for Laboratory and Epidemiology in Vientiane, Lao PDR was recognized as a NIC, bringing the total number of NICs in 15 countries in the WPR that belong to the GISN to 21. During this same period, there were two WHO Collaborating Centers in the WPR, one each in Australia and Japan; however, the NIC in China was recognized as a WHO CC on October 28, 2010.

- Nineteen out of 21 (90%) NICs participated in the WHO EQAP in 2010, and 18 out of 19 scored 100%.
- Twenty out of 21 (95%) NICs had virus isolation capacity in 2010.
- Twelve out of 15 (80%) countries with NICs participated in FluNet in 2010.

Preparedness

The Bi-regional Consultation on the Asia Pacific Strategy for Emerging Diseases and Beyond was conducted May 24-27, 2010 in Kuala Lumpur, Malaysia. The meeting produced one of the important core publications, APSED Technical papers, which served as a basis for developing the bi-regional strategy, APSED 2010.

Cambodia

- National infection control policy was developed and approved by the MOH.

Lao PDR

- The influenza pandemic provided ample lessons and opportunities for self-assessment to improve the pandemic planning process in Lao PDR. Pandemic response evaluation was done using a WHO tool in June 2010.
- Consultants assisted the MOH with development of a communication plan and messages for pandemic 2009 H1N1 and the post-pandemic period.
- Technical assistance was provided for pandemic vaccine deployment planning, surveillance of adverse events following immunization, and a communication campaign to support the distribution of donated pandemic 2009 H1N1 vaccine.
- Two reviews of the *National Work Plan for Emerging Infectious Disease (EID) 2007-2010* were conducted in light of the Asia Pacific Strategy for EID followed by the first planning meeting for the *National Work Plan for Emerging Infectious Disease (EID) 2011-2015*.
- National epidemiologists (human and animal health) and clinicians attended the Western Pacific Global Outbreak and Response Network (GOARN) regional meeting in Cambodia in March 2010.

Training

Cambodia

- Refresher training was conducted for rapid response teams (RRTs).
- Training for respiratory infection control was conducted at referral hospitals throughout the country.

Lao PDR

- Refresher training was conducted for provincial staff throughout Lao PDR.
- A representative from Communicable Disease Surveillance and Response (CSR) attended the International Conference on Emerging Infectious Disease (ICEID) in July 2010.

Public Health Importance

- In Cambodia, many cases of 2009 H1N1 and cholera were detected and investigated by RRTs during this reporting period. Although training and investigation initially focused on 2009 H1N1, emphasis transitioned to also investigating acute watery diarrhea and, in particular, suspected cholera cases.
- In the Pacific, WHO WPRO supports surveillance staff that conduct trainings for syndromic surveillance for not only ILI, but also diarrhea, prolonged fever, and acute fever and rash.
- WHO WPRO supported professional staff from the Regional Office in their attendance of the second Asia Pacific dengue meeting.

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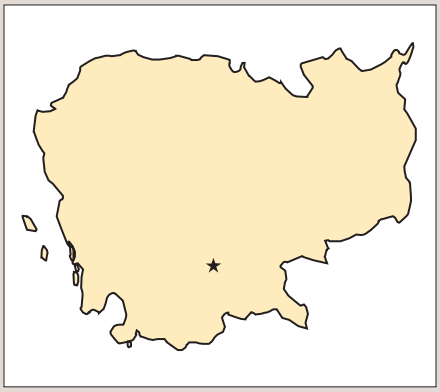
Cambodia



- **Capital:** Phnom Penh
- **Area:** 181,035 sq km
- **Population:** 14,701,717 (July 2011 est.)
- **Age Structure:** 0-14 years: 32.2% (male 2,375,155/female 2,356,305); 15-64 years: 64.1% (male 4,523,030/female 4,893,761); 65 years and over: 3.8% (male 208,473/female 344,993) (2011 est.)
- **Life Expectancy at Birth:** Total population: 62.67 years; male: 60.31 years; female: 65.13 years (2011 est.)
- **Infant Mortality Rate:** Total: 55.49 deaths/1,000 live births; male: 62.54 deaths/1,000 live births; female: 48.13 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 73.6%; male: 84.7%; female: 64.1% (2004 est.)
- **GDP:** $30.13 billion (2010 est.)
- **GDP per Capita:** $2,000 (2010 est.)

U.S. CDC Direct Country Support

Since 2006, U.S. CDC has provided support to Cambodia through the following non-research cooperative agreements: *Development of Influenza Surveillance Networks Overseas* with Cambodia's MOH, *Surveillance and Response to Avian and Pandemic Influenza* with the WHO Country Office, and *Avian Influenza Community Based Risk Reduction Project* with CARE Cambodia. The collective goals of these cooperative agreements have been to build human and infrastructure capacity in surveillance, response, laboratory diagnosis, and pandemic preparedness of influenza. Other key in-country partners include the Institute Pasteur Cambodia (IPC) and the Naval Medical Research Unit No. 2 (NAMRU-2).

Implementation of these cooperative agreements has resulted in the establishment of laboratory-based influenza surveillance, national public health laboratory capacity to perform molecular detection of influenza viruses, and strengthening of national and local response to avian influenza (AI), pandemic influenza, and other communicable disease outbreaks.

Surveillance

Influenza surveillance did not exist in Cambodia prior to CDC support. Since the implementation of the cooperative agreement, laboratory-based ILI and SARI surveillance systems have been established under MOH with technical guidance from WHO, CDC, and IPC. Currently, ILI surveillance involves 13 sites (health centers and hospital outpatient departments) located in seven provinces and Phnom Penh. SARI surveillance consists of four hospitals from Phnom Penh, Siem Reap Province, and Kandal Province. Influenza surveillance has clearly demonstrated the existence of annual influenza seasonality in Cambodia.

Key Surveillance Activities

- ILI surveillance utilizing mobile phone short message service (SMS) reporting was maintained during the 2010 project year.
- Four new ILI sites – two health centers in each of the Mondulkiri and Kampot Provinces – were added to strengthen the ILI system. Necessary equipment, supplies, and training were provided to these sites.
- Testing for RSV and parainfluenza viruses was implemented as part of SARI surveillance.
- Microbiologic testing was implemented as part of SARI surveillance.
- NIPH continued 2009 H1N1 testing as part of ILI and SARI surveillance.
- Site visits were conducted at all ILI health centers and hospitals.
- A monthly Respiratory Disease and Influenza Bulletin was produced.

Laboratory

Support from the CDC/MOH cooperative agreement has resulted in substantial strengthening of laboratory capacity, including skills of technicians, at the MOH's National Institute of Public Health (NIPH). NIPH is able to perform real-time RT PCR testing for all major influenza virus subtypes, including H5N1 and 2009 H1N1, in addition to multiplex PCR testing for other selected respiratory viruses. NIPH can also perform gram stain, culture and identification for various clinical specimens and supports development of microbiology labs at national and provincial hospitals.

Key Laboratory Activities

- Multiplex PCR testing for RSV and parainfluenza viruses was established at NIPH.
- SARI surveillance was strengthened to incorporate microbiologic testing of sputum and blood culture samples, resulting in significantly greater lab activity than previously at NIPH.
- The floor plan designs for BSL-2, BSL-2+, and cell culture rooms were completed. NIPH reviewed applications from four companies for the implementation of these enhancements. NIPH also participated in the CDC/APHL assessment of NIPH's molecular laboratory.
- NIPH participated in the WHO EQAP for the detection of influenza virus type A by PCR.
- One full-time molecular laboratory technician and two full-time microbiology laboratory technicians were hired at NIPH. Two NIPH technicians were sent to a training workshop on Strengthening of GISN-International Air Transport Association (IATA) Licensing for NICs in the Western Pacific, Vietnam. Both technicians earned certificates after successfully completing course attendance and examination.
- Internal quality control was performed for media preparation, antimicrobial susceptibility testing, and gram stain at NIPH microbiology laboratory.
- The completion of microbiology laboratory enhancements was funded at Takeo and Kandal Provincial Hospitals.
- NIPH provided technical support and supplies to the microbiology laboratory at Khmer-Soviet Friendship Hospital (KSFH), a SARI site, to facilitate onsite testing of specimens.

Preparedness

CDC support through WHO has considerably advanced pandemic influenza preparedness and planning in Cambodia. The National Committee for Disaster Management, together with partnering ministries, have continued to work on a national pandemic plan while MOH and WHO have led the development of a health sector response plan. Furthermore, in 2009, a multi-sector pandemic planning pilot project was successfully completed in Siem Reap Province, resulting in a model planning process for use in other provinces.

Key Preparedness Activities

- A draft of a national health sector pandemic response plan and a draft of a national plan for pandemic communication were both completed during 2010.
- Preparedness of national and provincial hospitals was strengthened to manage an increased number of patients with respiratory diseases.
- Workshops at several hospitals were conducted on the management of severe respiratory diseases.

Influenza researchers at the National Institute of Public Health Laboratory, Phnom Penh, Cambodia. From left to right: Mr. Chin, Savuth; Mr. Sok, Siyeatra; Ms. Leang, Chhay Heng; Ms. Nuth, Dara; Ms. Chhum, Chan Ravy; Mr. Ann, Vuth; Mr. Unn, Thy.

Training

The Cambodian MOH hosted the following training activities in 2010:

- ILI surveillance refresher training was provided for staff from all sites.
- SARI surveillance refresher training was held in May and October for staff from all sites.
- Training on proper blood culture sample collection was provided at each SARI site.
- An influenza outbreak investigation workshop was conducted for SARI surveillance staff from all sites.
- Basic microbiology training was conducted at NIPH for technicians from Battambang Provincial Hospital and KSFH.
- Microbiology and clinical laboratory training was held at NIPH for students from the Technical School for Medical Care and staff from the Ministry of National Defense.

2009 H1N1 Activities, FY 2010

The first confirmed case of 2009 H1N1 in Cambodia occurred in June 2009. Soon thereafter, the NIPH molecular laboratory acquired the capacity to detect 2009 H1N1 and, together with IPC, performed RT-PCR testing for 2009 H1N1 as part of ILI, SARI, and event-based surveillance, as well as outbreak investigation. ILI surveillance first detected 2009 H1N1 in September 2009, and while more ILI samples tested positive for 2009 H1N1 throughout the rest of the influenza season, 2009 H1N1 was not the predominate circulating subtype for most of this period. In addition, SARI surveillance data suggests that 2009 H1N1 did not cause more severe disease than H3N2. In 2010, 2009 H1N1 surveillance remained integrated into both ILI and SARI surveillance systems. Overall, 2009 H1N1 did not significantly impact influenza activity, and three months into the influenza season, either H3N2 or B predominated on a weekly basis throughout the rest of the year.

Key 2009 H1N1 Activities, 2010

- NIPH and IPC continued to test influenza surveillance samples for 2009 H1N1.
- Through WHO support, the MOH provided over 1.8 million doses of 2009 H1N1 vaccine to targeted groups at high risk: all health care workers, pregnant women, infants six to 24 months of age, and individuals with chronic lung disease.

Special Influenza Projects and Other Notable Achievements in FY 2010

- NIPH molecular laboratory achieved a perfect score on Panel 8 of the WHO EQAP for the detection of influenza virus type A by PCR.
- MOH, with technical assistance from WHO, completed the *National Strategic Plan for Infection Control in Health Care Facilities, 2011-2015.*
- MOH, with technical assistance from WHO, completed the *Infection Prevention and Control Guidelines for Health Care Facilities.*

Public Health Importance

- Strengthening of the NIPH microbiology laboratory allowed for the detection of *Vibrio cholerae* O1 (Ogawa and Inaba serotypes) from stool samples as part of separate clusters of severe acute watery diarrhea in various parts of the country.
- NIPH laboratory detected *V. cholerae* non-O1 non-O139 from a stool sample of a case of acute gastroenteritis as part of an outbreak possibly linked to contaminated noodles.

- Previous AI and 2009 H1N1 outbreak response training of Rapid Response Teams (RRTs) led to more effective response, including rapid assessment and active surveillance for suspect human avian influenza cases, during a confirmed H5N1 outbreak in poultry.
- Previous integrated outbreak training of RRTs resulted in improved investigations of individual cases and clusters of cholera.
- CARE Cambodia's external evaluation of the village surveillance team (VST) model as a surveillance system for AI revealed that the VST model could be potentially adapted to other emerging zoonotic diseases besides AI.

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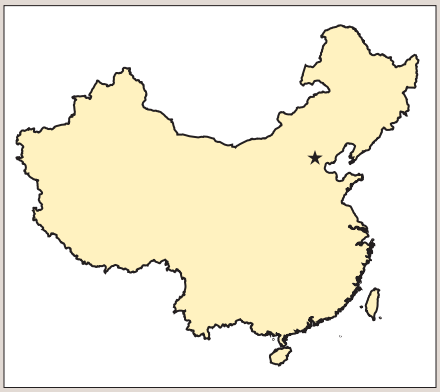
China



- **Capital:** Beijing
- **Area:** 9,596,961 sq km
- **Population:** 1,336,718,015 (July 2011 est.)
- **Age Structure:** 0-14 years: 17.6% (male 126,634,384/female 108,463,142); 15-64 years: 73.6% (male 505,326,577/female 477,953,883); 65 years and over: 8.9% (male 56,823,028/female 61,517,001) (2011 est.)
- **Life Expectancy at Birth:** Total population: 74.68 years; male: 72.68 years; female: 76.94 years (2011 est.)
- **Infant Mortality Rate:** Total: 16.06 deaths/1,000 live births; male: 15.61 deaths/1,000 live births; female: 16.57 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 91.6%; male: 95.7%; female: 87.6% (2007)
- **GDP:** $9.872 trillion (2010 est.)
- **GDP per Capita:** $7,400 (2010 est.)

U.S. CDC Direct Country Support

The project *Developing Sustainable Influenza Surveillance Networks and Response to Avian and Pandemic Influenza* is China's second five-year cooperative agreement with U.S. CDC; it began in August 2009. Fiscal year 2009-2010, the first year of the sustainability agreement, was a special year for the Chinese National Influenza Center (CNIC). First, facing the influenza pandemic challenge, CNIC successfully responded to the pandemic by confirming 2009 H1N1 cases and providing technical guidance to the entire National Influenza Surveillance Network (NISN) on the pandemic response. Second, after years of effort and preparation, CNIC welcomed the WHO onsite assessment of CNIC's application to be designated a WHO Collaborating Center for Reference and Research on Influenza (WHO CC) in December 2009, and finally received the official designation in October 2010. Third, the NISN was expanded in 2009 as part of the response to the influenza pandemic. The number of sentinel hospitals increased from 197 to 556 and network laboratories increased from 63 to 411.

Surveillance

The influenza surveillance network contains a total of 411 network laboratories and 556 sentinel hospitals that cover all provincial, prefectural and municipal-levels of China Center for Disease Control (CDC) and some important county level CDCs.

Key Surveillance Activities

- The weekly report on influenza surveillance was published and distributed in both Chinese and English to share information with national and international partners.
- The influenza surveillance information system was improved to include more functions and the construction of a comprehensive influenza database.

- Circulating influenza virus strains isolated by CNIC were submitted to the WHO GISN.

Laboratory

CNIC has been designated a WHO CC. To meet the terms of reference for a WHO CC, a great effort has been made to improve the influenza laboratory surveillance in China.

Key Laboratory Activities

- The current nucleic acid detection reference kit was optimized and used to assess nucleic acid detection quality in all 556 network laboratories.
- A new zanamivir resistance surveillance method was developed using a fluorescence-based NA inhibition assay.
- CNIC strengthened its capacity to conduct egg-based virus isolation in network laboratories.
- A ferret model was scaled up for anti-serum preparation.
- The whole genome sequence was determined for various subtypes of previous viruses collected over the last 50 years in China, and for currently isolated viruses.
- The evolution of influenza antigens was analyzed using an antigenic cartography analytic technique.
- A laboratory platform was established for surveillance of multiple respiratory pathogens.

Preparedness

The national plan for influenza surveillance was renewed and issued by the China MOH in 2010. In the new plan, the provincial reference laboratories were assigned greater responsibilities and additional functions.

Training

China NIC hosted the following trainings in FY 2010:

- Nucleic acid detection training for approximately 700 technicians at network laboratories.
- Training for 2,000 clinical workers in sentinel hospitals to enhance the quality of ILI surveillance.
- Medium and long-term hands-on-training conducted by the CNIC for 13 technicians in network laboratories.

2009 H1N1 Activities, FY 2010

- A national cross-sectional serological survey was conducted to understand the seroprevalence of 2009 H1N1 virus.
- Summary reports of the influenza epidemic situation were provided at monthly meetings organized by China MOH.

Other Notable Achievements in FY 2010

In order to better evaluate the progress of the first five-year cooperative agreement, understand the current state of influenza surveillance, and identify strengths and weaknesses of the influenza surveillance system in China, a joint review of the influenza surveillance system in China was conducted by U.S. CDC and China CDC from August 18 to August 31, 2010.

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Save As...

Processed ducks for sale in a Chinese market. Ducks are important natural reservoirs for Influenza A viruses.

Save As...

GDD-China

The GDD (Global Disease Detection) Regional Center in China (GDD-China) was established in 2006 as the China-U.S. Collaborative Program on Emerging and Reemerging Infectious Diseases (EID). 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 Field Epidemiology Training Program (FETP) began its first 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 strategic development of infectious disease surveillance systems. Responses have included pandemic 2009 H1N1 influenza, multi-drug resistant tuberculosis, human enterovirus 71, Streptococcus suis, plague, and foodborne risks such as salmonella, brucellosis, cholera, and botulism.

GDD-China activities include:

- Outbreak Response.
- Pathogen Discovery.
- Training.
- Surveillance.
- Networking.

Effect

In 2010, the GDD Regional Center in China increased their laboratory testing capacity by 18%. GDD-China trained 14 FETP graduates and nearly 2,000 participants in short-term regional and national trainings. GDD-China responded to 33 outbreaks, of which 100% were responded to in less than 24 hours and involved laboratory support that subsequently yielded a confirmed cause.

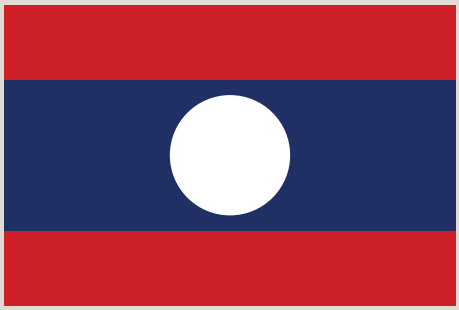
In-Country Field Staff

Jeffrey McFarland, MD
China GDD Regional Center Director
Influenza Lead

Principal U.S. CDC Program Collaborations In-Country

- Influenza Division International Program
- International Emerging Infections Program
- Field Epidemiology and Laboratory Training Program
- International Emergency Preparedness Program
- Health Communications

Lao People's Democratic Republic (Lao PDR)



- **Capital:** Vientiane (Viangchan)
- **Area:** 236,800 sq km
- **Population:** 6,477,211 (July 2011 est.)
- **Age Structure:** 0-14 years: 36.7% (male 1,197,579/female 1,181,523); 15-64 years: 59.6% (male 1,908,176/female 1,950,544); 65 years and over: 3.7% (male 107,876/female 131,513) (2011 est.)
- **Life Expectancy at Birth:** Total population: 62.39 years; male: 60.5 years; female: 64.36 years (2011 est.)
- **Infant Mortality Rate:** Total: 59.46 deaths/1,000 live births; male: 65.49 deaths/1,000 live births; female: 53.18 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 73%; male: 83%; female: 63% (2005 Census)
- **GDP:** $15.68 billion (2010 est.)
- **GDP per Capita:** $2,400 (2010 est.)

U.S. CDC Direct Country Support

U.S. CDC established a collaborative working relationship with the MOH and Ministry of Forestry and Agriculture (MOFA) under a single Government of Laos (GOL) recognized Memorandum of Understanding (MOU) in May 2006, reflecting first time in-country representation, with focus on pandemic and seasonal influenza activities. CDC operations are managed through the U.S. Embassy in Vientiane Capital, and coordinated with and through the WHO Western Pacific Regional Office (WPRO) in Laos. The focus on capacity building with emphasis on pandemic planning, surveillance and laboratory, outbreak response, clinical case management and infection control have significantly contributed to control and mitigation efforts of pandemic H5N1 and 2009 H1N1 threats.

A new year five-year CDC MOU is currently being discussed with the MOH; this MOU will allow for expanded recognition of CDC-supported country activities, including those supported through Global Disease Detection (GDD)/Bangkok and Center for Global Health (CGH), which are coordinated and supported by the Country Representative. Also, support will continue through a cooperative agreement support with WHO WPRO in Laos. This agreement is intended to develop capacity building gains in support of International Health Regulations (IHR) to provide for more evidence-based findings leading to sustainable efforts in minimizing the impact of seasonal influenza (including vaccination initiatives) and pandemic threats. CDC country representation has continued to provide de-facto representation for "other" USG sponsored health activities, including USAID, DoD and USDA-Animal and Plant Health Inspection Service (APHIS).

Surveillance

The absence of laboratory detection capabilities precluded ILI/SARI surveillance start-up in Laos until January 2007. Three ILI sites and one SARI hospital site were concentrated in Vientiane Capital at this time. Planned expansion throughout the country of both surveillance networks coincided with 2009 H1N1, with three additional provincial hospitals added in June 2009. The current network reflects data and specimen collections from seven provinces, and has provided first-time data on seasonal influenza in Laos, and served to enable the country's contribution of 197 specimens and viral isolates through the WHO GISN.

Key Surveillance Activities

- The GOL submitted their first contribution of surveillance findings to WHO FluNet.
- Lao participated in the WHO GISN for the first time by sharing 94 isolates with the WHO CC Atlanta.
- Three new SARI and two ILI hospital sites were added to the surveillance network, representing both the northern and southern provinces.
- The circulation of 2009 H1N1 virus continued as the dominant subtype transitioned from pandemic to seasonal influenza.
- Laos completed its preliminary five year National Surveillance Strategy.
- The management of the ILI/SARI surveillance system was transitioned from the WHO-U.S. CDC Collaboration to the National Laboratory.

Laboratory

The National Center for Laboratory and Epidemiology (NCLE) with support from the CDC-WHO collaboration has transformed diagnostic capacity in Laos since 2007; established testing capabilities now include conventional and real time PCR and cell culture and hemagglutination inhibition testing (HI). Systems have also been put in place to ensure quality assurance and bio-safety. A new initiative to develop molecular capabilities for carrying out in-country partial and full genomic sequencing of H5N1 and 2009 H1N1 in describing phylogenic evolution is underway. A new planning effort is underway to decentralize testing functions in key regional provincial hospital laboratories.

Key Laboratory Activities

- Newly developed cell culture capabilities, taking advantage of CDC training, allowed for first-time contribution of "viral isolates" through WHO GISN.
- Laboratory staff from Laos received training for the first time from CDC in establishing molecular capabilities, allowing for partial genomic sequencing of H5N1 and 2009 H1N1 isolates.
- Real-time PCR testing was validated as 100% accurate through the WHO EQAP which NCLE has participated in since 2007.
- All laboratory functions have been temporarily relocated to other facilities while bio-safety enhancement upgrades are on-going at NCLE.
- CDC sponsored APHL to conduct an assessment of laboratory capabilities as part of the requirements to obtain the WHO NIC designation.

Preparedness

Pandemic preparedness planning and actions were sustained through 2010, in recognizing and mitigating a less dramatic second 2009 H1N1 wave. The adaption of the U.S. CDC Automated Disaster and Emergency Planning Tool (ADEPT) model allowed provinces to modify prepared pandemic plans to accommodate a much less severe than anticipated pandemic. Preparedness experience enabled the GOL to manage outbreak threats associated with the Southeast Asian (SEA) Games in Vientiane, which attracted over 30,000 visitors during the influenza pandemic.

Key Preparedness Activities

- Regional pandemic training workshops were held by GOL in the Northern and Southern provinces to adapt evidence-based pandemic 2009 H1N1 findings into local plans.
- A successful series of national and provincial planning exercises were held by GOL in preparation for Laos to host the December 2009 SEAGAMES in Vientiane Capital.
- GOL established Infection Control Committees at all national and provincial hospitals, and workshops were conducted in translating newly established guidelines in practice.
- GOL held outbreak response re-training sessions in three key regional provinces.

Training

MOH and MOFA hosted numerous training activities in 2010, with support and technical assistance provided by the CDC – WHO Collaboration and the CDC in partnership with USDA/APHIS and DoD. These included:

- CDC laboratory training in strengthening of real-time PCR and establishment of cell culture capabilities, February 2010.
- CDC-Atlanta training of NCLE staff in establishing sequencing capabilities, March 2010.
- Training of newly-established sequencing team in genomic phylogenic analysis in Ho Chi Minh City (HCMC) Vietnam, June 2010.
- Infection control workshops in disseminating new infection control (IC) guidelines and establishing IC committees, February and September 2010.
- Refresher training for all ILI/SARI surveillance hospitals, in each province represented in network, and at NCLE, September 2010.
- Training workshops for pandemic vaccination teams throughout the country, April and May 2010.
- Clinical management and IC workshop in formulating national 2009 H1N1 strategy, August 2010.
- Veterinary H5N1 laboratory training at National Animal Health Center, August 2010.
- Veterinary epidemiological training on H5N1 in Xiengkhouang Province, September 2010.
- National outbreak and surveillance workshop, Thalat, June 2010.

2009 H1N1 Activities, FY 2010

Activities related to 2009 H1N1 in 2010, in addition to ongoing surveillance and laboratory detection, were focused on vaccine deployment to high-risk and prioritized populations. Significant technical consultations with the GOL prompted acceptance of a delivery strategy. Planning and execution led to successful vaccine deployment, which WPRO recognized as being highly successful.

Key 2009 H1N1 Activities, 2010

- Vaccine and ancillary materials were brought into Laos through the CDC – WHO Collaboration.
- Vaccines were delivered to an estimated 1 million targeted groups in Laos.
- Field Epidemiology Training (FET) led investigation into adverse reactions associated with delivery of vaccine, with and without tetanus toxoid vaccination in pregnant women.
- The ILI/SARI surveillance network expanded in the North and South to identify a "second wave" of the 2009 H1N1 pandemic.

Special Influenza Projects and Other Notable Achievements in FY 2010

- Lao NCLE became an NIC.
- Laos contributed influenza viral isolates to WHO GISN through CDC.
- An influenza component was added to non-malaria fever study/surveillance.
- Molecular sequencing training was initiated, providing in-country capacity to describe phylogenic evolution of H5N1 and 2009 H1N1.
- ILI surveillance enabled early recognition of a "second wave" of the 2009 H1N1 pandemic.
- FET led investigation of adverse reactions associated with 2009 H1N1 vaccine delivery.
- FET graduated its first class of 8 students and began the second year of the program.
- First Infection Control Committees were established in all national and provincial hospitals.
- A senior MOH delegation visited CDC-Atlanta for the first time, for consultations on expanding scope and depth of relationship.

Public Health Importance

- Laos established a field epidemiology field training program (FETP), which provided critical human resources in responding to pandemic and seasonal influenza threats; it allowed NCLE to address a host of outbreak entities, including cholera, Japanese encephalitis virus (JEV), dengue, measles, and anthrax.
- Real-time PCR capabilities developed for influenza detection were used to establish first-time in-country recognition of human anthrax and circulating dengue serotypes, both during outbreak conditions.
- Pandemic influenza plans and processes were adapted to address disease impact resulting from severe flooding conditions in the south of Laos.
- Anticipated sequencing capabilities will be applied to rabies and other zoonotic disease entities.
- CDC supported outbreak investigative activities allowed for detection and containment of measles, dengue, human anthrax, cholera and JEV.

Save As...

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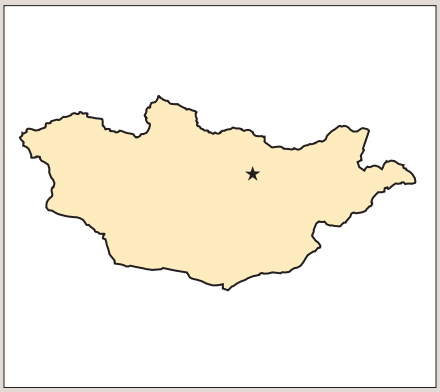
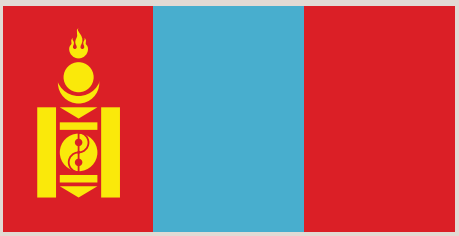
Save As...

Mongolia





- **Capital:** Ulaanbaatar
- **Area:** 1,564,116 sq km
- **Population:** 3,133,318 (July 2011 est.)
- **Age Structure:** 0-14 years: 27.3% (male 437,241/female 419,693); 15-64 years: 68.7% (male 1,074,949/female 1,076,455); 65 years and over: 4% (male 54,415/female 70,565) (2011 est.)
- **Life Expectancy at Birth:** Total population: 68.31 years; male: 65.85 years; female: 70.89 years (2011 est.)
- **Infant Mortality Rate:** Total: 37.26 deaths/1,000 live births; male: 40.26 deaths/1,000 live births; female: 34.11 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 97.8%; male: 98%; female: 97.5% (2000 census)
- **GDP:** $10.08 billion (2010 est.)
- **GDP per Capita:** $3,300 (2010 est.)

U.S. CDC Direct Country Support

FY 2010 is the second year of the U.S. CDC/Mongolia sustainability cooperative agreement *Developing Sustainable Influenza Surveillance Network* (2009-2014). The previous agreement *Development of Influenza Surveillance Network* was completed in 2004-2009.

Influenza-like illness has been a serious public health challenge in Mongolia since the 1970s, due to rapid growth in population size and urbanization. The NIC in Mongolia was established in 1974, and joined the GISN in 1978. The system was damaged seriously due to economic difficulties in the 1990s in connection with political and economic transition. The CDC/Mongolia cooperative agreement activities that began in 2004 have restored the system and improved its quality to meet the requirements of the WHO for NIC designation.

Surveillance

Until 2004, ILI surveillance was seasonal (from October 1 to June 30) and based only on weekly phone reporting of ILI incidences among outpatient visits in Ulaanbaatar, the capital city, and 21 aimag (province) centers. Starting in the 2004-2005 season, influenza sentinel surveillance sites (ISSSs) were equipped with consumables for nasopharyngeal sample collection and refrigerators at 28 family group practices (FGP) in Ulaanbaatar City and two aimag (province) centers. The ISSSs have increased gradually in number to 158 and, as of October 2009, cover the whole country. ILI surveillance became a year-round activity in the 2006-2007 season, along with hospital-based surveillance of pneumonia and SARI events.

Key Surveillance Activities

- Countrywide, 121 outpatient ISSSs report registered ILI cases to the Mongolia NIC by telephone on a daily basis. The registered ILI morbidity was 2,170.9 /10,000 population during the 2009-2010 season (7.9% of all registered outpatient visits), an increase of 2.1 times over the previous season.
- Thirty-seven hospital-based ISSSs in Ulaanbaatar City and aimag centers reported diagnosed pneumonia and SARI cases among hospitalized patients; 25,031 pneumonia cases with 100 (0.4%) deaths were registered.
- Weekly surveillance information was posted in real time on the NIC website www.flu.mn in Mongolian and English.

Laboratory

Influenza virological surveillance in Mongolia is based on weekly collection of samples from ISSSs and detection and identification of viral agents in the samples by isolation in cell culture, direct fluorescent antibody (DFA) and polymerase chain reaction (PCR). Until August 2009, all samples submitted to the NIC were inoculated first into MDCK cell line and then the isolates were identified by PCR using primers supplied by World Health Organization Collaborating Centers (WHO CCs). Beginning in August 2009, all samples were tested first with real-time RT-PCR and then PCR positive samples were inoculated in cell culture. DFA of R-Mix cells inoculated from randomly selected samples have been used for detection of other respiratory viruses since the 2008-2009 season. The Virology Laboratory at NIC joined the WHO External Quality Assessment Program at the beginning of 2007 and the last seven panels were tested with 100% accuracy.

Key Laboratory Activities

- A total of 2,102 (25.6%) influenza viruses were detected by real time RT-PCR from 8,200 samples. Among them, 1,796 (85.5%) were 2009 H1N1 viruses and 306 (14.5%) were B viruses.
- The number of samples tested doubled in comparison to the previous season.
- A total of 387 (4.7%) influenza viruses were isolated by inoculation of MDCK cell culture from 8,200 samples. Among them, 279 (71.3%) isolates were 2009 H1N1 viruses and 108 (28.7%) were B viruses.
- In 2008-2010, 317 influenza strains were isolated and tested for oseltamivir resistance by a chemoluminescence-based NA inhibition quantitative assay. Two (0.6%) resistant strains were detected.
- Thirty-four genes (3 PB2, 2 PB1, 3 PA, 9 HA, 3 NP, 4 NA, and M, and 3 NS) of 10 2009 H1N1 strains were sequenced and submitted to and released by GenBank.
- Thirty new influenza isolates were sent to WHO CCs in Tokyo, Japan and Atlanta, United States for more detailed analysis.
- Seventy (9.3%) virus-specific antigens were detected by DFA with R-Mix hybrid cell line (DHI, USA) from 749 tested samples. Among them were: 21 (30%) influenza A, 17 (24.3%) influenza B, 23 (43.5%) parainfluenza, 8 (11.4%) adenovirus. and 1 (1.4%) RSV.

Preparedness

The National IPPP assessment was first conducted in April 2008 and in November 2008 (retrospective for 2003) using the CDC's National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response assessment tool. In March 2009, IPPP assessments were conducted nationwide (including among sub-national or provincial governments) using a modified CDC inventory with the financial support of the World Bank Project Avian Influenza Control and Human Pandemic Preparedness and Response.

Key Preparedness Activities

- The National Influenza Workshop 5 was held in October 2009; 220 participants representing all concerned parties convened. They issued recommendations for the government and other stakeholders and called for urgent actions to prepare for pandemics.
- A revised guideline "Influenza pandemic preparedness and response" was issued by the Mongolia MOH in April 2010.
- A National IPPP re-assessment, combined with the Influenza Laboratory Assessment, was conducted in June 2010 using CDC guidelines and CDC instructors.

Training

The following trainings included participants from Mongolia in FY 2010:

- Forty-five training workshops (a total of around 3,500 hours) on infectious disease surveillance and prevention, including influenza control, were organized by National Center of Communicable Diseases (NCCD), MOH with the support of WHO, World Bank and Asian Development Bank. Participants included 8,845 directors, doctors, epidemiologists and laboratory scientists and their assistants.
- The project manager of the cooperative agreement project and a laboratory scientist from the Virology Laboratory at the NIC participated in the CDC Influenza Division International Partners Workshop in Atlanta, Georgia in July 2010.
- An epidemiologist and two laboratory scientists received two months of on-the-job training on hemagglutination inhibition testing (HI) and (micronuetralization) MN for serological surveillance at the Department of Virology, Tohoku University, Sendai, Japan and China CDC, Beijing, China.

2009 H1N1 Activities, FY 2010

The 2009 H1N1 pandemic was the first influenza pandemic documented in Mongolia.

Key 2009 H1N1 Activities, 2010

- The first laboratory confirmed 2009 H1N1 influenza case was detected on October 12, 2009 in the capital city through routine influenza surveillance activity. It was followed with an explosive 2009 H1N1 outbreak throughout the country within three weeks, peaking at epidemiological week 45 of 2009.
- The National Emergency Committee was nominated on November 3, 2009 under the chairmanship of the Vice Prime Minister; the Committee coordinated all control measures. The Government of Mongolia approved a budget of 6.4 billion Tugriks (approximately USD 4.4 million) for response to the pandemic, including logistical support and mobilization of additional health personnel. The Parliament issued a Special Act on November 4, 2009 regarding the tax exemption of pharmaceuticals, medical equipment and supplies (including disinfectant) needed for 2009 H1N1 infection control and 2009 H1N1 pandemic vaccine.

- The MOH issued several orders: releasing additional funds for the treatment of the hospitalized patients, establishment of expert groups for urgent guidance of medical staff throughout country, and the mobilization of post-graduate medical students to work at primary health care (PHC).
- The Government of Mongolia quickly purchased more than 30,000 tablets of Tamiflu and an additional 50,000 were supplied by WHO.
- The Government of Mongolia purchased the first 60,000 doses of 2009 H1N1 pandemic vaccine in December 2009 for vaccination of health care workers.
- The first part of WHO vaccine supply arrived in Mongolia in January 2010 and a total of 500,000 people (around 20% of the whole population) were vaccinated in 2010.

A traditional yurt or "ger" house of nomadic herders in Mongolia. Most rural Mongolians live in single tent-houses such as this, with the whole family sharing one room. This close proximity may facilitate the spread of influenza.

Other Notable Achievements in FY 2010

- Two additional virology laboratories in Darkhan and Erdenet (Mongolia's two most populous cities after Ulaanbaatar) were established and equipped with RT-PCR equipment and personnel received on-the-job training at the NIC using funding from the World Bank Project. The laboratories have been fully functional since March 2010.
- A total of 5,000 sera were collected in June 2009, November 2009 and June 2010 from apparently healthy individuals of all age groups for serological surveillance history of 2009 H1N1 virus transmission in Mongolia. MN and HI tests have been performed with these sera by

Mongolian researchers in collaboration of Department of Virology, Tohoku University, Sendai, Japan and China CDC, Beijing, China. Both organizations provided financial and technical support, along with WHO and World Bank. The statistical analysis and interpretation of results are on-going.

- In response to a request by and financial support from the World Bank Project, a nationwide assessment of ILI reporting was completed in March and April 2010. Based on the recommendations of this assessment, a computer program called Flu Information System (FIS) for on-line ILI reporting was developed in March and April 2010. Testing and training of personnel was organized from May through October 2010 and the online ILI reporting system is in experimental operation for the 2010-2011 season.

Special Influenza Projects

- An influenza transmissibility study started in Baganuur District, Ulaanbaatar City in October 2010 with technical and financial support of Tohoku University, Sendai, Japan.

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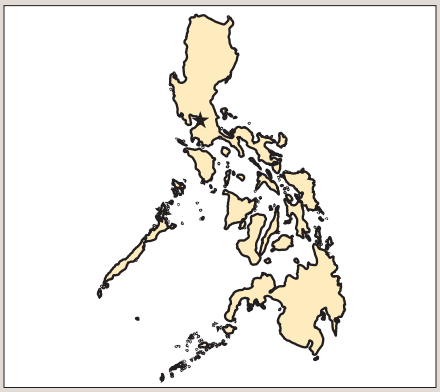
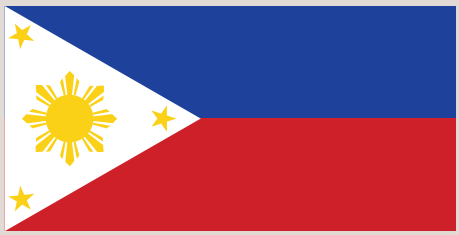
The Philippines





- **Capital:** Manila
- **Area:** 300,000 sq km
- **Population:** 101,833,938 (July 2011 est.)
- **Age Structure:** 0-14 years: 34.6% (male 17,999,279/female 17,285,040); 15-64 years: 61.1% (male 31,103,967/female 31,097,203); 65 years and over: 4.3% (male 1,876,805/female 2,471,644) (2011 est.)
- **Life Expectancy at Birth:** Total population: 71.66 years; male: 68.72 years; female: 74.74 years (2011 est.)
- **Infant Mortality Rate:** Total: 19.34 deaths/1,000 live births; male: 21.84 deaths/1,000 live births; female: 16.71 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** Total population: 92.6%; male: 92.5%; female: 92.7% (2000 census)
- **GDP:** $353.2 billion (2010 est.)
- **GDP per Capita:** $3,500 (2010 est.)

U.S. CDC Direct Country Support

The Philippines completed its first year under the *Developing Sustainable Influenza Surveillance Networks and Response to Avian and Pandemic Influenza* cooperative agreement in August 2010. The previous five-year agreement *Developing Influenza Surveillance Networks* lasted from September 2004 through August 2009. The Research Institute for Tropical Medicine (RITM) is the NIC for the Philippines. Activities conducted under the present cooperative agreement include the continuation of surveillance activities at established sentinel sites and burden of disease activities.

Surveillance

In 2010, a total of 7,684 ILI cases were reported from 29 surveillance sites. Specimens were collected from 2,823 (37%) of these reported cases. The 2010 ILI trend showed a steady rate of cases from January to March 2010, compared to low ILI case reports in previous years during the same timeframe.

Key Surveillance Activities

- RITM held a meeting with stakeholders in December 2009 as a first step toward ensuring the viability and sustainability of the functional influenza surveillance system in country. Participants included the local government units, regional directors from the 12 Regional Centers for Health Development and other local officials. Progress on surveillance activities was discussed; an initial discussion regarding sustainability strategies also took place.
- Two scientific papers are being written for publication: one methods paper describing the experience, challenges and difficulties in setting up the influenza surveillance network and strategies to overcome them, and a second paper describing the seasonality of influenza in the Philippines and its circulating strains.

Laboratory

RITM is the NIC for the Philippines and is responsible for maintaining and enhancing laboratory capacity.

Key Laboratory Activities

- RITM, through the National Center for Health Facilities Development under the Department of Health (NCHFD-DOH), provided technical assistance in setting up four sub-national laboratories for the molecular detection of 2009 H1N1. These sub-national laboratories are located in the National Capital Region, the Cordillera Autonomous Region, Visayas, and Mindanao.
- RITM has initiated communications with WHO CC Melbourne to schedule training on the use of egg-based culture methods to isolate viruses that are difficult to grow by standard culture methods. The RITM NIC and the Bureau of Animal Industry are in continuing negotiations for the acquisition of eggs to be used for this purpose.

Training

Philippines/RITM hosted the following training activities in 2010:

- January 18-22, 2010, the molecular biology laboratory at RITM conducted a workshop on molecular diagnosis of influenza that provided basic and proficiency training to NIC medical technologists on molecular techniques. Participants included NIC virology staff and staff from other laboratories within the NIC; the training ensured that staff could meet surge capacity needs.
- A refresher training was conducted October 22-23, 2009, for the regional influenza surveillance officers, nurses and physicians from the National Capital Region sentinel health centers.

2009 H1N1 Activities, FY 2010

During the 2009 H1N1 pandemic, the National Epidemiology Center (NEC) was primarily in charge of the outbreak investigations, while the NIC laboratory contributed significantly by providing the data necessary for the investigations.

Key 2009 H1N1 Activities, 2010

- A total of 11,713 specimens were tested by the molecular laboratory at RITM for 2009 H1N1; 5,790 (49.4%) were positive for 2009 H1N1; more than 57.4% were from the National Capital Region.
- The molecular biology laboratory at RITM began 2009 H1N1 testing in May 2009. Cases occurred in people aged three days to 95 years of age; 61% of cases were from those 19 years and younger. More than half of the cases were female.

Other Notable Achievements in FY 2010

- A total of 11,010 influenza burden of disease health center consultations were recorded from September 2009 to March 2010; 1,860 were ILI consultations.
- ILI consults comprised 16% of total health center visits, and 16-17% of all health center consultations.
- In Baguio City, specimen was collected from 819 ILI cases (40%). The virus positivity rate was 21% while the influenza positivity rate was around 5%.

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Secretariat of the Pacific Community

U.S. CDC Direct Country Support

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 support the development of the region's land, marine, and human resources. Within the framework of SPC is the Pacific Public Health Surveillance Network (PPHSN), a joint initiative of SPC and WHO, which is dedicated to communicable control and surveillance.

The current *Influenza Surveillance Networks Cooperative Agreement* between SPC PPHSN and the U.S. CDC began in 2005 and supports the development of influenza surveillance networks across a vast area, including both the North and South Pacific, covering ten time zones and wide geographic, socio-political, and cultural diversity. Key collaborating organizations include WHO, Pacific Islands Health Officers Association (PIHOA), PICT Ministries and Departments of Health and reference laboratories in Australia, New Zealand, Fiji and New Caledonia.

Surveillance

Influenza is not seasonal in PICTs and can occur at any time of the year, usually associated with introduction by travelers. Prior to the cooperative agreement with CDC, influenza testing and surveillance capacity was very limited in PICTs. During the five years of the project, immunofluorescence assay (IFA) testing capability for influenza has been introduced into PICTs and a network of 48 sentinel sites has been established. Sample referral arrangements have been established with reference laboratories in Australia, New Zealand, Fiji and New Caledonia. During this time WHO and partners have supported the introduction of influenza PCR into Mataika House, Suva, Fiji.

Key Surveillance Activities

- Project staff supported the development of a standardized syndromic surveillance system for PICTs under a joint WHO/SPC initiative. The system includes the use of a ILI case definition and weekly reporting of data.
- Links between PICT laboratories and reference laboratories were strengthened and sample referral mechanisms were streamlined.
- In consultation with key stakeholders, a strategic approach for further enhancement of influenza surveillance in PICTs, including consideration of country-specific and regional solutions, was developed.
- PICTs were encouraged to report their experience with the 2009 H1N1 outbreak in the SPC bulletin, Inform'ACTION.
- Viral Transport Media (VTM) was introduced into suitable PICTs as storage and transport facilities become available to allow the culture of live virus at reference laboratories.
- The project provided support to laboratories in Niue, Tokelau, Tuvalu and Nauru, which do not have influenza testing capability, in order to allow for transport of samples to reference laboratories.

Laboratory

PICT laboratories face a range of challenges in maintaining laboratory-based influenza surveillance including high turnover of staff, inexperience with IFA techniques and irregular shipments of nasopharyngeal supplies for testing. Regular follow-up visits to PICTs are undertaken by project staff and recent efforts have focused on supporting PICT laboratory staff with training on sample collection, IFA techniques and sample packaging and transport. Collaboration between human and animal health laboratory staff is also being supported. Strategic development of the Pacific laboratory network is a key role for LabNet which operates under the umbrella of PPHSN.

Key Laboratory Activities

- IFA testing was established in 15 sites in 14 PICTs. One nasopharyngeal swab is tested locally and another is sent for confirmatory testing. Thirty-three laboratory technicians have received on-site training on IFA. To facilitate the collection and storage of samples in VTM for live virus detection at reference laboratories, -80OC freezers were purchased for nine PICTs.
- Links have been established with Pacific-based biomedical engineers to support the regular servicing and repair of immunofluorescence microscopes.
- External Quality Assurance has been established through the WHO CC Melbourne, which provides a panel of IFA slides for testing and reporting by PICT laboratories. Excellent results were achieved for the six laboratories reporting in 2010. WHO CC Melbourne also provides additional control slides for PICT laboratories.
- Intensive laboratory training at WHO CC Melbourne was provided for three PICT laboratory staff in September 2010, bringing the total to 23 technicians who have received training at the Centre.
- Human and animal health laboratory staff received training and accreditation on packaging of infectious substances for airline transport of samples.
- Fine, flexible, flocked swabs were introduced to improve the collection of nasopharyngeal specimens.
- Project staff provided advice and support for the development of a BSL-2 facility in Guam.
- A LabNet meeting in November 2010 strengthened the links between human and animal health laboratories and between PICT-based and reference facilities. The formation of a LabNet Technical Working Group will support the development of laboratory services in the region.

Preparedness

PPHSN focuses on outbreak-prone diseases, with influenza being one of the priority conditions. The project works within the PPHSN framework and with the SPC-based Pacific Influenza Pandemic Preparedness Project (PRIPPP) in supporting pandemic planning, emergency exercises, health risk communication, procurement and stockpile strategies, and surveillance and outbreak response. Improved collaboration between human and animal health laboratory staff has been achieved through the project.

The 2009 H1N1 outbreak highlighted the importance of well-established sample transport and confirmatory testing arrangements.

Key Preparedness Activities

- The role of reference laboratories in supporting outbreak investigation and response has been strengthened.

- Project staff contributed to the development of the standardized syndromic surveillance guide and outbreak response manual and supported the implementation of syndromic surveillance in PICTs.
- Project staff participated in the Third Pacific Avian and Pandemic Influenza Task Force meeting held in Fiji in May 2010, supporting the One Health approach that recognizes the interdependence of people, animals and environment.

Training

The following trainings occurred in FY 2010 in SPC member countries:

- A five-day influenza workshop in May 2010 was organized by the project for Polynesian countries for seven participants from human and animal health laboratories in Cook Islands, Samoa, American Samoa, Tonga and Tokelau. The training included intensive IFA instruction, PCR demonstration, presentations and exercises on influenza surveillance as well as training and certification for packaging of infectious substances.
- Mataika House, Suva Fiji hosted a five-day influenza workshop for human and animal laboratory staff from Fiji, Kiribati, Vanuatu, Solomon Islands and Papua New Guinea. Eighteen participants achieved certification in sample packaging and transport and training on IFA and PCR.
- The WHO CC in Melbourne hosted laboratory staff from Saipan, Tonga, Solomon Islands, Fiji and Pohnpei for one week of intensive influenza training including IFA instruction and PCR.
- A LabNet regional workshop was held November 1-4, 2010 in Suva, Fiji for 19 countries from the Pacific Islands. The meeting's specific objectives included the following: provide an update on the role of laboratories in surveillance; define the role of SPC in the implementation of the *WHO Asia-Pacific Strategy for Strengthening Health Laboratory Services;* support the linkages between PICTs laboratories and reference laboratories in Australia, New Zealand and Hawaii; and discuss specific testing methods and training needs of laboratory staff.
- Training was provided on the packaging of infectious substances to meet International Air Transport Association requirements.

Further training is planned to occur at three levels; in-country training during follow-up visits, sub-regional workshops for human and animal health staff and intensive training at reference facilities.

2009 H1N1 Activities, FY 2010

The 2009 H1N1 pandemic presented a huge challenge to PICTs, which generally have limited diagnostic facilities and developing surveillance and response capacity. PPHSN supported PICTs through the communication mechanisms of PacNet and associated networks, which allowed for rapid dissemination of information and feedback from PICTs. The pandemic highlighted the importance of surveillance and well-established sample referrals mechanisms. A key challenge during 2010 was to build on and sustain these fragile systems.

Key 2009 H1N1 Activities, 2010

- Information on 2009 H1N1 was disseminated through the PacNet and PacNet restricted communication services during the outbreak.
- PHSSN supported the National Task Forces and the development or revision of National Influenza Pandemic Preparedness plans during in-country visits.
- PICTs continued to receive communication materials on cough and sneeze etiquette and information related to infection control.

- Scientific literature was consulted regarding the use of rapid test kits and IFA in the detection of 2009 H1N1. In-country visits were used as opportunities to discuss with laboratory staff and clinicians the limitations of rapid tests kits and IFA in the diagnosis of influenza.

Other Notable Achievements in FY 2010

- Most PICTs have been unable to send live virus samples because of the difficulties of storage and transport of samples in VTM. For most PICTs that meant that samples in alcohol were sent for PCR testing. Funding provided by CDC was used for the procurement of -80OC freezers for nine PICTs. The logistics of purchasing, sending and establishing freezers in the PICTs proved a challenge. Country visits have been used to provide training on the use of the freezers and the method of packing samples in dry ice. The use of VTM will allow for culture, antiviral susceptibility testing and further characterization of influenza viruses found in the Pacific region.
- Successful sub-regional workshops undertaken at NCBID and Mataika House in 2010 along with a 2009 workshop in Guam for the U.S.-affiliated Pacific islands established a new approach to the organization of laboratory influenza surveillance networks in the Pacific region. The workshops were highly valued and significantly increased participants' knowledge and experience of influenza testing and surveillance.
- The establishment of a standardized syndromic surveillance system for PICTs, including a standard ILI definition, is contributing to improved influenza surveillance in the region.

Special Influenza Projects

The technical difficulty of IFA along with high staff turnover means that proficiency with IFA testing is difficult to maintain in PICT laboratories. The use of digital images taken on-site in PICT laboratories and transmitted to a reference laboratory will be tested. If successful, this system would help to maintain technical expertise and would be an adjunct to current quality assurance.

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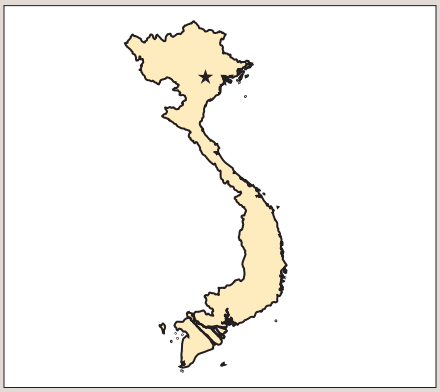

- **Capital:** Hanoi
- **Area:** 331,210 sq km
- **Population:** 90,549,390 (July 2011 est.)
- **Age Structure:** 0-14 years: 25.2% (male 11,945,354/female 10,868,610); 15-64 years: 69.3% (male 31,301,879/female 31,419,306); 65 years and over: 5.5% (male 1,921,652/female 3,092,589) (2011 est.)
- **Life Expectancy at Birth:** total population: 72.18 years; male: 69.72 years; female: 74.92 years (2011 est.)
- **Infant Mortality Rate:** total: 20.9 deaths/1,000 live births; male: 21.27 deaths/1,000 live births; female: 20.48 deaths/1,000 live births (2011 est.)
- **Literacy Rate:** total population: 90.3%; male: 93.9%; female: 86.9% (2002 est.)
- **GDP:** $278.1 billion (2010 est.)
- **GDP per Capita:** $3,100 (2010 est.)

U.S. CDC Direct Country Support

In 2005, CDC Influenza Division placed an assignee in Vietnam to support collaboration on avian influenza (AI) with the Government of Vietnam. A cooperative agreement with Vietnam's MOH was established in 2005 to develop a national influenza surveillance system that would include surveillance for human influenza H5N1 cases. In 2006, a second cooperative agreement began, to address the three pillars of influenza prevention and control: preparedness and communication, surveillance and early detection of signs of an influenza pandemic, and rapid response and containment of disease outbreak.

In 2009, a second person, a medical epidemiologist, was assigned to Vietnam. The team works collaboratively to support the Animal-Human Interface (AHI) work, which looks more closely at the risk factors for cross-species transmission of influenza and other zoonotic diseases, and provides for stronger collaboration between the animal health and human health sectors. A research cooperative agreement with the MOH began in 2009 for research related to influenza and other emerging and re-emerging infectious diseases. In 2010, a sustainability cooperative agreement for national influenza surveillance with the MOH began and a letter of intent with the Vietnam Ministry of Agriculture and Rural Development (MARD) to enhance partnership at the animal-human interface of influenza and other zoonotic disease surveillance and research in Vietnam was assigned.

Surveillance

In 2005, CDC entered into a five-year cooperative agreement with the Vietnam MOH National Institute of Hygiene and Epidemiology (NIHE) to establish a national influenza surveillance system. Developed primarily as an outpatient surveillance system for ILI, the system initially had four sites. Later, a total of 15 sites were strategically located throughout the country's four geographic regions. The system also

included nationwide passive surveillance, which detected cases of unexplained severe pneumonia in hospitals, including the vast majority of Vietnam's confirmed human H5N1 cases. The second five-year cooperative agreement started in 2010 with a similar design, and expanded surveillance to include inpatient SARI. Currently, there are 11 sentinel sites in this sustainability cooperative agreement, including five sites for both ILI and SARI surveillance and six sites for ILI-only surveillance.

Key Surveillance Activities

- NIHE completed the first five-year cooperative agreement of influenza surveillance and conducted a review of surveillance activities from 2006-2010.
- NIHE presented influenza surveillance data at international influenza conferences, including ICEID 2010, Options VII, and a workshop on emerging vector-borne and zoonotic infectious disease in Southeast Asia.
- NIHE and CDC refined the location of sentinel sites and data collection forms for the second surveillance cooperative agreement based on the experience and lessons learned from the first cooperative agreement implementation.

U.S. and Vietnam government officials sign a bi-lateral Letter of Intent at the IMCAPI meeting, between the CDC Influenza Division and the Ministry of Agriculture and Rural Development, to support continued partnership in surveillance and research of influenza and other zoonotic diseases, Hanoi, Vietnam 2010.

Laboratory

Vietnam has two National Influenza Centers, NIHE in Hanoi and Pasteur Institute in Ho Chi Minh City. Vietnam has been providing influenza specimens to the WHO CC Atlanta since 2006. In addition, the MARD National Centre for Veterinary Diagnosis has provided numerous poultry influenza samples to the CDC Influenza Division laboratories.

Key Laboratory Activities

- NIHE tested 4,400 samples collected from the outpatient sentinel sites of the National Influenza Surveillance System in 2010, with an influenza positivity rate of 22%.
- NIHE tested 132 samples from persons with severe unexplained pneumonia, detecting all 7 of Vietnam's reported H5N1 cases, and 16 cases caused by other influenza subtypes.
- NIHE provided 50 influenza specimens to the WHO CC Atlanta.
- NIHE and CDC developed a new database for linking epidemiology and laboratory influenza data.
- NIHE developed a surveillance system for oseltamivir resistance, to start in 2011.

Preparedness

Technical support from CDC for pandemic preparedness started in 2006 in the form of a cooperative agreement with the Vietnam MOH General Department of Preventive Medicine (GDPM). The agreement focused on helping with the development, revision and testing of avian influenza and pandemic influenza preparedness plans for government, agencies, and organizations; coordinating activities and the sharing of information among partners, and; developing and disseminating communication messages and materials.

Key Preparedness Activities

The following activities were undertaken by GDPM:

- Supported the development of a national action plan on avian influenza prevention.
- Supported the updating and revision of the circular *Regulating the Mechanism of Informing and Reporting Infectious Diseases*.
- Conducted simulation exercises for influenza pandemic preparedness in three provinces.
- Conducted a review workshop on the communicable diseases reporting system.
- Updated *Practical Guideline on Influenza A Infection Control in Health Care Facilities*.
- Produced and disseminated messages via mass media to increase awareness and behaviors of general population related to influenza prevention and control.

Training

CDC-Vietnam partners hosted the following training activities in 2010:

- Training on surveillance and reporting of potential pandemic threats and emerging diseases for preventive medicine staff at national level.
- Revision of training documents related to surveillance, prevention, control and treatment of influenza and influenza pandemics for preventive health workers at the provincial level.

CDC hosted the following training activities in 2010:

- Bioinformatics and phylogenetic workshop for laboratory personnel in Vietnam.
- Laboratory capacity-building training at CDC-Atlanta for personnel from the MARD Department of Animal Health.

CDC Influenza Division and Ministry of Health NIHE partners attend a workshop of the CDC-supported National Influenza Surveillance Project, Hanoi, Vietnam, 2010.

The following training activities have been planned for the year 2011:

- Training on timely detection of, reporting of, and measures for controlling avian influenza cases in health care settings for health care workers.
- Training on influenza epidemiology and supervision capacity of preventive medicine staff at provincial levels.
- Training for provincial rapid response teams on surveillance and response to influenza outbreaks.

2009 H1N1 Activities, FY 2010

The first case of 2009 H1N1 virus infection was identified in Vietnam in May 2009. The number of cases increased rapidly and peaked in September 2009, reaching over 10,000 cases in October 2009 before the MOH stopped counting all individual cases. Pandemic 2009 H1N1 virus activity largely disappeared by May 2010 but started increasing again in December 2010.

Key 2009 H1N1 Activities, 2010

- MOH tracked and responded to pandemic 2009 H1N1 with surveillance and preparedness systems supported by CDC.
- MOH included 2009 H1N1 in the epidemiology and laboratory surveillance programs, demonstrating that it caused more cases of unexplained severe pneumonia than any other influenza subtype in 2010, including H5N1.
- MOH conducted genetic and molecular epidemiological analysis of the 2009 H1N1 virus, identifying mutations similar to those found in other locations in the world.

Special Influenza Projects and Other Notable Achievements in FY 2010

- In early 2010, through the MOH-NIHE cooperative agreement the AHI initiative supported a joint surveillance project between MOH and MARD to detect the types and prevalence of influenza virus in people, pigs, and poultry living in close proximity in rural Vietnam. This was the first AHI project and a significant achievement for the IP in Vietnam, as well as for MOH and MARD.
- A letter of intent was signed between Vietnam MARD and U.S. Department of Health and Human Services (HHS) to enhance partnership at the animal-human interface of influenza and other zoonotic diseases surveillance and research.
- Six influenza laboratory and epidemiology abstracts from Vietnam partners were accepted at the Options for Control of Influenza VII conference, Hong Kong.
- CDC Influenza Division assisted Vietnam's first FETP class with classroom technical assistance and abstract review for TEPHINET and other conferences.

Public Health Importance

- CDC-supported work has directly enhanced collaboration between MOH and MARD, which will continue to benefit research on influenza and other zoonotic diseases, as well as the detection of and response to H5N1.

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Influenza Research

Burden of Disease and Risk Factors

Bangladesh

Estimating the burden of influenza-associated mortality through severe acute respiratory infection in Matlab population-based surveillance

A recent study performed within a hospital-based surveillance platform documents a burden of nine influenza cases per 100 person-years among persons of all age groups in Bangladesh. This influenza incidence rate is similar to rates calculated from a population-based surveillance site in urban Dhaka (10 per 100 person-years) and rates throughout Southeast Asia. These population–based efforts, however, have been unable to estimate influenza mortality. This longitudinal study aims to estimate the incidence of severe acute respiratory infection (SARI) and the mortality rate attributable to respiratory viral infections in Matlab, a rural sub-district of eastern Bangladesh during five months of the 2010 influenza season.

Study Aims and Objectives:

- Estimate the mortality rate with influenza and other viral respiratory infections in this community-based surveillance site.
- Determine the sensitivity of commonly used influenza case definitions.
- Identify subpopulations at risk of dying with influenza.
- Quantify co-infections with immune-preventable or treatable pathogens.

Approach: From June through October 2010, field staff made weekly home visits and daily hospital visits to report potential SARI case-patients in the community or at the hospital. A study physician obtained a nasopharyngeal swab from all enrolled case-patients, and collected blood for culture from hospitalized case-patients. All swabs were tested for influenza A and B viruses, respiratory syncytial virus (RSV), human metapneumovirus (hMPV), adenoviruses and human parainfluenza viruses (HPIV) type 1, 2 and 3 by real-time RT-PCR. Blood was tested for *Streptococcus* species, *Staphylococcus* species, *Hemophilus* species, *Klebsiella pneumoniae, Enterococcus faecalis, Acinetobacter* species, *Pseudomonas* species and *Candida* species. Deaths of any SARI case–patients were identified and a nested case-control study was planned to identify potential risk factors for death among SARI case-patients.

Timeline: Data and sample collection was completed from June to October 2010. Data analysis and write-up is currently ongoing.

Progress and Findings: During the study period, 172 SARI case-patients were identified in a community of 113,660 persons including 13,115 children of less than 5 years of age. Among the case-patients, 141 were children less than 5 years of age. Respiratory viruses were detected in 82 case-patients, with most of them being under 5 years of age. The incidence of SARI attributable to respiratory viruses among children younger than 5 years of age was 19.3/100,000 child-week for RSV, 3.5/100,000 child-week for HPIV3, 3.2/100,000 child-week for influenza and 1.8/100,000 child-week for adenovirus. The incidence of SARI attributable to respiratory viruses among those older than 5 years of age was 0.2/100,000 person-week for influenza and 0.04/100,000 person-week for RSV. No death among SARI case-patients was reported.

Conclusion: Respiratory viruses, and in particular RSV, are commonly associated with severe acute respiratory infection among children under 5 years in this rural setting. Further studies to provide influenza mortality data are critical to understand the burden of influenza disease in Bangladesh and to appropriately prioritize influenza prevention and control efforts in a country with many competing health priorities.

Incidence of influenza-associated mortality in Bangladesh: 2008–2009

Although data on incidence of influenza deaths could help policy makers prioritize allocation of scarce resources, limited information is available from Bangladesh. Influenza surveillance data and community surveys were leveraged to estimate the incidence of influenza mortality in Bangladesh during 2008–2009.

Study Aims and Objectives:

- Estimate the incidence of influenza-associated mortality during 2008-2009 within the study area.
- Project national death estimates attributable to influenza.

Approach: ICDDR,B in collaboration with the government of Bangladesh and funding from CDC has been conducting hospital-based enhanced influenza surveillance in four sentinel hospitals. Two days per month, surveillance physicians collect respiratory samples from hospitalized severe pneumonia (younger than 5 years) and severe acute respiratory infection (younger than 5 years) case-patients who reside in the hospitals' catchments areas. All samples are tested for influenza virus using real-time RT-PCR. Twenty randomly selected unions (smallest administrative unit) from the hospitals' catchment areas were identified and canvassed to identify persons who died during 2008–2009. To estimate the incidence of influenza-associated deaths, the number of decedents in the catchment areas who had sudden onset of fever and cough or sore throat within 14 days of death was multiplied by the proportion of sampled hospitalized case-patients who were positive for influenza at the sentinel hospitals and then this numerator was divided by the census population of the survey sites.

Timeline: The community survey was conducted between February and May 2010. The influenza surveillance is ongoing in the four sentinel sites.

Progress and Findings: Of 4,358 decedents identified, 578 (16%) had fever and cough and/or sore throat within 14 days of death. The annual incidence of influenza-associated death during 2008-2009 was as follows for different age groups: 2 per 100,000 person-years (py) for children under 5 years of age, 5 per 100,000 py for those aged 5 to 60 years, and 87 per 100,000 py among individuals aged over 60 years. Assuming the rates were similar in other parts of the country, we project approximately 15,000 influenza-associated deaths occur annually with 440 occurring among children aged less than 5 years. The findings were presented at the Options for the Control of Influenza VII conference held in September 2010 and a manuscript is in preparation.

Conclusion: The data suggests the highest burden of influenza mortality is among the elderly. Investing in cost-effective scalable interventions may help lower influenza disease burden. The study demonstrates that our method of combining community survey and influenza surveillance data can be adopted in other similar resource-poor settings to provide estimates of influenza-associated deaths where there is limited use of vital registers and many deaths occur at home.

Estimating the financial burden of influenza and other respiratory pathogens in four tertiary hospitals in Bangladesh

Recent studies suggest that influenza and other respiratory diseases are prevalent and costly in Bangladesh. In Kamalapur, a low income neighborhood of Dhaka, influenza caused 84.5 episodes/1,000 children-years and was responsible for 14% of pneumonia cases among children under 5. The cost of having a child hospitalized for pneumonia was estimated at US $94 per illness episode and the cost of outpatient respiratory infections at US $3.7. Hospital expenditure exceeded 50% of the most families' monthly income, thus hospitalization for respiratory diseases represents a catastrophic cost for patients. The economic burden of influenza in Bangladesh is believed to be similar to that found in the pneumonia studies.

Study Aims and Objectives:

- Estimate the direct expenditures incurred by hospitalized patients who test positive for respiratory pathogens.
- Provide policy makers from the Government of Bangladesh with initial estimates of the cost associated with influenza and other respiratory pathogens so as to better evaluate the value or respiratory illness intervention and prevention strategies.

Approach: From May 2010 to October 2010, each month we listed all patients from four tertiary hospitals who were hospitalized with respiratory illnesses and tested positive by rRT-PCR for any of the following respiratory viruses: influenza, RSV, parainfluenza type 1, 2 and 3, rhinovirus, adenovirus or metapneumovirus. Within 30 days of discharge from the hospital, interviewers administered a structured questionnaire at the patient's residence and collected information on the total direct cost of treatment which included medical costs (physician consultation fees, hospital bed, medicines and diagnostic tests) and non-medical costs (food and travel). Prescription and discharge reports were used to estimate medical costs; patients helped categorize out-of-pocket medical cost or hospital-supported medical cost. Additionally, patients were questioned to identify the strategies used by families to meet the treatment costs (e.g. from monthly income, by borrowing or savings).

Timeline: May to October 2010, spanning the annual influenza season in Bangladesh.

Progress and Findings: The study was finished in October 2010 and preliminary analysis of the data focusing on inpatients has been completed. The study findings will be presented at an international scientific conference by a junior Bangladeshi scientist who implemented the study. Thirty-eight patients under 5 years of age and 34 patients over 5 years were enrolled. The median monthly household income was US $123. The median direct cost per episode was US $39 among patients under 5 and US $49 among patients over 5 years of age. On average, medical cost was 64% of the total direct cost. The majority of medical cost was out-of-pocket as hospital supported only a small fraction of expenses. One-third of patients spent over 50% of their total family monthly income for the treatment of an episode of respiratory viral illness. Sixty percent of families borrowed money to manage the expenditure and 44% of those, borrowed with a mean monthly interest of 78%. Sixty percents of families reported that they had to reduce their monthly food expenses to manage the expenditure of treatment.

Conclusion: Costs for hospitalizations with respiratory viral infections results in significant financial hardship to the families. Cost-effective prevention programs can reduce both clinical morbidity and related cost of treatment.

Longitudinal assessment of the effect of influenza on the cognitive development of urban poor children, Bangladesh

Frequent, protracted, and severe influenza disease may cause cognitive developmental delays in very young children, as has been previously shown with other infectious pathogens. Substantiating whether frequent respiratory infections delay cognitive development is important because of the long-term implications for affected children and their communities. This protocol proposes to study, during two years, the association between rates of influenza disease and delayed cognitive development in a birth cohort of urban poor children aged less than 2 years based in Mirpur.

Study Aims and Objectives:

- Assess the potential association between the frequency, duration, and severity of influenza disease and delayed cognitive development in a birth cohort.
- Assess the attributable risk of secondary tobacco exposure, indoor air pollution, and infrequent hand washing to the frequency, duration, or severity of acute respiratory infections (ARI) and laboratory-confirmed influenza disease in participating birth cohort children.
- Explore genome-wide associations with frequency, duration, and severity of laboratory-confirmed influenza disease in participating children.

Approach: Participants aged 3-12 months were enrolled into the study and followed during two years to determine the hazard of delayed cognitive development; quantify the incidence of ARI, laboratory-confirmed influenza, and diarrhea; administer yearly cognitive tests; and survey covariates. Field teams also collected socio-demographic information from each of the enrolled participants and recorded monthly indoor air particulate matter levels during 2009 among a subset of children. Study teams visited households every three days to administer a brief standard questionnaire using PDAs and determine if participants have developed ARI or acute diarrhea in the past three days. If field teams identified ARI case-patients, they requested that the children be taken to the neighborhood clinic for sampling of nasopharyngeal washes. Respiratory samples were tested for influenza A and B, parainfluenza 1 and 3, RSV, adenovirus, rhinovirus, bocavirus, and human metapneumovirus by real-time RT- PCR. Blood samples were collected for genome-wide association analysis.

Timeline: April 2009 to March 2011.

Progress and Findings: Enrollment of the children in the study is complete and follow-up is ongoing.

From April 2009 through March 2010, 415 children were followed for a total of 307 child-years. A total of 273 children developed 578 episodes of ARI and respiratory viruses were detected in the majority of these episodes. Of the 578 episodes of ARI, 198 were diagnosed as clinical pneumonia. The annual incidence of pneumonia associated with different respiratory viruses were 14 episodes per 100 child-year for RSV, followed by rhinovirus at 8, human metapneumovirus at 7, influenza at 6, adenovirus at 2 and parainfluenza virus 3 at 2 episodes per 100 child-year. These preliminary findings confirm that childhood pneumonia is prevalent and that viruses are frequently identified in urban poor children aged less than 2 years of age with pneumonia in Bangladesh. Two manuscripts are being drafted on findings from the first year. Further data analysis will explore the primary objectives of this study, but the viral incidence data illustrates how research platforms can be leveraged and allow for time-sensitive studies to be performed in a cost-effective manner.

Central America

Characterization of 2009 H1N1 cases and deaths in El Salvador, Guatemala, Costa Rica, Panama and Dominican Republic

During 2009, the epidemiologic and clinical characteristics of 2009 H1N1 were poorly understood. A priori, health authorities considered persons with risk factors for severe disease from seasonal influenza (i.e. children younger than 5 years of age, persons with chronic medical conditions, and persons older than 65 years of age) as potentially at high risk of developing complications from 2009 H1N1. To explore the epidemiologic characteristics of decedents infected with 2009 H1N1, ministries of health in Central America and Dominican Republic implemented active surveillance for 2009 H1N1 decedents.

Study Aims and Objectives:

- To explore the epidemiologic characteristics of decedents infected with 2009 H1N1, ministries of health in Central America and Dominican Republic implemented active surveillance for 2009 H1N1 decedents.

Approach: Ministries of health actively searched for case-patients through rumor reporting, event-based surveillance, sentinel site hospitals, and death reporting systems. Upon identifying potential case-patients, health authorities obtained verbal autopsies and clinical records (when available) to determine if decedents met the SARI case-definition two weeks before death. Using standardized questionnaires, health authorities systematically abstracted demographic and clinical information from SARI-confirmed decedents' close relatives or clinical records. We described 2009 H1N1-positive SARI decedents' demographic and clinical characteristics through proportions and graphical representations.

Timeline: May to December 2010.

Progress: The survey was completed, the databases are available, and the data analysis is ongoing. The manuscripts were presented in January 2011.

Conclusion: During 2009, we identified 92 SARI decedents, all of whom were tested for respiratory viruses. The median age of 2009 H1N1-positive SARI decedents was 29 years and 52 (57%) were female. Out of 52 female decedents, 16 (31%) were pregnant. The most common pre-existing conditions observed were asthma, diabetes and obesity. On average, 2009 H1N1-positive SARI decedents presented for care a median of three days from symptom onset and died seven days from consult. The most common admitting diagnoses were pneumonia, bronchopneumonia, and pharyngotonsilitis. The most frequent pathological findings were cardiomegaly, pulmonary hemorrhage, and neutrophilic bronchopneumonia. The pandemic disproportionately affected the young and healthy in Central America and Dominican Republic. Case-patients frequently presented late for care and did not receive oseltamivir. Such findings were also applied to high-risk groups targeted with risk communication messages.

Ecological Study of Excess SARI during Influenza Pandemic in 2009; El Salvador, Costa Rica, Nicaragua and Guatemala (San Juan de Dios Hospital)

The occurrence of pandemic 2009 H1N1 was accompanied by doubts about the severity of the disease. Because of the difficulty in identifying all severe cases of influenza A (lack of resources and supplies), the cases of severe acute respiratory illness (SARI) were studied as a proxy for severe influenza cases. This study, conducted in different countries, gave a regional view of the pandemic with data from multiple sources such as surveillance, social security and a national hospital.

Study Aims and Objectives:

- Determine the excess of SARI case admissions to hospitals during 2009 as an indirect measure of the impact of the pandemic.

Approach: In Nicaragua, the data source was the daily information gathered by the Statistic Planning and Information Directorate of the MOH (129,586 hospital admissions between 2004 and 2009). In El Salvador, weekly information collected by the Morbidity and Mortality System of the Epidemiological Surveillance Directorate at the MOH (83,647 hospital admissions 2005-2009) was used. In Costa Rica, the data source was the weekly information gathered by the Social Security Fund (Caja Costarricense del Seguro Social) (95,413 hospital admissions from 2000 through 2009). Guatemala National Hospital San Juan de Dios Epidemiological Surveillance Unit provided information on a weekly basis (9,763 hospital admissions, period 2002-2009). Time series analyses were conducted. SARIMA model was fitted with the pre-pandemic data, forecasting of expected hospital admissions was generated with 95% Confidence Intervals.

Timeline: March to September 2010.

Progress: The survey was completed, the databases are available and the data analysis is ongoing. The manuscripts will be presented in March 2011.

Conclusion: Excess hospital admissions were defined as: the difference between the observed hospital admissions in 2009 and the forecasted number of admissions generated by the model (Upper Confidence Interval) for each country. In the first quarter of 2009, an excess of 262 hospitals admissions was found for Nicaragua; this is a 10.19% excess (95% CI: 10.15-10.22). Nevertheless, during the pandemic period, the data did not show any excess. In El Salvador, findings revealed that an excess of 1,871 hospital admissions were observed between epidemiological weeks 27 and 37, or an excess of 118.66% (95% CI: 118.61-118.72). Costa Rica data did not show any excess of hospital admissions during 2009, and in Guatemala, data from San Juan de Dios Hospital revealed an excess of 32 hospital admissions, or 35.99% (95% CI: 34.98-36.99) between epidemiological weeks 27-30.

Cambodia

Epidemiology of Human Influenza in Kampong Cham Province, Cambodia

Active community-based surveillance covering 25 villages (cohort population around 15,000, all ages) in Kampong Cham province, about 130 kilometers north of Phnom Penh capital. This surveillance was implemented by Institut Pasteur – Cambodia (IPC) with support from U.S. CDC and was a component added to an existing community surveillance of febrile illness and dengue fever in the same cohort villages supported by the Pediatric Dengue Vaccine Initiative of the International Vaccine Institute (PDVI-IVI).

Study Aims and Objectives:

- Describe the seasonality, age distribution and transmission patterns.
- Describe the burden of disease including incidence rates, hospitalization rates and mortality rates by age group.

Approach: In 25 target villages, villagers of all ages were eligible for the surveillance of fever illness. Village Teams (VT) performed weekly household visits to take a temperature reading, identify and document subjects having fever or history of fever during the past six days using digital thermometers and report them to nurses at the pediatric ward of Kampong Cham provincial hospital by phone. Fever is defined as a body temperature ≥37.5°C measured at armpit.

Nurses visited fever cases at home to conduct an interview and take a nasopharyngeal swab and blood samples, after obtaining signed written consent from each participant.

For each fever episode, swab and blood samples were collected at one or two days following fever onset (first visit) and a second blood sample was collected at 14 days later (second visit). All specimens were shipped to IPC in Phnom Penh for viral detection, subtyping and serology testing.

Timeline: March 2009 to February 2010.

Progress and Findings: A total of 4,168 fever episodes were identified with 4,114 nasopharyngeal swab samples obtained. A total of 1,712 (42%) swab specimens were tested; of these, 182 were positive for influenza A/B infections. The predominant influenza virus circulating in 2009 was H3N2 subtype (75.8%) followed by 2009 H1N1 (14.3%) and influenza B (9%). Seventy-nine percent of positive cases were among subjects younger than 20 years of age.

By applying the total percentage of influenza-positive specimens to all detected fever cases, the estimated incidence of flu A or B was of 26.4 per 1,000 population (95% CI: 17.7 - 47.6). Estimated incidences per 1,000 by virus subtype were 20.0 (95% IC: 12.5 - 30.6) for H3N2, 3.7 (95% IC: 1.5 - 8.2) for 2009 H1N1, 2.5 (95% IC: 0.6 - 7.8) for influenza B, and 0.20 (95% IC: 0.01 - 0.9) for seasonal H1N1.

A clear seasonality of influenza activity was observed with increased influenza infections during July and November and peak detection during September – November, representing 65% of the positive specimens.

Costa Rica

Household survey to estimate the prevalence and burden of severe acute respiratory infection, influenza-like illness and 2009 H1N1 in Cartago, Costa Rica

Influenza epidemiology knowledge is limited in Central America, since sentinel surveillance focuses mainly on laboratory functions. In response to the need for better knowledge about the impact of this disease among the population in 2010, the Costa Rican Social Security Fund, with technical assistance from the Influenza Program, implemented a survey on the use of health care services in the sentinel surveillance platform of Cartago, Costa Rica.

Study Aims and Objectives:

- Estimate crude rates of ILI and SARI among the studied population, for the last 30 days and 12 months, respectively.
- Describe health care services practices for identified persons with symptoms consistent with ILI and SARI definition.
- Estimate economic and disease burden in households with SARI and ILI identified cases.

Approach: The survey was applied in a random sample of houses located in six cantons and 30 districts, which serve as approximately 80% of the catchment population for health care services provided by the hospital Max Peralta of the province of Cartago, Costa Rica. The sample was a multistage model, with the first stage cluster sampling and the second stage a systematic random sample within each cluster, and for the different stratums. The size of the sample was n=1,500 (77% in urban zone, and 23% in rural zone). Data was collected in every selected house that previously completed informed consent, through validated and standardized questionnaires. The questionnaires asked about symptoms, disease burden, what kind of health care service was sought or the reason why they did

not request health care services, and related risk factors. Cases were identified using the WHO case definitions of ILI and SARI. Biological specimens were not obtained from the identified cases.

Timeline: June to July, 2010.

Progress: The survey was completed, the databases are available and the data analysis is ongoing. The manuscripts will be presented in January 2011.

Conclusion: Of the studied households, 13.9% (209/1500) registered an ILI case, or 4.5% (291/6,453) of the sample population. Of the studied households, 4.4% (68/1500) reported a SARI case, which is equivalent to 1.5% (95/6453) of the persons in the sample. Ninety-four percent of the households had health insurance provided by the Costa Rican Social Security Fund, 2% had private insurance, and 4% did not report health insurance. Related to use of health care services, 70.6% (204/291) of the persons with ILI requested health care services. Among the SARI cases, 80% (76/95) requested health care services. The average number of work days missed by persons with ILI was 4.3 days, and on average there were 4.8 school days missed due to ILI. Of those with ILI, 22.85% (64/280) reported loss of income during the disease due to wages decrease ($40) and loss of other kind of incomes ($30). Thirty-one percent (87/280) of main caregivers reported loss of income during the disease ($22.5), wage discounts ($20) and loss of other kind of income ($40).

El Salvador

Household survey on the use of health care services for respiratory infections in urban and rural populations within five municipalities of Santa Ana, El Salvador

A population survey to estimate the frequency of influenza-like illness (ILI) and severe acute respiratory infection (SARI) and to describe the pattern of use of health care services was carried out by the Ministry of Health (MOH) of El Salvador in late 2009, with technical support from the CDC Central America and Panama (CDC-CAP) Influenza Program. This was conducted with a population sample of five municipalities within the catchment area of the influenza surveillance sentinel unit of Santa Ana, El Salvador.

Study Aims and Objectives:

- Estimate the ILI frequency in the 30 days previous to the population survey.
- Estimate the SARI frequency in the 12 months previous to the population survey.
- Describe the pattern for the use of health care services due to ILI and SARI identified among the surveyed population.

Approach: Using data from the last population census of El Salvador, the geographical area that captures the population seeking care at the influenza surveillance sentinel unit of Santa Ana City was determined. Five municipalities were selected around the sentinel hospital, which provided 80% of the hospital discharges due to SARI-related causes in the last three years. A two-stage cluster sampling using census segments for urban areas, and local maps by cantons for rural areas, was carried out. The sampling size was estimated in 1,680 households through a formula of proportions, and was stratified by urban/rural. Four teams of previously trained surveyors were formed; they surveyed one person (the head of household, ideally) of every selected household, according to the programmed routes, collecting data from the persons who live in the house and who had lived there during the last six months, by means of a questionnaire previously validated and standardized. Surveyed persons were asked to provide informed consent.

Timeline: November to December 2009.

Progress: The study was completed. Databases are available. Currently, the data analysis is being performed. The first manuscript will be presented in February, 2011.

Conclusion: A total of 7,683 persons were surveyed in 1,663 households (an average of 4.62 persons by household.). Four hundred and sixty-four (6%) ILI cases were reported during the days previous to the survey, and 52 (0.7%) SARI cases were reported during the 12 months previous to the survey. Two hundred fifteen (46.3%) people who reported ILI sought medical care, 155 (33.4%) in some health care facility of the MOH and 10 (2.2%) went to the SARI sentinel unit hospital of Santa Ana. Only six (11.5%) of the total identified SARI cases reported going to the sentinel hospital of Santa Ana. ILI is common among the population; nevertheless, only half of the people seek medical care in health services and one third of people go to a public health network facility in the country. Pneumonia and SARI are less frequent among the population, but a higher percentage of persons seek medical care for these diseases, primarily in the network of the MOH, due to the severity of those diseases.

Influenza seasonality model established in El Salvador showing a Southern Hemisphere pattern during 2003-2009

In collaboration with Ministry of Health (MOH) of El Salvador, the in-country seasonality model was updated, using data available from 2003 to 2009.

Study Aims and Objectives:

- Determine the seasonality of influenza A in El Salvador.

Approach: An ecological time series study was conducted. Data collected by the surveillance system and tested with IFA, RT-PCR, and viral culture were analyzed. The following analysis methods were used: Simple Autocorrelation Function, Spectral Analysis, and a Generalized Linear Model. Of influenza-suspected cases, 6,163 specimens were processed and 21.5% were positive for influenza A [95% CI: 20.4-22.5].

Timeline: March to June 2010.

Progress: The survey was completed, the databases are available and the data analysis is ongoing.

Conclusion: A total of 6,163 specimens from suspect influenza cases were processed and 21.5% were positive for influenza A [95% CI: 20.4-22.5]. Influenza A positivity is approximately 30% in midyear; the highest peak was observed in 2009 (50%) and the lowest in 2007 (20%). An increase of influenza A cases was observed from June until December (influence of the pandemic in 2009). If 2009 data are removed, then the increase of flu cases is observed from June through September (relatively wide); Simple Autocorrelation Function showed a sinusoidal shape that suggests an annual seasonality; the Spectral Density Function showed a marked oscillation around 0.08-0.09 frequency corresponding to a 12 month period (seasonality). The Generalized Linear Model proved seasonality. The pattern found is similar to the one observed in countries of the Southern hemisphere with a peak in the middle of the year.

Ecological Study of Excess ARI, SARI and Deaths due to SARI, related to Influenza Virus Circulation in El Salvador (2007-2009)

After influenza seasonality was determined, a study was conducted in El Salvador, a first in the Central American region, to determine the respiratory disease burden attributable to influenza virus circulation. Severe acute respiratory illness (SARI), acute respiratory infections (ARI) and deaths caused by SARI were studied.

Study Aims and Objectives:

- Correlate the circulation of influenza virus with the occurrence of ARI, SARI and deaths due to SARI. A time series analysis was conducted.

Approach: The data sources were: Daily Epidemiological Report, Online Morbidity and Mortality National System, and data from the National Influenza Center. Co-linearity of circulation of influenza A, B; parainfluenza 1, 2 and 3; human respiratory syncytial virus and adenovirus was evaluated. ARI, SARI and deaths due to SARI time series data was pre-whitened using Box- Jenkins models for each viral positivity percentage ARIMA model and respective crossed correlations were determined. A Poisson regression model was fitted using the robust quasi Likelihood model (step by step backwards) of the morbidity and mortality time series data to estimate the Attributable Risk Percent of the Positivity Percentage for Influenza.

Timeline: July to September 2010.

Progress: The survey was completed, the databases are available and the data analysis is ongoing.

Conclusion: ARI does not demonstrate a marked seasonality, and is more frequent in children younger than 5 years old and young adults. Influenza was the cause of 10.4% of ARI in the general population in the period 2007-2009. In children younger than 1 year old, influenza caused 13.8% of ARI. In children 1-4 years old, influenza caused 9.9% of ARI and in those older than 60 years, 7.4% of ARI. SARI has annual seasonality (cases increase at midyear) and is more frequent in children younger than 1 year old. The main diagnosis at discharge in all age groups is pneumonia. During 2007-2009, 14.2% of SARI cases in the general population were due to influenza. In children younger than 1 year old, influenza causes 20.3% of SARI and in children 1-4 years old, influenza caused 20.7% of the cases. Estimates of the Incidence Rate Ratio for SARI deaths due to influenza were not statistically significant in all age groups and in the general population.

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 respiratory infections. To address this issue, a population-based longitudinal study is ongoing at three sites (collaboration between AIIMS, Delhi; Christian Medical College, Vellore; and Vadu Rural Health Program at KEM Hospital, Pune) with demographic surveillance systems (DSS) to estimate the burden of influenza in these communities.

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.
- Estimate the incidence of laboratory-confirmed influenza among medically attended outpatients seeking care 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 due to influenza, including underlying chronic conditions, demographics, smoking, and socioeconomic status.
- Describe the health care utilization of the population and define the burden of respiratory disease that did not seek care or refused hospitalization for severe respiratory illness, describe obstacles to care.

- Estimate the annual mortality rate due to severe respiratory disease and influenza in the population.

Approach: Persons living in the DSS areas in one of the three study areas (Ballabgarh, Vadu, and Vellore) that seek inpatient medical attention and meet the study enrollment criteria are enrolled, and clinical and epidemiologic information and respiratory specimens are collected from all consenting persons. Each site is also conducting a community-based survey to gather health care utilization data as well as household risk factors and socioeconomic status. Additionally, two sites (Ballabgarh and Vadu) are conducting outpatient screening and enrollment to estimate the burden of non-hospitalized medically attended influenza disease.

Timeline: April 2009 to September 2011.

Progress and Findings: The population under surveillance at three sites is approximately 300,000. The facility-based surveillance for medically attended inpatients has varied greatly both in enrollment and percent positivity for influenza from site to site. While Vadu/Pune revealed influenza positivity of 24% (683/2,866), Delhi has 8 % (62/775) and Vellore has 10% (29/284). Almost half of the infections at each site are due to pandemic 2009 H1N1. A preliminary estimate of influenza-related hospitalizations from these sites, based on eligible-cause hospitalization rate of 13/1,000 population/year and 8-10% influenza positivity, has allowed researchers to extrapolate the data for a national estimate of approximately 1.6 million total hospitalizations related to influenza. Studies are underway to do similar estimations from other sites to generate influenza disease burden and hospitalization estimates.

Vellore, India, one of the population-based study sites for the Influenza Disease Burden in India (IDBI) study, as seen from the roof of the Christian Medical College

Kenya

Population-based Surveillance for Influenza and Other Respiratory Diseases in Nairobi and Kisumu, Kenya

The Influenza Program in collaboration with the International Emerging Infections Program (IEIP) under KEMRI/CDC currently conducts population-based disease surveillance (PBDS) for severe acute respiratory illness (SARI) and influenza-like illness (ILI) in two sites in Kenya; Kibera, an informal urban settlement in Nairobi, and Lwak, a rural community in western Kenya. Approximately 25,000 residents are enrolled in each of the two sites.

Study Aims and Objectives:

- Characterize etiologies of acute respiratory illness in a rural community and an urban community in Kenya.
- Evaluate the burden of medically attended and home-reported influenza and other respiratory diseases.
- Provide a platform to evaluate interventions such as vaccine.

Approach: Community interviewers visit each household every week to ask residents questions about illness symptoms in the past week. In addition, residents have access to a free clinic, where surveillance is conducted for respiratory illness, including influenza, and a number of other disease syndromes. Patients meeting the case definition for SARI and ILI have a nasopharyngeal and oropharyngeal sample collected. Specimens for SARI and ILI are tested at the CDC IEIP laboratory in Nairobi for influenza and other viral pathogens using real -time RT- PCR. Data from weekly household visits, visits at the free clinics, and laboratory results are stored in a central database in CDC-Nairobi and at KEMRI/CDC, Kisumu.

Timeline: Surveillance for respiratory illness in the two sites began in 2006. The plan is to continue the project for at least five years so that seasonality, epidemiology and burden of influenza can be well-understood, and interventions such as vaccine can be evaluated.

Progress and Findings: The study is ongoing. However, preliminary analysis has been undertaken, and rates of influenza, pneumonia and laboratory-confirmed influenza virus infection have been determined for the first three years of acute respiratory illness surveillance. Influenza virus has been shown to circulate year-round with a peak in activity between July and October of every year. The rates for acute lower respiratory illness resulting in clinic visitation were 0.36 and 0.51 episodes per year for children younger than 5 years and 0.0067 and 0.0026 for persons 5 years and older in Asembo and Kibera, respectively.

Surveillance for Hospital-acquired Infections in Kenya

Surveillance for healthcare-associated infections (HAIs) in Kenya is an initiative to build infection control capacity initiated by CDC-Kenya and the Kenya Ministry of Health. The surveillance for HAIs is being conducted at three public hospitals -- a national referral hospital, a provincial general hospital, and a district hospital. This surveillance will help provide data on HAIs to the Kenyan government that can inform infection control policy decisions.

Study Aims and Objectives:

- Monitor respiratory, diarrheal, and non-specific (fever-associated) HAI among patients admitted to selected surveillance wards at three hospitals in Kenya.

- Assess the prevalence of respiratory infection in patients and health care workers on surveillance wards.
- Describe microbiology and clinical sequelae of incident respiratory HAI on surveillance wards.

Approach: At each site, surveillance officers survey pediatric, adult general, surgical, and specialty wards for HAIs. Patients admitted to the hospital for more than three calendar days who develop new onset of fever or hypothermia or who developed new onset of cough or sore throat are considered to have suspected HAI. Suspected HAI cases are assessed for onset of clinical symptoms and signs by questionnaire and medical record review. Nasopharyngeal and oropharyngeal samples are then collected from these patients and sent to the CDC-Kenya laboratory in Nairobi, where they are tested by RT-PCR for influenza A and B, adenovirus, respiratory syncytial virus, human metapneumovirus, and parainfluenza virus 1, 2 and 3. Specimens positive for influenza A are subtyped by RT-PCR.

Timeline: Surveillance started in September 2009 and will continue for at least two years.

Progress and Findings: In the first 11 months of surveillance, a total of 437 case patients with suspected HAIs have been identified in the three hospitals. Of these suspected HAIs, 161 (36.8%) met the case definition for suspected respiratory HAIs, 23(5.3%) were suspected urinary tract infections, 16(3.6%) were suspected surgical site cases, and 12(2.8%) were suspected sepsis cases. Pandemic influenza was first identified in Kenya in late June 2009, and HAI surveillance documented six cases of nosocomial transmission of 2009 H1N1 in the three hospitals. The surveillance is ongoing; the intent is to collect enough data to inform the trends of HAIs in the selected facilities for the next three years.

Peru

Burden of illness and risk factors for transmission of seasonal influenza in four distinct regions of Peru

This study includes a prospective population-based cohort of 6,000 people to estimate incidence and disease burden, to assess risk factors and seasonality patterns for influenza (seasonal and pandemic H1N1 influenza), and to evaluate an alternative route of virus shedding. Data generated as part of this study will determine the most-at-risk groups for influenza, providing useful information for policy makers and program managers to develop prevention and control plans that are meaningful to the Peruvian context – and possibly that of other tropical countries in South America.

Currently two nested studies are being added. They are titled: 1) Intra-household/backyard Influenza Cross-Species Transmission Dynamics in Semi rural communities in Peru and 2) The effect of micronutrient deficiencies on frequency, severity and outcome of influenza-like illnesses.

Study Aims and Objectives:

- Estimate incidence of influenza.
- Estimate burden of influenza.
- Assess risk factor for influenza.
- Assess seasonality patterns for influenza.
- Describe the transmission epidemiology of influenza virus between human and domestic pigs and poultry in semi rural communities in Peru. (nested study)
- Estimate the effect of nutritional deficiencies on severity, frequency and outcome of influenza -like illness (ILI) infection among individuals living in semirural communities of Peru. (nested study)

Approach: This prospective, population-based cohort study was implemented with 6,000 people in four locations that are representative of the geographic and climatic diversity of Peru (Coast, Highlands, Jungle and Tropical dry forest). They are being followed using an active Influenza-like Illness (ILI) screening through household visits three times per week since late June 2009. Once all ILI cases are identified, they are sampled (throat and nose swabs) for laboratory confirmation (culture and rRT-PCR). Finally, they receive follow-up visits for 15 days to assess the economic burden of influenza through questionnaires.

Timeline: June 2009 to June 2012.

Progress and Findings: As a product of this active surveillance, we have identified 3,957 influenza-like illness syndrome cases in a year and a half period, and 1,573 (39.8%) samples tested positive for influenza. Of the positive samples, 36.9% were 2009 H1N1, 27.3% and 19.7% were seasonal H3N2 and influenza B respectively. On average, we found higher cumulative attack rates for 2009 H1N1 (8.9%) when compared to seasonal H3N2 (6.7%) and influenza B (4.8%). In a one-year analysis, overall rates of influenza infection for children under 5 were higher for all strains, compared to other age groups. Influenza infection rates were highest in Tumbes, followed by Lima, Puerto Maldonado and Cusco, with incidence rates of 211.41, 161.74, 74.50, 47.1 episodes/1000 person-years, respectively. Chronic conditions (i.e., diabetes, asthma, cancer, hypertension, bronchitis) were associated with an increased risk for infection across the four sites, RR= 2.19 (CI: 1.77-2.71), when controlling for age and gender. Smoking was not associated with increased risk of infection. Presence of a chimney, exhaust duct or open windows in the kitchen was observed as a protective effect in Cusco, RR = 0.77 (CI: 0.61-0.97). Having more than two persons sleeping per room was identified as a risk factor, RR=4.42 (CI: 1.04-18.79) in Puerto Maldonado.

West Africa

Delayed 2009 H1N1 Circulation in West Africa, May 2009-March 2010

Study Aims and Objectives:

- Summarize the laboratory and epidemiologic data in ten countries in Western Africa and Cameroon to better understand the epidemiology, introduction of and circulation of 2009 H1N1 in this region.

Approach: The country ministries of health and influenza laboratories in the following ten countries in the West African region were contacted: Cameroon, Cape Verde, Côte d'Ivoire, Ghana, Guinea, Mali, Mauritania, Niger, Nigeria, and Senegal. Influenza surveillance laboratory data was collected from May 4, 2009 until April 3, 2010, including laboratory diagnostic methods, the number of sentinel surveillance sites, number of specimens tested by week, number and percent positive for influenza by type and subtype, date of availability of 2009 H1N1 primers and date of first 2009 H1N1 case. The 2009 H1N1 predominance in a country was defined as when more than 50 percent of influenza subtyped strains were 2009 H1N1 over a four-week period.

Progress and Findings: This summary of pandemic activity in ten West African countries and Cameroon suggests that established sentinel surveillance systems and laboratory capacity to detect and subtype influenza strains determined that introduction and widespread transmission of influenza was delayed in this region. This shows that up to the end of 2009, 2009 H1N1 was a small minority of all typed influenza strains in the region, rising to be large majority only in 2010, and several countries did not detect 2009 H1N1 until at least six months after emergence of the pandemic strain in April. Of the six countries in West Africa that detected their first 2009 H1N1 case in 2009, the pandemic strain did not predominate until 2010 for five of them.

Lack of widespread transmission and little general availability of influenza vaccine suggest that substantial future 2009 H1N1 transmission in potentially immunologically naïve populations in the West African region remains possible. Vaccination and other prevention measures should be actively promoted, especially as health care systems in this region are often not well-equipped to treat severe respiratory diseases. This study highlights the importance of timely virologic surveillance in tracking pandemic and seasonal influenza transmission and the role of the Global Influenza Surveillance Network (GISN) coordinated by the WHO.

Disease Prevention

Bangladesh

Effectiveness of 2009 H1N1 Vaccine in Bangladesh, 2010; a Program Evaluation

During 2010, WHO and other international partners donated 15.5 million doses of 2009 H1N1 monovalent vaccine to Bangladesh in an effort to protect those at highest risk of complications from influenza illness. While the Government of Bangladesh vaccinated high-risk groups, we took the opportunity to estimate the effectiveness of the vaccine (VE) among health care workers (HCW), pregnant women and children. Measuring vaccine effectiveness is critical for a new vaccine as this estimation will help to develop recommendations or decide best use of the vaccine for future policy decisions.

Study Aims and Objectives:

- Estimate the vaccine effectiveness among health care workers, pregnant women and children who received 2009 H1N1 vaccine during the vaccination campaign.

Approach: Local health officials implemented a vaccination campaign during May-July 2010, with the technical assistance of WHO Extended Program on Immunization experts, to target prioritized high-risk groups (HCW, pregnant women and children more than 6 months to 5 years of age). Starting in May 2010, 12 geographically diverse hospitals and the vaccination centers in three unions (i.e. administrative units of Bangladesh with about 10,000 persons each) nearest to those hospitals were visited during the vaccination campaign, to randomly enroll participants recorded as vaccinated. Unvaccinated individuals were enrolled at a 1:1 ratio from the same hospitals and the same vaccination centers as vaccinated participants. Following enrollment, investigators telephoned and/or visited participants weekly to obtain nasal and oropharyngeal swabs during episodes of influenza-like illness (ILI, defined as sudden onset of fever with cough or sore throat) during the influenza season (May-October). Samples were tested for influenza by real-time RT-PCR.

Timeline: May to October 2010, spanning the annual influenza season in Bangladesh.

Progress and Findings: Over 500 vaccinated HCWs, 1,000 pregnant women and 300 children and their controls were enrolled in the study. None of the participating children tested positive for 2009 H1N1. Study participants who tested positive for influenza were infected with influenza A H3N2 and 2009 H1N1 viruses as well as influenza B virus. Of seven HCWs who were infected with 2009 H1N1, two were vaccinated compared to five who were unvaccinated. Of 11 pregnant women who were infected with 2009 H1N1, five were vaccinated compared to six who were unvaccinated.

Conclusion: Although the vaccine seemed effective, low circulation of 2009 H1N1 hampered our ability to differentiate the proportion of 2009 H1N1 infections among vaccine recipients and those unvaccinated. Further studies remain to be performed to fully evaluate the vaccine effectiveness of influenza vaccines considered for distribution in Bangladesh.

Central America

Surveillance of adverse effects allegedly attributed to the vaccine and effectiveness of the influenza A(H1N1) 2009 vaccine in Central America

When the influenza A (H1N1) vaccine was developed, a system was needed to detect adverse effects related to the vaccine. Per international recommendations, evaluations in cohorts of prioritized populations were proposed. CDC Central America and Panama (CDC-CAP) Influenza Program proposed

to evaluate the adverse effects potentially attributable to the influenza A (H1N1) vaccine, as well as the vaccine effectiveness in populations at risk.

Study Aims and Objectives:

- Evaluate the adverse effects allegedly attributed to the influenza A (H1N1) vaccine, as well as the vaccine effectiveness in populations at risk in El Salvador and Costa Rica.

Approach: In the first quarter of 2010, the influenza A (H1N1) 2009 vaccine was distributed in the countries of the region amidst controversy about the risks of the vaccine. An evaluation was implemented following people with chronic conditions, pregnant women, children, and health care workers to provide evidence to improve the population's confidence, strengthen the surveillance systems of adverse events following immunization (AEFI), and evaluate the effects of this vaccine.

Timeline: April to November 2010.

Progress: The survey was completed, the databases are available and the data analysis is ongoing.

Conclusion: In Costa Rica and El Salvador, follow-up cohorts of 10,000 vaccinated persons were organized. The AEFI related to the vaccine were found to be 0.2 x 10,000 applied doses. The more frequent AEFI were: headache (15%), pain in the vaccination place (12%), and sore throat (5%). All AEFI were mild and 60% were reported the first day.

Characterization of influenza vaccination policies in Nicaragua and El Salvador

CDC Central America and Panama (CDC-CAP) Influenza Program undertook a collaborative effort with country Ministries of Health to harmonize immunization policies and practices against influenza in Central America, Panama and Dominican Republic, in order to promote and strengthen preventive responses in the Region.

Study Aims and Objectives:

- Design and validate a model and tools to characterize influenza immunization policies and practices in Central America.

Approach: First, the immunization program was analyzed to evaluate the facilitating aspects and/or barriers within the program. An unfocused analysis was conducted to characterize the available resources and the performance of the immunization program at a sub-national level. The program's performance will be evaluated through the coverage achieved in different sub-populations, and the coverage achieved at the district level in different districts. A third part of the evaluation consisted of surveying clinical personnel with regard to influenza vaccination. Checklists and surveys addressed participants' knowledge and perceptions about influenza and influenza vaccination.

Timeline: The study was performed March – August 2010.

Progress: The survey was completed, the databases are available and the data analysis is ongoing.

Conclusion: In Nicaragua, seasonal influenza vaccination was introduced in 2007. The immunization program had a budget of US $5,518,114 intended for the purchase of biologicals, and 7% is earmarked for the purchase of seasonal influenza vaccine. There are approximately 460,000 doses of the vaccine available per year. Eleven of the country's seventeen sentinel sites were visited. The rapid assessment process also obtained information about vaccination coverage in health care workers (n=200) and other target populations for vaccination (n=195). Eighty-four percent and 31% of these individuals, respectively, received the seasonal influenza vaccine in 2009. The seasonal influenza vaccine was introduced in El Salvador in 2004. In 2009, the immunization program allocated US $2,178,100 to purchase the seasonal influenza vaccine. There are approximately 620,000 available doses of the vaccine

per year. Evaluators visited the five Health Regions of the country. In one sample (n=228) from the target population, 69% of health care users were vaccinated. Seventy percent of health care workers (n=240) were vaccinated.

Côte d'Ivoire

Awareness of the 2009 influenza A(H1N1) pandemic and willingness to be vaccinated among pregnant women in Ivory Coast, Africa

Study Aims and Objectives:

Prior to local distribution of pandemic vaccine in western Africa, knowledge of the 2009-10 influenza A (H1N1) pandemic (pH1N1) and vaccine acceptance were assessed among a diverse population of pregnant women.

Approach: A cross-sectional intercept survey of 411 pregnant women in four prenatal care settings was conducted February 15-28, 2010 in Abidjan, Ivory Coast.

Progress and Findings: The majority (64.5%) of pregnant women said they had heard of the influenza pandemic, and of these, the majority (61.3%) were aware of the pandemic vaccine. However, awareness varied significantly by clinical setting, education, and access to media. After adjusting for other socio-demographic factors, college-educated women were 16.8 (95% confidence interval, 3.3 – 85.2) times more likely to be aware of pH1N1 than women without formal educations. Of those aware of pH1N1, 69.8% said they would accept the pandemic vaccine while they were pregnant. Although pandemic awareness was highest in the private prenatal care settings, acceptance of vaccine was significantly lower in private compared to public care settings.

Conclusions: Gaps in knowledge about the influenza pandemic and vaccine highlight the challenges of pandemic preparedness in the developing world, where substantial disparities in education and media access are evident.

Dominican Republic

Clinical Trial of Safety (Reactogenicity) and Immunogenicity of Needle-free Jet Injection of Reduced-dose, Intradermal Influenza Vaccine Administered to Infants and Toddlers aged six months to less than 24 months of age, in the Dominican Republic

This is a sequential phase I and II, controlled, double-blinded study to determine whether immune responses suggesting protection against influenza can safely be induced in young children by two reduced doses one month apart of a trivalent inactivated influenza vaccine (INF) administered by the intradermal (ID) route with an investigational ID spacer on a needle-free jet injector (JI) (0.1 mL), compared to two standard intramuscular (IM) doses by needle-syringe (N-S) (0.25 mL). The locale is a developing country where financial restraints for the use of full-dose influenza vaccine would limit protection from an influenza pandemic threat, where N-Ss pose dangers and have drawbacks in clinical use and mass campaigns.

Study Aims and Objectives:

- Demonstrate the safety and immunogenicity of a dose-sparing intradermal (ID) method to allow larger numbers of young children to be protected when supplies of influenza vaccine are limited.
- Prove the principle that needle-free jet injection can obviate the cost, time, expertise, and difficulty administering ID injections by the Mantoux N-S method.

Approach: Healthy participants were recruited from among eligible patients and their siblings attending immunization, outpatient, or inpatient clinics and wards of a large, public tertiary care children's hospital. Participants were randomly assigned to receive two doses of Sanofi-Pasteur Vaxigrip® influenza vaccine by one of the three study arms: a) Group "IM-NS-0.25" (controls) - two full 0.25 mL doses administered IM by standard N-S; b) Group "ID-JI-0.1" (investigational) - two reduced 0.1 mL doses administered ID by needle-free jet injector (JI), and c) Group "IM-NS-0.1" (investigational) - two reduced 0.1 mL doses administered IM by N-S. At the conclusion of the study, at the time of collection of the final blood specimen, participants in the two investigational groups that received reduced doses received a third "insurance" dose of the influenza vaccine via the conventional route, method, and dose, to ensure adequate protection. Six months after this study "graduation", all participants received a fourth "bonus" booster dose for protection during the following influenza season.

Timeline: This study started in October 2006 and data collection was completed in November 2009. Final serologic results became available in the final quarter of 2010. Final analysis and an article for publication are being completed; the estimated end date for this study is December 2011.

Progress and Findings: Preliminary still-blinded results among 390 participants (out of 450), show that local pain was mild in 100 (26%), moderate in eight (2%), and severe in four (1%) participants. Systemic adverse events (AEs) were diarrhea (38%), fever ≥38.0°C (32%), loss of appetite (31%), vomiting (29%), sleepiness (18%), unusual crying (17%), irritability (13%), and convulsions (2%). Serious AEs (n=25) included: 10 asthma-related, four varicella, four febrile convulsions, one death (trauma), and six miscellaneous others. All AEs but one possibly-related convulsion 23 days after dose 1 were deemed unrelated by the Drug Safety and Monitoring Board (DSMB). HAI inverse geometric mean titers (GMTs) after dose 2 for multiple formulations and strains (n=207) were 193 for H1N1, 45 for H3N2, and 101 for B. Seroconversion was 72%, 25%, and 63%; seroprotection was 88%, 49%, and 85%, respectively. H3N2/Brisbane/10/2007 strain responses were poor, and under investigation. Based on these preliminary results, it seems local AEs were tolerable, and immunity was generally good. Definitive assessment awaits unblinded analysis by group of all participants.

El Salvador

Cost-effectiveness of Seasonal Influenza Vaccine in El Salvador

El Salvador, one of the countries in Central America that has conducted influenza vaccination more consistently, evaluated the cost-effectiveness of the 2010 seasonal influenza vaccine. The evaluation included a study of the supplier costs of care for ILI and SARI due to influenza, the out-of-pocket expenses for the families, and a study on cases and controls based on influenza cases captured by sentinel surveillance.

Study Aims and Objectives:

- Estimate seasonal influenza vaccine effectiveness in a vaccinated population younger than 2 years and older than 60 years.
- Estimate direct and indirect medical costs due to ILI and SARI in influenza-confirmed cases.
- Estimate the cost-effectiveness of a vaccination program against seasonal influenza, under different development scenarios.

Approach: Influenza vaccine effectiveness was evaluated through paired cases and controls from persons who needed care due to severe acute respiratory infections (SARI) in three hospitals of the Sentinel Surveillance System of El Salvador. A case was defined as a child between 6 months and 2 years old, or an adult older than 60 years old, who met the SARI case definition, and whose results confirmed influenza through RT-PCR in real time, with samples taken through nasal and/or pharyngeal swab. Two

controls were selected for each case, paired by age. Eligibility criteria also included having a symptom start date three or fewer days before the consultation, and being eligible to receive the influenza vaccine during the 2010 influenza season. In the identified cases (n=270), a basic clinical-epidemiological data form was completed. Estimates of disease costs were developed through studies of SARI costs due to influenza and other laboratory-confirmed respiratory viruses. Supplier's costs were determined through a review of clinical records of the cases and controls. The cost of clinical care was estimated based on cost catalogs through the Management Information System (WinSIG) of the Ministry of Health. Out-of-pocket expenses were determined through survey of the main caregivers and explored direct and indirect costs and days out of work.

Timeline: May to October 2010.

Progress: Identification of cases is completed, as well as the cost analysis; the databases are available. Manuscripts were presented in January 2011.

Conclusion: During the 2010 influenza season the sentinel surveillance system identified 246 SARI case-patients; 38 tested positive for seasonal influenza (< 2y: 24, >60y: 14). Twenty-eight patients had complete data and 56 age-matched SARI case-patients who tested negative for seasonal influenza were selected. The mean value for health system spending on laboratory-confirmed influenza-related severe pneumonia among case-patients less than 2 years was US $2,305 (CI95% US $326 – 4,283), with a median value of US $417.3 (IQR US $3139 – 184) and among case-patients aged 60 years or older the mean value was US $1,734 (CI95% US $708 – 4,176) with a median of US $488 (IQR US $4,108 – 40). The estimated cost of influenza-positive SARI averted among children aged 2 years or younger and among persons aged greater than 60 years by the current vaccination program is US $4,507 and US $583.79 per event, respectively.

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. Through a collaboration between the All India Institute of Medical Sciences (AIIMS), U.S. CDC, and the University of Alabama, a study to determine whether immunization of young children with trivalent influenza virus vaccine (TIV) protects immunized children and older non-immunized household members is being conducted in three rural villages near New Delhi, India. Children aged 6 months to 10 years are randomized at the household level to receive TIV or inactivated polio vaccine (IPV) (the control vaccine) and weekly household surveillance for febrile acute respiratory illness (FARI) is conducted among all household members.

Study Aims and Objectives:

- Measure direct protection of children by influenza vaccine.
- Measure indirect protection against influenza among family members of influenza vaccine recipients.
- Define contribution of influenza virus to illness within three villages in rural Ballabgarh.
- Assess risk factors for more severe disease due to influenza virus.
- Establish a surveillance system for influenza virus infections that will be used to assess outcomes in subsequent influenza virus vaccine studies.

Approach: A prospective, household randomized, controlled, observer-blinded study is being conducted in three rural and peri-urban villages outside of Delhi, India. The vaccination of children aged 6 months to 10 years with either trivalent influenza vaccine (TIV) or the control vaccine (inactivated polio vaccine (IPV)) will be carried out for three years, followed by weekly household surveillance for febrile acute respiratory illness (FARI) to assess the efficacy of influenza vaccination. The total population under surveillance for all three villages is approximately 17,000, with an estimated 3,700 children eligible for vaccination. Additionally, 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.

Timeline: September 2008 to September 2011.

Progress and Findings: Enrollment, vaccination, and surveillance activities have been successfully implemented with high rates of vaccine acceptance (91% of 3,700 eligible children) received at least one dose of vaccine, and exceptionally high rates of community acceptance for surveillance enrollment (90% of 17,000 persons consented to participate for weekly surveillance). Influenza positivity was identified among 350 (17%) of the 2,030 FARI episodes during 2010 across all age groups. Pandemic 2009 H1N1 accounted for half of the influenza positivity. While predominant circulating strain in 2009 was pandemic H1N1, cocirculation of both influenza B and 2009 H1N1 was observed in 2010. The clinical trial has been enrolled in Clinical Trials Registry - India (CTRI); National Institute of Medical Statistics, ICMR, Ansari Nagar, New Delhi. # CTRI/2010/091/001235, 13-10-2010; http://164.100.72.67/Clinicaltrials/ViewTrial.jsp?trialno=2537.

In summary, enrollment and immunization rates are high, reflecting a high community acceptance. Influenza vaccinations likely will have little benefits in 2009-2010 due to the pandemic, and highlight the importance of multi-year studies of influenza vaccine. The vaccine effectiveness study will provide useful data related to herd immunity and indirect protection effects in this rural setting. The second year of immunization is underway.

CDC's Fatimah Dawood (left) and Katie LaFond (right) outside the National Institute of Virology in Pune, India

Kenya

Seasonal Influenza Vaccine Effectiveness Study

Influenza vaccine has been shown to reduce influenza-associated acute respiratory illnesses (ARIs) in developed countries. However, little is known about the effectiveness of influenza vaccine in the developing world. KEMRI/CDC–Kenya, with support from the Kenya Ministry of Public Health and Sanitation, is conducting a three-year observational influenza vaccine effectiveness study using the commercially available Southern Hemisphere seasonal vaccine in two sites in Kenya; Lwak -- a rural site in western Kenya, and Kibera– an informal urban settlement in Nairobi. The International Emerging Infections Program (IEIP) under KEMRI/CDC currently conducts population-based disease surveillance (PBDS) for severe acute respiratory illness (SARI) and influenza-like illness (ILI) in these two sites.

Study Aims and Objectives:

The objectives of the study are to evaluate the following:

- Effectiveness of the vaccine in preventing laboratory-confirmed disease.
- Effectiveness of the vaccine in preventing medically attended ILI and SARI, and symptomatic ILI and SARI reported in the community.
- Indirect effect of the vaccine in preventing laboratory-confirmed influenza, and ILI and SARI in non-immunized household members.
- Acceptability of influenza vaccination among community residents.

Approach: The vaccine is offered on a voluntary basis to infants from 6 months of age through children up to 10 years old enrolled in the IEIP study site. Sanofi Pasteur-France has donated Southern Hemisphere trivalent influenza vaccine for the study. Prior to the vaccination campaign a vaccination awareness campaign was conducted to sensitize the community on the benefits and availability of the influenza vaccine.

After vaccination, the study participants are followed up with using the routine IEIP surveillance which includes weekly home visits where field workers ask household members questions about recent illnesses and deaths. The study participants also have free access to a medical clinic where free care is provided. At the clinic, specimens are collected from patients who have SARI or ILI. Samples are tested at the CDC laboratory using real-time RT-PCR for influenza virus. At the end of every year patients who received vaccine will be compared to patients who did not receive vaccine.

Timeline: Data from the past three years of influenza surveillance has shown that the influenza season in Kenya peaks July - October, and therefore most closely mirrors the Southern Hemisphere influenza season. The vaccine is available every year in Kenya beginning in March to coincide with the Southern Hemisphere influenza season. Vaccine will be offered from April- June of every year from 2010-2012.

Progress and Findings: In 2010, approximately 40% of children received the influenza vaccine in the two sites. In Kibera 3,962 (39.2%) out of 10,098 children eligible for vaccination received the vaccine; similarly, in Lwak 3,994(39.8%) out of 10,041 children eligible for vaccination received the vaccine. Data analysis comparing outcomes of vaccinated and unvaccinated children for the first year is ongoing.

Senegal

Assessment of the Effectiveness of Seasonal Trivalent Influenza Vaccine among Children in Senegal

Effective influenza vaccines have been available for decades, but they have neither been studied nor used in tropical developing countries. A number of reports from developed countries indicate that influenza vaccine, when given to a limited number of persons most responsible for transmission, usually children, has the potential to interrupt transmission and reduce the overall influenza burden in a community. This study will determine whether immunization of young children (6 months to 9 years of age) with influenza vaccine will protect not only the immunized children but also the infants, older children and adults who are around them.

Study Aims and Objectives:

- Evaluate the total (direct plus indirect) effectiveness of TIV in reducing rates of laboratory-confirmed symptomatic influenza among vaccinated children from villages where TIV is introduced compared to among vaccinated children from villages where inactivated polio vaccine (IPV) is introduced.
- Evaluate the age-specific indirect effectiveness of TIV in reducing rates of laboratory-confirmed symptomatic influenza among unvaccinated persons (children younger than 6 months of age and children and adults older than 10 years of age) from villages where TIV is introduced compared to among persons from villages where IPV is introduced.
- Evaluate the overall (population) effectiveness of TIV in reducing rates of laboratory-confirmed symptomatic influenza among all persons (of any age) from villages where TIV is introduced compared to among all persons from villages where IPV is introduced.
- Evaluate the post-vaccination immune responses to influenza vaccine (as percentage seropositive and antibody level) among a subset of children 6-11 months, 12-35 months, 3-5 years, and 6-8 years of age, and describe the safety profile of the TIV in a subset of children.
- Describe the epidemiology of influenza in the population by defining the rates of laboratory confirmed influenza, describe the clinical characteristics of influenza in the study population, and describe the etiologies of influenza-like illness in the study population.

Approach: This study is an observer-blinded Phase IV cluster-randomized trial with villages randomized into two groups. Children aged 6 months to 10 years in these villages receive either trivalent influenza vaccine (TIV) or the control vaccine, inactivated polio vaccine (IPV). In addition, some of these vaccinated children will be enrolled into an immunogenicity and safety subset which will measure their immune response to vaccination and assess reactions to the study vaccines among children in Senegal. A combined approach of active and passive influenza surveillance will be used to assess lab-confirmed influenza among vaccinated children and among consenting unvaccinated persons (older children and adults), in order to evaluate the effects of the vaccine in this population.

Timeline: July 2008 to June 2011.

Progress and Findings: Enrollment, vaccination, and surveillance activities are ongoing. Year 3 vaccination will take place in May - June 2011. Surveillance activities, including administration of health questionnaires and nasopharyngeal specimen collection, are year-round. Twenty-eight percent (1,561/5,483) of those tested in 2009 were positive for influenza; all positives were influenza A (H3N2). Pandemic 2009 H1N1 was not detected in Niakhar until the first week of February, 2010. Preliminary findings were shared at two major conferences: ICEID (July 2010) and Options (Sept 2010).

Thailand

Household Influenza Transmission Study (HITS)

HITS is a study to assess the effectiveness of non-pharmaceutical interventions on household transmission of influenza viruses. This study is being conducted at Queen Sirikit Institute for Child Health in Bangkok with collaboration from the Armed Forces Research Institute of Medical Sciences (AFRIMS).

Study Aims and Objectives:

- Assess the effectiveness of mask use and hand washing when practiced by susceptible persons to decrease influenza virus infection in the household.
- Determine the secondary attack rate in households with a child with laboratory-confirmed influenza virus infection.
- Determine the level of adherence to mask use and hand washing.

Approach: This is a prospective intervention trial. Children under 15 years of age with influenza virus infection are enrolled along with their households. A pediatric influenza virus-infected index case is identified and their household is then enrolled and randomized to one of three study arms: control, hand washing, or hand washing and mask use. Following enrollment, at days 0, 3 and 7, all household participants are tested for influenza viruses. The index case is assessed for influenza viral shedding and household members are assessed for secondary influenza infection.

Timeline: Enrollment began in April 2008 and ended in February 2011.

Progress: Enrollment is almost complete and analysis is underway.

Suntarattiwong P, Jarman RG, Levy J, Baggett HC, Gibbons RV, Chotpitayasunondh T, Simmerman JM. Clinical performance of a rapid influenza test and comparison of nasal versus throat swabs to detect 2009 pandemic influenza A (H1N1) infection in Thai children. The Pediatric Infectious Disease Journal. 2010;29(4):366-7.

Conclusion: This study will identify generalizable and transferable information on influenza virus transmission prevention measures. The results will assist those involved in providing influenza prevention and control policy recommendations for seasonal and pandemic influenza.

Research at the Animal-Human Interface

Avian Influenza Cooperative Research Centers

In 2006, five cooperative agreements were initiated to establish a set of research projects related to detecting, preventing, and controlling zoonotic influenza. This provides a more integrated public health response to avian and swine influenza 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).

The 2010 research activities for these Centers for Research at the Animal-Human Interface include:

Colorado State University

Study Aims and Objectives:

- To better understand the interspecies transmission of avian influenza in small duck flocks.
- To evaluate the prevalence of avian influenza virus in ducks in Indonesia.
- To assess the dynamics of oseltamivir exposure in ducks, since oseltamivir and its metabolites have been found in sewage effluent and waterways.
- To better understand the incidence and seasonality of influenza in Indonesia.

Approach: Ducks were experimentally infected with low pathogenic avian influenza H5 and H7 viruses. These dusks were then housed with common barnyard species, including rats, blackbirds and pigeons, to better understand how efficiently avian influenza viruses (AIVs) are transmitted between these species. The poultry and other species housed with the infected ducks were monitored for AIV infection. The pharmacokinetics of oral oseltamivir was evaluated. Ducks infected with a low pathogenic H5N2 virus and given low levels of oseltamivir were sampled to determine if viruses with antiviral resistance could be obtained.

Surveillance for influenza was performed in Indonesia. From 2009 to 2010, surveillance for AIV was performed on ducks in West Java, Indonesia to determine the prevalence of infection. Surveillance for influenza-like illness (ILI) has been performed at three community health centers in Bandung, Indonesia since 2008, with household mapping of ILI cases starting in 2010.

Timeline: This research will conclude in 2011.

Progress and Findings: In the experimental barnyard, the avian influenza viruses accumulated to high concentration in the duck pool and viruses were transmitted to other birds. This suggests the potential for efficient transmission of avian influenza viruses to barnyard chickens by visiting ducks. Examination of the pharmacokinetics of oseltamivir in ducks revealed that these values were considerably different from humans. Analyses of the results of this study are ongoing.

A high prevalence of avian influenza virus was found in domestic duck populations in West Java with frequent illness and mortality reported in flocks. Extensive movement of domestic duck flocks may contribute to the spread of AIV. Surveillance for ILI in humans in Bandung has enrolled over 1,500 cases and found influenza in 17% of the samples.

University of Minnesota

Study Aims and Objectives:

- To evaluate avian, swine and human influenza virus transmission at the human-animal interface.
- To identify factors that facilitate influenza virus transmission from animals to humans.
- Characterize human illness caused by avian and swine influenza viruses.
- Assess the use of interventions that interrupt transmission of influenza viruses from animals to humans

Approach: Surveillance for avian influenza was conducted among backyard flock poultry flocks and their handlers in Minnesota and Wisconsin, as well as in an urban wild geese population living in a recreational area and the human users of their habitat. Swine influenza surveillance was conducted to detect and characterize influenza A viruses from pigs and people who work with them in large and small operations in the Midwest. Surveillance for influenza viruses in swine at fairs in the Midwest was also conducted. Personal protective equipment (PPE) and hygiene practices used by swine and poultry handlers were evaluated. Surveillance for avian influenza was also conducted in four rural villages in Thailand where highly pathogenic avian influenza H5N1 had been detected previously. An evaluation of PPE incorporated across the research sites of this project was conducted.

Timeline: Research was completed in 2010.

Conclusions: This project found that the prevalence of avian influenza virus in backyard flocks and geese in Minnesota and Wisconsin was very low. There was no evidence of transmission of avian influenza virus to humans in this study. This study documented the impact and subtypes found on Minnesota swine production facilities. Pandemic 2009 H1N1 influenza virus was identified in pigs exhibited at a state fair in 2009. Barriers to the use of personal protective equipment (PPE) were identified, including cultural/ethnic factors related to PPE and hand washing practices among Thai poultry and duck owners. A self-assessment tool for markers of preparedness to respond to highly pathogenic avian influenza outbreak in birds was developed for use by organizations potentially responding to avian influenza outbreaks. This tool is available online: http://www.wildbird.umn.edu/.

Manuscripts are in production or have been submitted for this research.

University of Georgia

Study Aims and Objectives:

- To better understand the risk of human infection with avian influenza from an environmental source.
- To estimate avian influenza viral loads associated with environmental sources of potential public health significance.
- To identify factors that may enhance or limit persistence of type A influenza viruses in these environmental sources (surface water, environmental surfaces, feces and carcasses).

Approach: A quantitative risk assessment of the public health risk associated with environmental sources of avian influenza was performed by estimating the viral shedding of ducks and the persistence of virus in lake water during the year. The risk of exposure to the human population in Georgia from avian influenza (H5N1) was characterized using surveys of duck hunters, non-commercial poultry owners, taxidermists, and friends of hunter to determine knowledge and attitudes.

Timeline: Research was completed in 2010.

Conclusions: When evaluating the risk of a person coming into contact with avian influenza viruses, it was found that this risk varies with the time of year and location of the lake. The peak risk was found to occur before the onset of seasonal flu in humans.

This research has resulted in these publications:

Stallknecht, D.E., V.H. Goekjian, B.R. Wilcox, R.L. Poulson, and J.D. Brown. 2010. Avian influenza virus in aquatic habitats: What do we need to learn? Avian Diseases 54: 461-465.

Harris, M. T., J.D. Brown, V. H. Goekjian, M. P. Luttrell, R. L. Poulson, B. R. Wilcox, D. E. Swayne, and D. E. Stallknecht.2010. Canada Geese and the epidemiology of avian influenza viruses. Journal of Wildlife Diseases. Journal of Wildlife Diseases 46:981-987.

Dishman,H., D. Stallknecht, and D.Cole. Duck hunter knowledge, attitudes and practices regarding exposure to Avian Influenza (H5N1) in Georgia, USA. 2010. Emerging Infectious Diseases 16: 1279-1281.

The National Institute of Public Health and the Environment (The Netherlands)

Study Aims and Objectives:

- To estimate to estimate infection probabilities for persons involved in disease control on farms infected with highly pathogenic avian influenza virus H7N7.
- To estimate effectiveness of personal protective equipment and oseltamivir use on farms infected with highly pathogenic avian influenza virus H7N7.

Approach: In 2003 an epidemic of highly pathogenic avian influenza H7N7 occurred in the Netherlands at commercial poultry farms. During this outbreak 89 confirmed human cases of avian influenza were identified among poultry workers and their families, including one death. This study used information and biologic samples collected during this outbreak to further evaluate the outbreak in humans. The effectiveness of personal protective equipment (PPE) and oseltamivir use during the epidemic was evaluated by linking databases containing information about farm visits and human infections to the use of oseltamivir and PPE. The infection probabilities for persons involved in disease control on infected farms were estimated using databases containing information on the infected farms, person-visits to these farms, and exposure variables (number of birds present, housing type, poultry type, depopulation method, period during epizootic).

Timeline: Research will be completed in 2011.

Conclusions and progress: Prophylactic treatment with oseltamivir significantly reduced the risk for infection of poultry workers per farm visit. Clinical inspection of poultry in the area surrounding infected flocks and active culling during depopulation were associated with a high infection probability, while low probabilities were estimated for management of biosecurity and assistance with cleaning during the flock depopulation. No significant association was observed between the probability of infection and the exposure variables, such as number of birds present, housing type, and poultry type.

This research has resulted in these publications:

te Beest DE, van Boven M, Bos MEH, Stegeman A, Koopmans MPG. Effectiveness of personal protective equipment and oseltamivir prophylaxis during avian influenza A (H7N7) epidemic, the Netherlands, 2003. Emerg Infect Dis [serial on the Internet] .2010 Oct [date cited]. http://www.cdc.gov/EID/content/16/10/1562.htm.

Bos ME, Te Beest DE, van Boven M, van Beest Holle MR, Meijer A, Bosman A, Mulder YM, Koopmans MP, Stegeman A. High probability of avian influenza virus (H7N7) transmission from poultry to humans active in disease control on infected farms. J Infect Dis. 2010 May 1;201(9):1390-6.

Maihidol University (Thailand)

Study Aims and Objectives:

- To understand the incidence and prevalence of avian influenza virus infection in birds, humans and other animals in Thailand.
- To assess the transmission of avian influenza to people exposed to humans, birds and other animals infected with avian influenza viruses.
- To determine the role of migratory birds in the transmission of avian influenza virus.
- To determine the diversity and phylogeny of avian influenza viruses isolated in Thailand.

Approach: Since 2004, outbreaks of highly pathogenic avian influenza virus H5N1 have occurred in wild and domestic birds in Thailand and numerous human cases have been identified. To determine the role of migratory birds in the transmission of avian influenza virus, the migratory routes of open-billed storks, lesser whistling ducks, and laughing gulls was evaluated by the use of satellite telemetry. The prevalence of avian influenza in these birds and in non-migratory birds, other animals, and humans who shared a habitat with the migratory birds is being monitored. The diversity and phylogeny of avian influenza viruses isolated in Thailand during the study is being evaluated. Avian influenza viruses and 2009 H1N1 influenza viruses were assayed to determine activity against multiple erythrocyte species.

Timeline: Research will be completed in 2011.

Conclusion: Migratory patterns of birds evaluated in this project have documented migration both within Thailand as well as into other parts of Asia, suggesting wild birds could bring virus into Thailand as well as spread it within the country. The highest hemagglutination titers for all viruses and antigens assayed were obtained with goose and guinea pig erythrocytes.

Manuscripts are in production or have been submitted for this research.

Bangladesh

Evaluation of CARE's avian influenza community-based and commercial poultry interventions

The purpose of this study is to evaluate the interventions of the non-governmental organization "CARE" to prevent avian influenza in backyard and small-scale commercial poultry farms.

Study Aims and Objectives:

- Assess the knowledge, attitude, and practices (KAP) of backyard poultry raisers about avian influenza, before and after CARE's intervention.
- Evaluate pre- and post-intervention backyard poultry husbandry practices.
- Evaluate the impact of CARE's intervention on KAP of small-scale commercial poultry producers.
- Describe the biosecurity of small-scale commercial poultry farms with and without intervention.

Approach: We conducted baseline and follow-up questionnaires on 480 backyard poultry raising households from intervention and control sub-districts of Tangail district. Later, we conducted a follow-up assessment in the intervention and control areas to assess KAP and to measure possible changes

in the backyard poultry raisers of both areas. In addition, a questionnaire for small-scale commercial poultry farms was administered to 70 control farms and 70 intervention farms in Tangail district to assess CARE's intervention efforts to improve biosecurity in commercial poultry.

Timeline: This study began in April 2009. Data collection was completed December 2010.

Progress: Baseline data collection for backyard farms was completed in 2009 and follow-up data collection was completed in 2010. Data collection for small-scale commercial poultry farms was completed in December 2010.

Conclusion: Data analysis is ongoing. A preliminary report of the findings was prepared and sent to CARE, which presented the findings in a poster at the ICEID meeting in Atlanta in July 2010.

Poultry influenza surveillance

The purpose of this study is to identify outbreaks of disease in domestic poultry by conducting active surveillance.

Study Aims and Objectives:

- Conduct active surveillance for avian influenza in live bird markets.
- Pilot surveillance for avian influenza in backyard poultry.
- Improve understanding of human interaction with backyard poultry.

Approach: This study involves monthly sampling of four rural and eight urban live bird markets. It also includes monthly active surveillance of backyard poultry from two rural village locations. In addition, a qualitative study was performed in two rural study sites to identify human interaction with backyard poultry relating to risk of avian influenza.

Timeline: This study began in August 2007.

Progress: From August 2007 through September 2010, over 2,200 poultry swabs from rural markets and communities were collected and tested for avian influenza A by rRT-PCR at ICDDR,B. We also characterized the seasonality of avian influenza. In addition, we collected pooled environmental samples from 12 live bird markets starting from May 2009 from Dhaka and rural markets and tested them for avian influenza A. Positive samples were then tested for H5 by rRT-PCR. In addition, we completed data collection and analysis for the qualitative study on human interactions with poultry in rural backyard farms.

Conclusion: This study is ongoing. A poster was presented on live bird market surveillance at the ICEID conference in Atlanta in July 2010. We have begun manuscript preparation for both the qualitative study and the live bird market surveillance.

Identifying risk factors for and dispersion of avian influenza in backyard poultry

This is a case control study with backyard poultry flocks as the primary unit of interest.

Study Aims and Objectives:

- Identify risk factors for infection of backyard poultry flocks with influenza A/H5.
- Assess the dispersion of influenza A/H5 virus within 10 km of affected farms.

Approach: This study aims to enroll 40 backyard case farms and five geographically matched negative controls per case. A questionnaire is administered to case and control farm owners in order to identify risk factors for flock infection with avian influenza A/H5. In addition, six backyard farms from within a

0.5 to 10 km radius of the affected case farms are enrolled and sampled two weeks after enrollment of case farms to assess the spread of the virus.

Timeline: This study began in March 2009 and is ongoing.

Progress: Enrollment of case farms has been lower than expected due to low rates of reporting of avian influenza in backyard flocks. So far, half of the targeted enrollment has been achieved (20 cases and their controls). The goal is to enroll 20 more case farms and their controls before finalizing the data analysis. Preliminary data analysis has identified a few potential risk factors.

National assessment of backyard poultry rearing practices

This is a prospective cohort study to assess poultry raising practices and to conduct active surveillance in backyard poultry.

Study Aims and Objectives:

- Describe poultry raising practices over time.
- Assess the contribution of poultry raising to household income and nutrition.
- Describe the epidemiology of poultry illnesses.
- Conduct nationwide active surveillance for avian influenza in backyard poultry.

Approach: This study includes 600 households selected from a representative sample of 30 village clusters from across Bangladesh. Baseline and bimonthly follow-up questionnaires, as well as structured observations are conducted by the research team. Trained volunteers conduct backyard poultry surveillance in the 30 villages. They collect and report information on poultry illness and death, seasonality of poultry illnesses, and outcome of the sick poultry twice weekly.

Timeline: This study began in May 2009 and is ongoing.

Progress: We have collected over 200 swab samples for avian influenza and other disease testing from sick chickens and ducks of the households meeting our inclusion criteria. We have collected baseline and follow-up information from over 45 field sites.

Conclusion: Preliminary data analysis has begun in preparation for producing a manuscript for a peer-reviewed journal. We found that most of the poultry raisers were not following the government recommended "10 steps of safe poultry raising" and are at risk of animal to human transmission of avian influenza.

Piloting an intervention to reduce the risk of transmission of avian influenza to humans in rural Bangladesh

This is a qualitative research study, the purpose of which is to develop preventive messages to reduce the risk of transmission of avian influenza to humans.

Study Aims and Objectives:

- Develop and disseminate a set of culturally appropriate messages on sick poultry slaughtering and sick and dead poultry handling in order to decrease risk of avian influenza transmission to humans.
- Explore the acceptability and feasibility of the messages in the community.

Approach: We developed a set of preventive messages and disseminated them in two rural communities of Bangladesh, collecting data on community response to the messages to evaluate their acceptability

and feasibility. Courtyard meetings and posters were used to disseminate the messages and their acceptance was evaluated using qualitative research methods such as focused ethnography, observation, informal conversations, in-depth interviews, and group discussions.

Timeline: This study began in June 2009 and is ongoing.

Progress: We have performed an analysis of the research findings. Currently we are modifying the messages according to the study findings to make them more appropriate for the community people. We convened a meeting of avian influenza researchers (qualitative and quantitative) in order to focus the messages on the most practical and important interventions. We will disseminate the new messages in settings with and without high poultry mortality in order to explore the acceptance of the messages and change in people's understanding and behavior.

Seroprevalence of antibodies to avian influenza A viruses among Bangladeshi poultry market workers

Since its emergence in Bangladesh, highly pathogenic avian influenza A virus H5N1 continues to be a major threat to poultry and people. Bangladesh, a country with approximately 183 million poultry, has had confirmed outbreaks of H5N1 throughout the country since February 2007. In March of 2008, the first human case of H5N1 influenza in Bangladesh was identified through a population based human influenza study in Dhaka. There is great concern that new human cases of H5N1 and other avian influenza A types (H2, H7, H9) may remain unrecognized. Little is known about transmission patterns of avian influenza to humans in Bangladesh. It is unclear how many Bangladeshis who routinely handle poultry develop mild or subclinical infections to influenza A viruses.

Study Aims and Objectives:

- Quantify the baseline seroprevalence of anti-avian influenza A (e.g. H2, H5, H7, and H9) antibodies among Bangladeshi poultry market workers
- Calculate the incidence of seroconversion among poultry workers during the one year study period.
- Guide targeted interventions aimed at decreasing the transmission of avian influenza from animals to humans and averting the generation of novel influenza strains with pandemic potential.

Approach: This study is being performed among poultry market workers who work in markets where avian influenza viruses are detected during routine animal surveillance efforts. Since 2009, multiple samples from live- market surveillance have tested positive for H5 and unsubtypeable influenza A. These signals help study teams time the collection of sera 21 days after presumed exposure. Therefore, both pre-exposure and post-exposure paired sera specimens will be available to test for the antibodies to avian influenza A viruses. Serum specimens will be tested for neutralizing antibody against avian influenza viruses (H5, H2, H7 and H9) by microneutralization assay and confirmed by Western blot assay and/or modified hemagglutination-inhibition assay at CDC.

Timeline: Epidemiologic data and serum samples have been collected. Serological assays will be performed and data will be analyzed by the end of 2011.

Progress and Findings: Over 400 poultry markets workers from 11 live bird markets were enrolled and baseline sera were collected. Follow-up sera were collected from the enrolled workers in markets where environmental or poultry samples have tested positive for avian influenza as part of ongoing animal surveillance. Serum samples have been shipped to the laboratories at CDC where serologic assays will be performed. At the end of the study, investigators intend to quantify the incidence of seroconversion among poultry workers to 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. The findings of the proposed study are expected to guide the response to H5N1 outbreaks and prevent the generation of novel influenza strains with pandemic potential.

Kenya

Network analysis of the Kenyan poultry trade

This study was conducted to identify probable routes of avian influenza (AI) virus spread through the movement of live birds in the informal poultry trade sector. This knowledge may be applied to better inform prevention and control efforts in the spread of avian viruses.

Study Aims and Objectives:

- Design trade network based on volume, distance, and frequency of trade.
- Determine knowledge, attitudes, and practice of players involved in informal poultry trade.
- Determine currently employed hygiene and veterinary measures in the informal sector.

Approach: A cross-sectional survey of five types of players in the Kenyan poultry trade was conducted in 5/8 provinces with relatively high human population. Five types of players were interviewed: backyard farmers, market traders, middlemen, commercial farmers, and hatchery operators. Questionnaires addressed geographic coverage, frequency and volume of trade, trading patterns, transportation and handling of poultry, and biosecurity practices.

Timeline: Data collection was carried out between late 2007 and late 2008 and primary analyses were conducted 2010-2011.

Progress: Analysis is complete and a primary manuscript will be published in 2011.

Conclusion: The informal poultry trade in Kenya is dependent primarily on the sale of backyard poultry to middlemen and market sellers. Middlemen and market traders play a critical role in poultry transport in Kenya; during an AI outbreak this group should be targeted for control- and containment-related interventions. The use of bicycles as a primary means of transport among middlemen, however, limits the geographic spread of their trade, making an understanding of the connections between points in the network vital for interventions.

Surveillance for avian influenza viruses in live bird markets in Kenya

Influenza viruses circulating in the poultry in Kenya have not been described. Influenza surveillance in live bird markets (LBM) has been recognized as an effective tool in detecting influenza subtypes circulating in the poultry population. Qualitative risk assessment studies carried out in Kenya in 2008 identified live bird markets as high risk points, not only for virus introduction and circulation among birds, due to the practices employed, but also for introduction of virus to humans working with poultry. Conducting surveillance at LBMs is vital to early detection of the introduction of avian influenza to the poultry population in Kenya.

Study Aims and Objectives:

- To identify and characterize avian influenza viruses circulating in poultry traded in live bird markets in Kenya.
- Investigation of market practices that would contribute to mixing and transmission of virus within the market.

Approach: Between March 2009 and February 2011, we collected samples from birds presented for sale in the five live bird markets in Kenya. We visited each market once a month, and collected tracheal and cloacal samples from 25 birds per market visit. We also collected five environmental samples in each market at every visit. All the specimens were tested for influenza A matrix gene by real-time reverse transcription-polymerase chain reaction at the BSL-3 KEMRI/CDC laboratory in Kisumu. All influenza A positive samples were sent to CDC-Atlanta laboratory for virus isolation and subtyping.

Timeline: The field work was carried out from March 2009 through February 2011; laboratory testing will continue until August 2011.

Progress and Findings: From March 24, 2009 through February 28th, 2011, we collected a total of 5,221 cloacal and tracheal samples during 22 monthly visits to the five markets. Of these 4,176 (80%) were from chickens, 321 (6.1%) from ducks, 382 (7.3%) from turkeys, and 342 (6.6%) from geese. Of the 5,199 (99.6%) samples tested, influenza A virus was detected in 42 (0.8%) of the samples. Influenza A was detected in 35 of 4,166 (0.8%) swabs from chicken, three of 381(0.8%) turkeys, four of 335 (1.2%) geese, and 0 of 317 (0%) ducks as shown in. Overall, influenza A was detected in 33 (1.3%) and nine (0.4 %) of oropharyngeal and cloacal swabs respectively. We collected 493 environmental samples from the markets. We did not detect influenza A in any of 443 specimens tested. Influenza A was detected in all the markets visited at one point during the surveillance period.

Ducks, geese and turkeys stayed longest at the market; for these species, the median (min-Min) days from delivery to the market to sampling time at the markets was 30 (0-90), 30 (2-90) and 28 (1-90), respectively. Chicken stayed in the market for a median two days (range 0- 30 days). Virus Isolation and subtyping of influenza A positive swabs is on-going to determine the influenza subtypes circulating in poultry species in Kenya.

Nigeria

Physicians' knowledge, attitudes, and practices (KAPs) of avian influenza, infectious disease reporting, and information sources in Nigeria

This study was performed to determine knowledge, attitudes, and practices (KAPs) among public sector physicians in Nigeria pertaining to avian influenza (AI) infection in humans, infectious disease reporting practices and perceived obstacles, and sources of heath information. This study is being conducted in collaboration from the Nigerian Federal Ministry of Health.

Study Aims and Objectives:

- Describe Nigerian physicians' attitudes and practices related to disease reporting.
- Determine physicians' preferred sources for acquiring new health knowledge.
- Assess physicians' knowledge level of human avian influenza infection.

Approach: During November and December 2008, 245 public sector physicians from six of the nine largest Nigerian cities were surveyed. Survey components included basic respondent demographics, knowledge of avian influenza, reporting practices for avian influenza as well as other epidemic and notifiable diseases, perceived obstacles to reporting, and information access and preferred sources used by the physicians.

Timeline: Data collection was carried out in late 2008 and primary analyses were conducted in 2009-2010.

Progress: Analysis is complete and a primary manuscript will be published in 2011.

Conclusion: Despite widespread awareness of avian influenza, including common symptoms and modes of transmission, physicians noted many obstacles to reporting. Physicians reported widespread access to information, identifying methods such as internet, cell phone, and email that could be better utilized to reach this population for regular updates and for crisis communications, such as epidemic or pandemic activity.

Peru

Influenza viral surveillance in swine populations of Peru

Pandemic influenza viruses can result from the re-assortment of circulating human influenza and avian influenza. In these instances, pigs are often incriminated as serving as mixing vessels, since these animals may serve as hosts for productive infections of avian, swine and human viruses. Implementing surveillance in swine populations will help us assess the different influenza strains circulating among these populations.

Study Aims and Objectives:

- To determine the different strains of influenza (swine, avian and human) circulating in Peruvian swine populations.

Approach: We are performing serological and virological surveillance to monitor and study informal and formal swine farms and slaughter houses. Studies are conducted in multiple locations in Peru (i.e. Tumbes, Cuzco, Lima, Puerto Maldonado). This study uses the infrastructure and workforce that is already established by other NAMRU-6 studies. Nasal/tracheal swabs are collected and serosurveillance of influenza virus exposition in the Peruvian pig population are planned to be conducted three times a year. RT-PCR, viral culture, and cDNA sequencing will be used to determine influenza infection outcomes as well as hemagglutination inhibition (HAI) and microneutralization (MN).

Timeline: March 2009 to December 2010.

Progress and Findings: In collaboration with the Veterinary School of San Marcos University, we have found evidence of infection by serology (9.1%, n=959) and virus isolation (1.04%, n=288) of human influenza 2009 H1N1 in community backyard slaughtered pigs in Tumbes-Peru (data not published). None of the serum-positive pigs were positive by virus isolation by egg culturing and real-time RT-PCR, suggesting that these pigs were previously exposed and later recovered from human 2009 H1N1 infection. It certainly raises concerns about how much exposure rural communities may have with animals. Additional studies are necessary to elucidate the epidemiological relationships and ecology of the human-animal interaction in these settings, which will provide key information for strategies of control and prevention of illness.

Knowledge, Attitudes and Practices about Avian Influenza (AI) in wild birds and poultry holders at Peruvian Wet Markets

Wet markets, also known as live-animal markets, provide optimal conditions for amplification and transmission of disease agents such as 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 and slaughter. Furthermore, illegal trade of wild birds at wet markets introduces a new and poorly studied potential risk. This study was conducted in the main cities of coastal and rainforest regions of Peru. Populations included wild/exotic bird and poultry handlers in wet markets.

Study Aims and Objectives:

- To assess the knowledge, attitudes and practices of wild bird holders and poultry workers regarding AI.
- To establish baseline data for development of educational and preventive intervention methods in this population.
- Approach: This study targeted individuals selling avian species (domestic poultry, wild-caught and exotic) in live animal markets in seven Peruvian cities. A standardized questionnaire was administered to each participant inquiring about their general knowledge regarding how AI is most commonly transmitted and ways to prevent infection. Furthermore, we explored the common attitudes and practices related to animal husbandry or management of birds.

Timeline: September 2009 to January 2010.

Progress and Findings: The study ended in January 2010. One hundred and sixty-six participants were enrolled, thirty percent of them were aware of AI, but only 49% understood how AI could be transmitted among poultry. Fifty percent understood that AI could be transmitted to humans; however, only 5% were aware that an AI infection can cause severe complications or death. We are in process of complementing this study with an observational component to have a better assessment of the practices performed by this population.

Occupational Exposure to Zoonotic Influenza in Peru

In an effort to have a better understanding of zoonotic influenza transmission in humans with intense occupational exposure to swine and avian species (i.e. backyard poultry, backyard swine, informal and formal poultry and swine farmers, slaughter houses, live bird markets, game birds breeders, etc.), controlled, cross-sectional and prospective (two-year) cohort studies of zoonotic influenza transmission among a total of up to 1,500 adults intensively exposed to swine and birds are being conducted.

Study Aims and Objectives:

- Study the prevalence of antibodies against AI and SI among humans, particularly against those strains which 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 avian and swine species.
- Determine which strains are circulating in these populations.

Approach: The study is being conducted in areas of Peru with large concentrations of potentially exposed humans. The study population includes any subject that is exposed to swine and/or avian species because of their occupation (e.g., veterinarians, poultry/swine farmers, poultry/swine vendors at live markets, slaughterhouse fighting cock breeders.) Questionnaires and serum samples from participants will be obtained at 0, 12, 24, and 36 months. Active surveillance for ILI among human subjects and related animal populations will be performed. When an ILI case is found, respiratory and serum samples will be collected. Serologic testing (HAI and MN), RT-PCR, viral culture, and cDNA sequencing will be used to determine influenza infection outcomes. By understanding zoonotic

influenza transmission in these specific populations, pandemic planning can be strengthened by including measures that will prevent influenza transmission within this population and to other at risk-populations.

Timeline: This study began enrollment on February 2011 and will finish follow-up on February 2013.

Progress and Findings: Two sites, Tumbes (north coast) and Pucallpa (central jungle), are actively enrolling participants. No testing has been performed yet.

Surveillance for Avian Influenza in Live Bird Markets of Peru

Previous studies have shown that wild birds in Peru may serve as competent reservoirs for influenza strains, although there has not been an outbreak of highly-pathogenic avian influenza detected to date. Furthermore, this risk may be increased if these birds and domestic poultry (or other species such as swine) are housed together or kept in close proximity to one another. The surveillance of live bird markets will allow us to assess the direct threat to human health and the threat to livestock posed by avian influenza and other zoonotic diseases. It will also allow us to monitor the international biosecurity threat posed by these markets, as part of the international wildlife trade chain.

Study Aims and Objectives:

- Determine whether or not avian influenza (AI; either high or low pathogenic types) is present in live bird markets of Peru.
- If AI is present, determine which types are circulating.
- Collaborate with additional projects to determine evidence of exposure to AI among the bird market worker population, and to examine and compare the knowledge, attitudes and practices associated with AI among live bird market workers.

Approach: We are testing birds for avian influenza and other diseases in Peruvian markets and in birds seized during government confiscations. The study includes wild-caught birds being offered for sale, exotic cage birds and domestic avian species. All samples are collected with the consent of the bird seller. Tracheal and cloacal swabs are collected from the birds and placed in viral transport media (VTM). Samples will be refrigerated until arrival to the lab, where they will be kept at –70°C until processed for viral isolation. Positive isolates, if any, will be analyzed by RT-PCR for confirmation, followed by sequencing for molecular characterization.

Timeline: The study is in its fourth year of execution and is expected to end by March 2012.

Progress and Findings: To date, 19 live bird markets and 11 confiscations have been monitored and sampled among seven cities in Peru. More than 2,500 samples (oral, cloacal, fecal swabs and feces) have been obtained from 1,600 birds of 77 avian species. None of these samples has been positive for AI. Seventy samples were positive for Newcastle disease (Paramyxovirus type 1). Among samples collected from groups of animals (fecal swabs and pooled fecal samples), 80 samples showed parasites (Coccidia, Ascaridia, Capillaria and Giardia). Campylobacter jejunii, Aeromonas hydrophila and Salmonella sp. and other antibiotic-resistant bacterial strains have been isolated from ducks, chickens and wild species (e.g., white-winged parakeets, American kestrels).

Development and Validation of Diagnostics

Kenya

Comparison of nasopharyngeal and oropharyngeal swabs for the diagnosis of eight respiratory viruses by real-time reverse-transcription polymerase chain reaction assays

Many acute respiratory illness surveillance systems collect and test nasopharyngeal (NP) and/or oropharyngeal (OP) swab specimens, yet there are limited data assessing the relative measures of performance for NP versus OP specimens. We compared the yield of NP and OP swabs for detecting eight respiratory viruses by quantitative real time-polymerase chain reaction (qRT-PCR). Sensitivities of the two specimen types varied by virus. Neither specimen type was consistently more effective than the other for virus identification.

Study Aims and Objectives:

- Evaluate the comparative yields of NP and OP swabs in detecting influenza by qRT-PCR.
- Determine the sensitivities of NP and OP swabs for other key respiratory viruses.
- Characterize the respiratory viruses circulating in the study population.

Approach: Paired NP and OP swabs were separately collected from pediatric and adult patients with influenza-like illness or severe acute respiratory illness from two respiratory surveillance sites in Kenya. NP and OP specimens from each patient were separately tested by singleplex qRT-PCR for eight viral pathogens: adenovirus, influenza A virus, influenza B virus, human metapneumovirus (hMPV), parainfluenza viruses (PIV) 1 – 3, and respiratory syncytial virus (RSV). Positive influenza A samples were also subtyped as 2009 influenza A pandemic (H1N1) virus, influenza A (H3N2) virus (H3N2), and seasonal influenza A (H1N1) virus. An individual was defined as positive for a specific virus if the viral nucleic acid was detected in either swab.

Timeline: Specimens were collected from June 9, 2009 to August 31, 2010; data were analyzed and a manuscript has been developed.

Findings: Of 2,331 paired NP/OP specimens 1,402 (60.1%) were positive for at least one virus. Overall, OP swabs were significantly more sensitive than NP swabs for adenovirus and 2009 influenza A pandemic (H1N1) virus. NP specimens were more sensitive for influenza B virus, parainfluenza virus 2, and parainfluenza virus 3. There was no significant difference between the two methods for human metapneumovirus, influenza A (H3N2) virus, parainfluenza virus 1, or respiratory syncytial virus. For respiratory disease surveillance programs using qRT-PCR that aim to maximize sensitivity for a large number of viruses, collecting combined NP and OP specimens would be the ideal approach.

Viral shedding in patients infected with pandemic influenza A (H1N1) virus in Kenya, 2009

We evaluated the duration of pH1N1 virus shedding in patients in Nairobi, Kenya. Nasopharyngeal (NP) and oropharyngeal (OP) specimens were collected from consenting laboratory-confirmed pH1N1 cases every two days during October 14 -November 25, 2009, and tested at the CDC-Kenya laboratory by real-time RT-PCR.

Two hundred eighty-five NP/OP specimens were collected from patients with acute respiratory illness, 140(49%) specimens tested positive for pH1N1; 106(76%) patients consented and were enrolled. The median age was 6 years (Range: 4 months-41 years). The median duration of pH1N1 detection after illness onset was 8 days. Viable pH1N1 virus was isolated from 133/168 (79%) of rRT-PCR-positive specimens. Viral RNA was detectable in 18(17%) and virus isolated in 7(7%) of specimens collected from patients after all their symptoms had resolved.

Study Aims and Objectives:

- Determine the duration of pH1N1 virus shedding.
- Determine the correlation between real time reverse transcriptase results and virus isolation.
- Determine the correlation between pH1N1 virus detection and age, gender, and/or HIV status.

Approach: The study was carried out in Kibera, a large informal settlement in Nairobi. Since 2005, CDC-Kenya and the Kenya Medical Research Institute (KEMRI) have conducted intensive population-based infectious disease surveillance within two villages in Kibera with a population of 28,000 people. Persons enrolled in the surveillance are able to attend a field clinic within the site, where they are provided with free care for any acute illness.

Consenting patients presenting to the clinic with signs and symptoms of ILI and SARI had oropharyngeal (OP) and nasopharyngeal specimens collected. Patients who were positive for pH1N1 were contacted at their homes by field workers and requested to return to the clinic for follow up every two days. During their initial return visit, written informed consent to participate in the study was obtained. During the initial visit and subsequent visits, a trained clinician recorded signs and symptoms and collected both NP and OP specimens. Patients who had two consecutive rRT-PCR negative specimens were released from the study.

Timeline: The study period was from October 14 to November 25, 2009.

Progress and Findings: During the study period, 285 NP/OP specimens were collected from patients presenting with ILI or SARI at the Kibera Clinic. Of these specimens, 140(49%) tested positive for pH1N1 by rRT-PCR. One hundred and six (76%) pH1N1-positive patients consented and were enrolled. The median age was 6 years (Range: 4 months-41 years); only two patients, both asthmatic, received oseltamivir. The median duration of pH1N1 detection after illness onset was eight days (95% CI: 7-10 days) for rRT-PCR and three days (Range: 0-13 days) for viral isolation. Viable pH1N1 virus was isolated from 133/168 (79%) of rRT-PCR-positive specimens. Viral RNA was detectable in 18 (17%) and virus isolated in seven (7%) of specimens collected from patients after all their symptoms had resolved. Thus, we concluded that the median duration of pH1N1 virus detection in this cohort was eight days, similar to what has been described in studies in other areas of the world. In our study, some patients who were no longer symptomatic may continue to shed viable pH1N1 virus.

Monitoring and Evaluation

Under the cooperative agreements made between CDC's Influenza Division and its partner countries, the Division supports the monitoring and evaluation (M&E) of activities associated with international Influenza program implementation. The purpose of M&E in this context is to:

- Demonstrate accountability for the resources used by programs to key stakeholders; CDC and the countries which receive funding.
- Document each country's capability and capacity for influenza surveillance, diagnostics and pandemic preparedness in order to:
    - identify program strengths and opportunities for improvement.
    - provide a mechanism to measure progress toward defined objectives and thereby demonstrate meaningful improvement in public health function over time.
- Guide ongoing investment in influenza surveillance, diagnostics and pandemic preparedness globally.
- Inform strategic and programmatic planning for countries and target technical assistance provided by CDC.
- Standardize and systematize practices.
- Identify good practices that can be shared between countries.

The Influenza Division has developed three M&E tools which are described below.

National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response

Purpose: A comprehensive tool by which countries can systematically and quantitatively measure their capability and capacity to respond to an influenza pandemic.

Tool: The tool covers 12 distinct domains, defined as 'core capabilities' and each capability is assigned a composite score based on the quality, coverage and timeliness of four related indicators. For example, 'Infection Control' is a core capability measured against (i) standards of infection control by level of health-care system (ii) integration of infection control training for staff (iii) availability of logistical resources for infection control and (iv) level of institutionalization of infection control efforts. The end-points for the core capabilities are not identical which allows for variation in public health priorities across countries with differing resource constraints. For a copy of the tool, please visit www.cdc.gov/flu/international/tools.htm.

Implementation: Between May and October of 2008, 40 countries completed baseline assessments, facilitated by CDC staff. A further 12 countries participated in late 2009 and early 2010 to establish baselines. As of November 2010, 36 countries of the initial 40 countries which participated had repeated the tool at approximately a two year interval, allowing for comparing baseline and subsequent scores.

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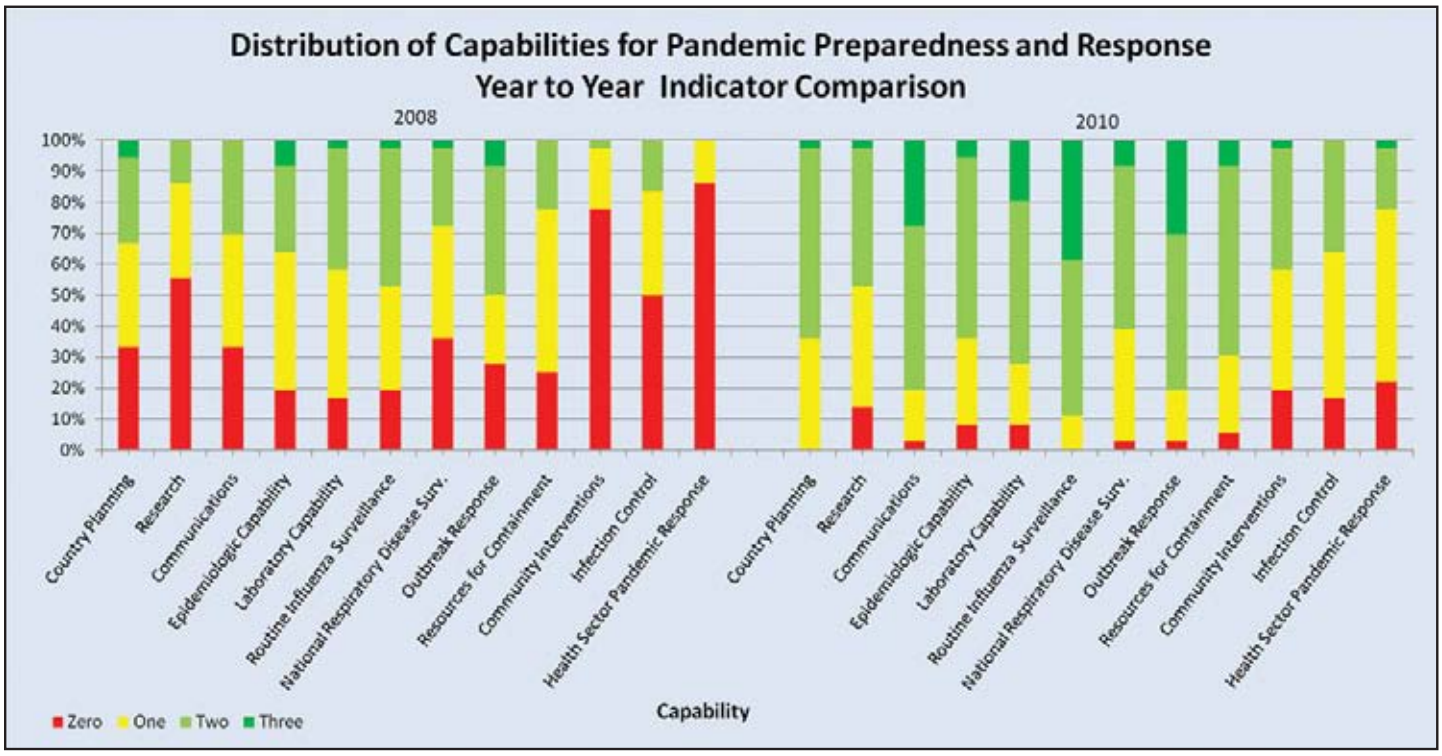
Outcomes: Comparison of the data for the 36 countries between 2008 (baseline) and 2010 revealed the following:

- Total (aggregate) scores for the tool moved in a positive direction indicating an overall improvement in pandemic preparedness for each country over the period.
- Looking at all countries in aggregate, all 12 core capabilities showed statistically significant improvement from baseline.
- Examining each indicator in aggregate, 47 of 50 indicators showed statistically significant progress from 2008 to 2010.

Further to this:

- The assessments in 2008 helped countries to identify and target areas for preparedness improvement which in turn strengthened their ability to respond to the 2009 H1N1 pandemic.
- At the same time, the 2009 outbreak offered an enormous opportunity for countries to test their pandemic response with the outcomes captured when they repeated the tool in 2010.
- Identifying areas for Influenza improvement is also enhancing capacity-building for other infectious diseases as well as encouraging compliance with International Health Regulations (IHR).
- Using the tool to document progress is helping countries advocate for continued support.



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International Influenza Laboratory Capacity Review

Purpose: A tool designed for countries to assess their capability and capacity to perform influenza diagnostics and best laboratory practices.

Tool: The tool consists of 10 sections for assessment including, virology and molecular biology techniques, availability and use of equipment and reagents, specimen collection and reporting, staff training in diagnostic procedures, laboratory safety and equipment maintenance and methods for quality control. The results from these sections form the basis for creating laboratory capacity summary reports for countries. For a copy of the tool, please visit www.cdc.gov/flu/international/tools.htm.

Implementation: Between September 2009 and November 2010, 41 countries completed baseline assessments, facilitated by staff from the CDC and Association of Public Health Laboratories (APHL).

Outcomes: The tool served to highlight overall laboratory strengths while recommendations were provided by reviewers where opportunities for improvement presented themselves. For example, of the 10 countries which participated in the Africa region, six laboratories do not perform virus isolation but all have expressed interest and readiness to receive technical assistance in these methods. Likewise, across all regions, many countries received specific recommendations for improving the biosafety of their laboratories. The tool has also allowed CDC and its collaborating countries to assess regional gaps and develop both individual and regional plans for improving laboratory capacity.

International Influenza Surveillance Assessment Tool

Purpose: A tool designed to standardize and systematize the review of national surveillance systems. The tool helps CDC and partners to clarify the objectives and structure of their surveillance systems, such that recommendations and technical assistance can be targeted to meet system goals such as, conducting data quality checks and establishing built-in laboratory and epidemiologic data integration.

Tool: The tool consists of six checklists covering national, central and sentinel site levels and covers all ILI and SARI related surveillance. For example, it includes a review of data management, analysis and reporting procedures. The tool uses a standard format for creating surveillance capacity summary reports where recommendations for countries can be provided. For a copy of the tool, please visit www.cdc.gov/flu/international/tools.htm.

Implementation: Between March and October 2010, the tool was piloted in nine countries by CDC staff.

Outcomes: Lessons learned from the pilot countries were used to refine and finalize the tool. The tool served to highlight overall surveillance strengths and recommendations for improvement in the pilot countries in which it was implemented. The finalized tool will be implemented in additional countries from late-2011.

The covers of the three monitoring and evaluation tools used for international Influenza programs. From left to right, the National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response, the International Influenza Laboratory Capacity Review and the International Influenza Surveillance Assessment Tool.

Meetings and Training

Meetings

First African Network for Influenza Science and Epidemiology (ANISE) Meeting

Location: Campus of National Institute of Communicable Diseases; Johannesburg, South Africa.

Dates: December 7 – 9, 2009.

Originally scheduled for May 2009 but postponed due to the 2009 H1N1 pandemic, the symposium was a collaborative effort organized by the NICD, CDC-Atlanta, CDC-Kenya, WHO-Geneva, WHO-African Regional Office, Institut Pasteur, the Naval Medical Research Unit No.3 in Cairo, and the U.S. Department of Defense's Global Emerging Infection Surveillance Program. Participants from more than twenty countries in Southern, East, West, Central and North Africa presented their surveillance data and original research.

Goals

The symposium highlighted the wide range of influenza surveillance and research that has been conducted throughout Africa in the last few years.

Agenda

Presenters included laboratory scientists, medical doctors, epidemiologists, veterinarians, doctoral students, and a behavioral scientist. More than 40 oral presentations were delivered over the course of two and a half days, and an additional 20 posters were presented. Oral and poster presentations focused on:

- Seasonal influenza surveillance.
- Pandemic H1N1 surveillance and outbreak response.
- Antiviral drug resistance.
- Animal-human interface research.

Additionally, scientists and epidemiologists from the NICD, WHO and CDC gave plenary lectures on:

- The global epidemiology and viral evolution of the 2009 H1N1 pandemic.
- The challenges of laboratory testing for 2009 H1N1.
- The various approaches to quantifying the burden of influenza worldwide, and in Africa specifically.

Outcome

Broad participation and the breadth of the research presented at the symposium illustrated the depth of influenza work that is occurring currently in Africa, a continent where information about influenza has historically been quite limited. The diverse reports of surveillance, detection, and response to 2009 H1N1 influenza in Africa showed that efforts by governments and international organizations to ramp up pandemic preparedness in Africa over the past few years have produced real results. The abstracts from the meeting can be found at

http://www.team-psa.com/afss2009/presentations.asp.

WHO Eastern Mediterranean Regional Meeting

Location: Grand Hyatt Cairo; Cairo, Egypt.

Dates: January 18 – 19, 2010.

Countries represented: Egypt, Morocco, and Pakistan.

Co-sponsors/other participants: WHO EMRO; NAMRU-3; Egypt Ministry of Health.

Goals

The regional meeting was held to focus on pandemic influenza surveillance and response, community mitigation and CDC programmatic issues. The meeting goals were to update regional partners on overall surveillance goals, to review and discuss pandemic 2009 H1N1 response and activity, to discuss lessons learned and strategies to improve surveillance activities, and to address navigation of CDC cooperative agreement requirements.

Agenda

The topics selected for the meeting agenda included recommendations from country partners. The agenda was developed to provide an opportunity for participants to receive CDC updates on priority areas, to highlight progress that projects have made in establishing sentinel surveillance, to discuss future program and technical needs to strengthen laboratory and epidemiologic capacity, and to participate in a mini-workshop on community mitigation.

Key Agenda Topics

- Influenza Surveillance and Response – The United States Experience and Future of Global Influenza Vaccinations.
- Influenza Surveillance and Response – WHO EMRO Regional Perspective.
- Pandemic 2009 H1N1 Influenza Update and the Future of Surveillance Post-Pandemic.
- Burden of Disease.
- Country Presentations.
- CDC Surveillance Review Tool.
- Sustainability and Future Plans.
- Navigating Cooperative Agreements.
- Community Mitigation Mini-Workshop.

Outcome

Country and WHO EMRO partners had the opportunity to discuss country and regional efforts to build capacity for influenza surveillance in a small group setting. Partners discussed what worked well in their surveillance networks during the pandemic. They also had the opportunity to discuss areas where technical assistance from CDC, WHO, and others would be needed to further improve influenza surveillance.

Noteworthy Outcomes

- Country partners had the opportunity to highlight progress made in developing national sentinel surveillance systems and lessons learned.
- Participants gained knowledge of community mitigation strategies with a scientific basis and the implementation plan for the surveillance review tool.
- Participants contributed suggestions for agenda topics for the July 2010 Influenza Division International Partners and Burden of Disease Meeting.

WHO European Regional Meeting

Location: Grand Hyatt Cairo; Cairo, Egypt.

Date: January 19 – 20, 2010.

Countries represented: Armenia, Georgia, Kazakhstan, Moldova, Romania, and Ukraine.

Co-sponsors/other participants: WHO EURO, PATH, NAMRU-3, Egypt Ministry of Health.

Goals

The regional meeting was held to focus on pandemic influenza surveillance and response, community mitigation and CDC programmatic issues. The meeting goals were to update regional partners on overall surveillance goals, to review and discuss pandemic 2009 H1N1 response and activity, to discuss lessons learned and strategies to improve surveillance activities, and to address navigation of CDC cooperative agreement requirements.

Agenda

The topics selected for the meeting agenda included recommendations from country partners. The agenda was developed to provide an opportunity for participants to receive CDC updates on priority areas, to highlight progress that projects have made in establishing sentinel surveillance, to discuss future program and technical needs to strengthen laboratory and epidemiologic capacity, and to participate in a mini-workshop on community mitigation.

Key Agenda Topics

- Overview of 2009 Pandemic Surveillance in the European Region.
- Influenza Surveillance and Response- the United States Experience.
- Burden of Disease.
- Future of Global Influenza Vaccination and the Future of Surveillance Post- Pandemic 2009 H1N1.
- Country Presentations and Individual Country Meetings.
- CDC Surveillance Review Tool.
- Sustainability and Future Plans.
- Navigating Cooperative Agreements.
- Community Mitigation Mini-Workshop.

Outcome

Country and WHO EURO partners had the opportunity to discuss country and regional efforts to build capacity for influenza surveillance in a small group setting. Partners discussed what worked well in their surveillance networks during the pandemic. They also had the opportunity to discuss areas where technical assistance from CDC, WHO, and others would be needed to further improve influenza surveillance.

Noteworthy Outcomes

Country partners were able to highlight progress made in developing national sentinel surveillance systems and lessons learned.

Participants gained knowledge of community mitigation strategies with a scientific basis and the implementation plan for the surveillance review tool.

Participants contributed suggestions for agenda topics for the July 2010 Influenza Division International Partners and Burden of Disease Meeting.

WHO South-East Asia Regional Meeting

Location: Le Meridian Hotel; Kochi, India.

Date: February 22 – 24, 2010.

Countries represented: Bangladesh, India, Indonesia, Nepal, Sri Lanka, Thailand, and the United States.

Co-sponsors: WHO SEARO.

Goals

The South-East Asia Regional meeting "Pandemic and Seasonal Influenza Surveillance and Response: Lessons Learned," brought CDC, WHO SEARO and cooperative agreement grantees from the South-East Asia Region together. Goals of the meeting were to showcase surveillance efforts in the region, to demonstrate how surveillance data can be analyzed and used effectively, to describe lessons learned from the 2009 H1N1 influenza pandemic and to discuss what countries could do differently in the future.

Agenda

The agenda included presentations, discussions, questions and answers, round table discussions and troubleshooting with experts from surveillance, health care systems, and communication. Countries reported on their routine surveillance systems and their epidemiologic and virologic 2009 H1N1 data and changes and modifications that were made after the pandemic. A highlight was hearing about vaccine production in India from Dr. Lalit Kant.

Key Agenda Topics

- Experiences and lessons learned from the pandemic with regards to surveillance, health care systems, laboratory and communications -- what worked and what didn't.
    - U.S. Experience: Challenges and Changes.
    - Health Care Systems.
    - Laboratory.
    - Communication Strategies/Messaging.
    - Was the pandemic what we planned for?

- Pandemic and seasonal influenza research and what the research suggests.
    - Bangladesh, Ongoing Research, Preliminary Findings.
    - India, Influenza Disease Burden and Vaccine Effectiveness.
    - Thailand, HITS Study Results.
    - Indonesia, Epidemiology of Avian Influenza in Indonesia.
    - India's plans for vaccine production.
    - Vaccines and Vaccinations, currently and into the future.

Outcomes

- Participants found it valuable to learn about each country's surveillance system. Discussion of this topic presented an opportunity to think through how they might adjust their own country's surveillance system.
- Participants found it valuable to hear from leading experts and to make new contacts from other countries. Some participants were able to arrange visits to other countries for laboratory training.
- Country staff were able to meet with CDC staff and seek their assistance regarding epidemiology, research, their cooperative agreement, clinical systems and pandemic response.

PAHO Regional Meeting

Location: Sheraton Maria Isabel Hotel and Towers, Mexico City, Mexico.

Date: April 12 – 14, 2010.

Countries represented: Argentina, Brazil, Mexico, Paraguay, and Peru.

Co-sponsors: PAHO.

Goals

The purpose of the meeting was to bring together representatives from the CDC, PAHO and the CDC-funded influenza grantees from Argentina, Brazil, Mexico, Paraguay and Peru to identify strategies for effective implementation of influenza sentinel surveillance and to review surveillance data and pandemic preparedness activities. The meeting provided an opportunity for the PAHO region to discuss the implementation of their pandemic influenza plans during the 2009 H1N1 pandemic. Countries were able to discuss the strengths, challenges and lessons learned during the pandemic.

Agenda

The meeting's agenda was built on CDC and country presentations with group discussions to learn from each other and to share past experiences. Issues included discussing the ability to decrease future pandemics through rapid detection of, accurate confirmation of and effective response to future novel influenza viruses. The meeting provided an opportunity to discuss the need to establish estimates of preventable disease burden and the need to make evidenced-based decisions on vaccine introduction. There were discussions about the need to increase vaccine production and the need to introduce vaccines for advance seasonal and pandemic prevention of influenza.

Key Agenda Topics

- Each country presented on their strengths and the challenges they encountered during the pandemic.
- Each country discussed their plans to include influenza vaccine in their future immunization activities.
- Each country discussed their plans to apply for the next CDC influenza cooperative agreement with new goals and objectives based on their past experiences and the need to sustain their present influenza program.

Outcome

The PAHO Region will continue working together to better understand influenza vaccine utilization, coverage and needs in the region. Due to funding restraints, the PAHO Region needs to continue to streamline and standardize influenza surveillance and vaccination policies using evidenced-based data gathered in partnership with regional countries.

Noteworthy Outcomes

- Countries shared their influenza communication campaigns.
- Several countries that shared borders discussed methods to improve cross-border influenza surveillance programs.
- The need was identified to develop new methods of sustaining the countries' influenza programs in light of to future decreases in CDC funding.

WHO Western Pacific Regional Meeting

Location: Pan Pacific Hotel; Manila, Philippines.

Date: May 6 – 7, 2010.

Countries represented: Cambodia, China, Fiji, Laos, Mongolia, Papua New Guinea, Philippines, Secretariat of the Pacific Community (SPC), and Vietnam.

Co-sponsors: WHO WPRO.

Goals

The CDC- WPRO partners meeting was an opportunity for CDC-funded cooperative agreement partners to share experiences and discuss lessons learned from the 2009 pandemic. Other meeting goals included discussion of sustainability of surveillance programs with decreasing CDC funds, ongoing laboratory support, and upcoming epidemiologic surveillance assessments. The meeting was followed by WHO's regional meeting of WPRO partners where their new FluID epidemiological reporting system was introduced and updates on the FluNet virus database were provided.

Agenda

Items covered by the agenda included CDC support of partners in the regional, epidemiologic surveillance assessment, laboratory support QandA, sustainability, and future plans for partner programs. Other items included planning for the July 2010 Influenza Division International Partners and Burden of Disease Meeting. A full day was devoted to country accounts of lessons learned from the 2009 H1N1 experience. The meeting was wrapped up with a discussion of what sorts of technical assistance, guidance, and direction would be most helpful to cooperative agreement partners.

Key Agenda Topics

- Sustainability and future plans for cooperative agreements and national surveillance systems.
- Laboratory support.
- Epidemiology surveillance assessment.
- Technical assistance to cooperative agreement partners.
- Lessons learned from 2009 pandemic.

Outcome

The meeting allowed many countries in the Region to discuss their plans for sustainability and to share lessons learned from the 2009 H1N1 pandemic.

Influenza Division International Partners and Burden of Disease Meeting

Location: Hyatt Regency Downtown; Atlanta, USA.

Date: July 9 – 11, 2010.

The CDC Influenza Division International Partners and Burden of Disease Meeting was held over two and a half days at the Hyatt Regency in downtown Atlanta. Over 300 invitees attended from 59 countries spread over all six WHO regions. Attendees came from Ministries of Health, National Influenza Centers, WHO, universities, research institutions, and world-wide CDC offices.

The first day of the meeting, Friday, July 9, opened with a welcome from CDC Director Dr. Thomas Frieden. Plenary session topics on Friday afternoon included:

- 2009 Pandemic Response.
- Pandemic Communications.
- Influenza Laboratory Response during the Pandemic.
- Capturing Global Data for Decisions.
- Influenza Policy Issues and Priorities.
- The Continuing Threat of H5N1 and Novel Influenza A Viruses.
- Improving Global Vaccine Strain Selection.
- Monitoring and Evaluation Global Progress.
- Monitoring and Evaluation from a Country Perspective.

Day two began with an overview of International Flu Vaccine Studies, with reports from India, Senegal, and Kenya. The morning then broke into tracks, which covered the following topics:

- U.S. Flu Vaccine Studies – plenary session.
- Managing Cooperative Agreements – breakout, 47 attendees.
- Animal-Human Interface – breakout, 75 attendees.

Saturday afternoon began with a plenary session focusing on disease burden estimation. The afternoon then broke into tracks, which included the following topics:

- Non-Pharmaceutical Interventions – breakout, 45 attendees.
- Training and Review Tools – breakout, 64 attendees.
- Poster Session.

Over 70 posters were submitted for the poster session, including five exemplary examples from Madagascar, Cambodia, Kyrgyzstan, Brazil, and Laos, whose authors were awarded scholarships to attend the meeting.

On Sunday morning, Dr. Lalit Kant of the Indian Council of Medical Research gave the keynote address on pandemic influenza vaccines. As with previous days, the meeting eventually broke into tracks, which covered the following:

- Estimating Disease Burden – plenary session.
- Electronic Data Systems for Surveillance – breakout, 42 attendees.
- International Shipping and Biosafety Issues – breakout, 21 attendees.
- Beyond Influenza: Full Respiratory Disease Diagnostics – breakout, 52 attendees.

Dr. Marc-Alain Widdowson wrapped up the meeting Sunday afternoon after the plenary session on disease burden estimation in China, Peru, and Nicaragua. Most attendees from the International Partners meeting stayed on for the International Conference on Emerging Infectious Disease (ICEID) that began directly after the partners meeting. Plans are in the works for the Influenza Division International Partners meeting to become an annual event.

Partners Meeting for Research and Other Activities at the Animal-Human Interface

Location: Emory Conference Center, Atlanta, United States`.

Date: August 23 – 24, 2010.

Countries represented: Bangladesh, India, Indonesia, Peru., and the USA

Goals

This was the third annual meeting of the Avian Influenza Cooperative Research Centers. Our goal was to provide updates on the international influenza research and surveillance activities at the animal-human interface performed by scientists from the Avian Influenza Cooperative Research Centers, U.S. CDC, and other partners. Our second goal was to enhance coordination and communication among investigators to advance scientific knowledge about virus transmission among and between animals and humans.

Agenda

The meeting agenda allowed investigators from the Avian Influenza Cooperative Research Centers, USDA, USAID, NIH and other international and U.S. partners to present and discuss up-to-date research and surveillance findings for novel zoonotic, swine, avian, and human influenza. The agenda was developed to provide an opportunity for participants to hear updates from CDC investigators, discuss priority areas of research, and identify critical needs for more research activities.

Key Agenda Topics

- CDC—One Health.
- Each investigator presented updates on research and surveillance activities at the animal-human interface.
- After a Pandemic: What did we learn and what might we expect?
- Revisiting the notion of influenza epicenters.
- Roundtable discussion of international animal-human interface research and enhanced surveillance priorities.

Outcome

The presentations at this meeting highlighted the breadth of activities being performed internationally at the animal-human interface, but also brought forth discussions of additional research and enhanced animal surveillance that needs to be performed to improve preparedness, detection, and response to zoonotic disease infection.

Noteworthy Outcomes

- This was the third and final meeting as the Avian Influenza Research Centers and provided a means for each center to showcase their results.
- International animal and human influenza experts were able to network and a working group was formed.
- Increased swine influenza virus surveillance was identified as a priority area of activity.

Laboratory Training

Pandemic Preparedness Team, Immunology and Pathogenesis Branch, Influenza Division—Serology Training

Location: CDC; Atlanta, USA.

Date: March 8 – 26, 2010.

Countries represented: Bangladesh, Indonesia, and Senegal.

Co-sponsors: None.

Goals

This workshop was organized by CDC scientists to provide essential material on serological assays for detection of antibodies to influenza viruses, with an emphasis on detection of human antibodies to pandemic H1N1 influenza viruses. Vic Veguilla covered protocols including egg inoculations for virus growth, virus harvesting, virus titrations, microneutralization assay, RDE treatment of sera, treatment of red blood cells, and hemagglutination-inhibition assay, among others. Participants were engaged in lectures as well as hands-on experience.

Agenda/Set-up

The curriculum for this training workshop was developed by Vic Veguilla to teach the principles of influenza serology assays. The course took place in BSL-2 facilities at CDC in Atlanta, Georgia.

Outcome

Participants became familiar with various serological assays, WHO guidelines for serologic diagnosis and detection of human influenza infection, and developed skills for trouble-shooting serological assays.

Pandemic Preparedness Team, Immunology and Pathogenesis Branch, Influenza Division – Serology Training

Location: InDRE; Mexico City, Mexico.

Date: March 31 – April 23, 2010.

Countries represented: Mexico.

Co-sponsors: None.

Goals

This workshop was organized by CDC scientists to provide essential material on serological assays for detection of antibodies to influenza viruses, with an emphasis on detection of human antibodies to pandemic H1N1 influenza viruses. Vic Veguilla covered protocols including egg inoculations for virus growth, virus harvesting, virus titrations, microneutralization assay, RDE treatment of sera, treatment of red blood cells, and hemagglutination-inhibition assay, among others. Participants were engaged in lectures as well as hands-on experience.

Agenda/Set-up

The curriculum for this training workshop was developed by Vic Veguilla to teach the principles of influenza serology assays. The course took place in BSL-2 facilities at InDRE in Mexico City, Mexico.

Outcome

Participants became familiar with various serological assays, WHO guidelines for serologic diagnosis and detection of human influenza infection, as well as develop skills for trouble-shooting serological assays. In addition, participants were able to develop a workflow for performing national influenza seroprevalence studies.

Molecular Epidemiology and Sequencing Workshop for the Analysis of Avian Influenza Viruses in Africa

Location: NAMRU-3; Cairo, Egypt.

Date: April 12 – 23, 2010.

Countries represented: Egypt and Oman.

Co-sponsors: NAMRU-3.

Goals

This one week workshop was organized by CDC scientists to train individuals in phylogenetics and bioinformatics for the analysis of highly pathogenic H5N1 avian influenza viruses circulating in Africa. Todd Davis and Pierre Rivailler provided a combination of both lectures and computer-based laboratory sessions to train NAMRU-3 laboratory staff in methods for sequencing viral genes, complete genome sequence analysis and influenza phylogenetics. Other topics included assessment of emerging influenza virus threats and characterization of H5N1 viruses isolated in humans and poultry.

Agenda/Set-up

The curriculum for this training workshop was developed by Todd Davis and Pierre Rivailler to teach the principles of full genome sequencing/phylogenetics to NAMRU-3 staff. The course was taught in a computer laboratory setting with ten participants working as staff scientists in the NAMRU-3 molecular virology laboratory.

Outcome

Ongoing collaborations between CDC and NAMRU-3 scientists continue to characterize the molecular and antigenic characteristics and evolution of H5N1 viruses in Africa. Data from these studies support research to develop H5N1 pre-pandemic vaccine candidates.

Serological Training for CDC/KEMRI

Location: Nairobi, Kenya.

Date: May 2 – 13, 2010.

Countries represented: Kenya.

Co-sponsors: None.

Goals

The goal of this training was to provide support, troubleshooting and hands-on assistance for a serological study conducted in Kenya. The training, conducted by Amanda Balish, CDC, was needed to address consistent errors in performing the assay.

Agenda/Set-up

Reagents were sent prior to arrival in the laboratory to ensure hands-on testing could be performed during training.

Key Topics/Set-up

- Serological training.
- Troubleshooting.

Outcome

The laboratorians were able to successfully perform the serological testing. Follow up results analysis was performed for the remaining serum not tested during training.

Molecular Epidemiology and Sequencing Workshop for the Analysis of H5N1 and Seasonal Influenza Viruses in Vietnam

Location: Pasteur Institute-Nha Trang; Nha Trang,Vietnam (PI-Nha Trang).

Date: June 8 – 12, 2010.

Countries represented: Vietnam.

Co-sponsors: Pasteur Institute-Nha Trang.

Goals

This laboratory training was initiated to review and improve the sequencing and bioinformatics capacity of the Pasteur Institute-Nha Trang as a regional reference laboratory for central Vietnam. The training was conducted by Dr. Todd Davis, CDC, with coordination and support from the WHO WPRO office (Dr. Mendsaikhan Jamsran) to review and enhance the laboratory's influenza sequencing, bioinformatics, and overall research capacity. Training was implemented to build upon and improve the capacity of PI-Nha Trang to fulfill its mission as a regional reference laboratory and to provide the necessary support to other regional and provincial influenza diagnostic laboratories in Vietnam.

Agenda/Set-up

Dr. Davis provided CDC full genome sequencing primers to PI-Nha Trang for sequencing seasonal, pandemic, and avian influenza viruses. Primers and protocols were tested in the PI-Nha Trang laboratories to demonstrate functionality and to perform sequence analysis using existing and recommended sequence analysis software. Data obtained from the training was used to demonstrate phylogenetic/bioinformatic tools to improve data analysis and interpretation.

Outcome

PI-Nha Trang leadership developed algorithms to determine which genes/number of samples would be sequenced each year with an emphasis on HA (genetic drift studies) and NA (antiviral resistance studies). Archival and new data generated has been shared with Vietnamese NICs and/or WHO CCs for surveillance/epidemiologic research. Influenza virus isolates of interest and sequence data continue to be shared with WHO CCs and submitted to sequence databases when appropriate.

Phylogenetic and Bioinformatics Workshop for the Analysis of Seasonal, Pandemic and Avian Influenza Virus

Location: Pasteur Institute; Ho Chi Minh City, Vietnam.

Date: June 14 – 25, 2010.

Countries represented: Cambodia, Indonesia, Lao PDR, Singapore, Thailand, and Vietnam.

Co-sponsors: Pasteur Institute, Ho Chi Minh City.

Goals

The U.S. CDC, in collaboration with the Pasteur Institute, Ho Chi Minh City, initiated an effort to provide critically needed training for regional influenza research centers. This two-week workshop was developed to train individuals in phylogenetics and bioinformatics for the analysis of seasonal, pandemic and avian influenza. CDC and regional scientists provided instruction in a hands-on manner using a combination of both lectures and computer-based laboratory sessions. Specific topics included molecular diagnostic procedures to detect influenza in clinical, veterinary, and environmental samples, database utilization, methods for sequencing viral genes, complete genome sequence analysis and influenza phylogenetics. Other topics included molecular characterization of virus isolates, sequence-based surveillance activities and assessment of emerging influenza virus threats.

Agenda/Set-up

Todd Davis, Pierre Rivailler, Catherine Smith and Rebecca Garten each developed curriculum and provided formal instruction in sequence database utilization and bioinformatics resources, introduction to sequence alignment software for data analysis, and phylogenetic software applications. The ten day course with more than 30 participants was taught using a series of lectures, demonstrations, computer lab practicals and group projects.

Outcome

Participants developed the use of phylogenetic analysis tools and resources to support influenza virus research and to strengthen seasonal and animal influenza surveillance and pandemic risk assessment activities. All participants developed independent research skills for the identification, characterization, and analysis of seasonal, pandemic and avian influenza. Several research collaborations between participants and instructors resulted from the course.

Cell Culture, Isolation and Troubleshooting

Location: Laboratorio de Virus Respiratorios; Lima, Peru.

Date: July 18 – 21, 2010.

Countries represented: Peru.

Co-sponsors: None.

Goals

The goal of this training was to provide support and provide troubleshooting in cell culture and the isolation of influenza viruses. Amanda Balish, CDC, provided support in the areas of biosafety, biosecurity and immunofluorscence.

Agenda/Set-up

The agenda was flexible so that the day-to-day activities of the laboratory could be reviewed.

Key Topics/Set-up

- Propagation of the MDCK cell line.
- Isolation of influenza viruses.
- Troubleshooting.
- Review of biosafety and biosecurity.

Outcome

The issue with the laboratory's current cell line was identified and the laboratory was sent new cell culture. The procedures were adjusted to reflect what was learned in the laboratory training. The laboratory has submitted many isolated samples to the CDC for influenza surveillance since the training.

Noteworthy Outcomes

The laboratorians learned quickly and were able to integrate changes and suggestions into their standard operating procedures.

Cell Culture, Isolation and Troubleshooting

Location: Central Laboratory of Public Health; Ascuncion, Paraguay.

Date: July 22 – July 27, 2010.

Countries represented: Paraguay.

Co-sponsors: None.

Goals

The goal of this training was to provide support and provide troubleshooting in cell culture and the isolation of influenza viruses. Amanda Balish, CDC, provided support in the areas of biosafety and biosecurity.

Agenda/Set-up

The agenda was flexible so that the day-to-day activities of the laboratory could be reviewed.

Key Topics/Set-up

- Propagation of the MDCK cell line.
- Isolation of influenza viruses.
- Troubleshooting.
- Review of biosafety and biosecurity.

Outcome

The issue with the laboratory's current cell line was identified and the laboratory was sent new cell culture. The procedures were adjusted to reflect what was learned in the laboratory training. The laboratory has submitted many isolated samples to the CDC for influenza surveillance since the training.

Noteworthy Outcomes

The laboratorians learned quickly and were able to integrate changes and suggestions into their standard operating procedures.

Influenza Biosafety and Virus Isolation Training

Location: NIHRD Laboratories; Jakarta, Indonesia.

Date: October 4 – 8, 2010.

Countries represented: Indonesia.

Co-sponsors: None.

Goals

This training was requested by the National Institute of Health Research Development (NIHRD) for assistance in virus isolation, serological assays, standard operating procedures and biosafety in a new BSL-3 facility for influenza surveillance and research. Laboratory assessment and training were conducted by Thomas Rowe, CDC. The training was held in order to provide guidance and expertise on influenza laboratory practices that are consistent with WHO/CDC influenza laboratories. NIHRD has expressed interest in becoming a WHO Influenza Collaborating Center and has requested assistance in strengthening their program to be in line with WHO influenza laboratories.

Agenda/Set-up

The training program was divided into three areas: 1) Influenza virus isolation troubleshooting, 2) influenza safety training, and 3) Development of BSL-3 safety program for a newly constructed BSL-3-enhanced HPAI laboratory. The goal of part 1 of the training was to identify areas in the laboratory which may contribute to the reduced rate of virus isolation. The goal of part 2 of the training was to provide basic influenza training which is consistent with WHO and CDC guidelines for working with seasonal, novel, and highly-pathogenic avian influenza. The goal of part 3 was to aid in the setup of the new BSL-3 enhanced HPAI laboratory and development of a laboratory/safety program.

Outcome

The training and assessment was well received by the members of the NIHRD influenza laboratory. Several areas for improvement were identified which would allow for greater recovery of virus as well as for quicker data turnaround time to provide needed epidemiological and virological information to Indonesia sentinel laboratories and WHO.

Noteworthy Outcomes

CDC and WHO were requested to provide technical assistance in virus isolation and areas of laboratory management. Additionally, key areas were identified for improvement and included features related to the BSL-3 enhanced HPAI laboratory, laboratory methodologies, and data management.

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Thomas Rowe (CDC) with participants from the Biosafety and Virus Isolation Training in front of Indonesia's new National Institute of Health Research and Development laboratories, Jakarta, Indonesia, 2010.

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Epidemiology and Surveillance Training

Sentinel Site Surveillance Training

Location: Addis Ababa, Ethiopia.

Date: February 2010.

Conducted by the CDC international influenza team in partnership with the University of North Carolina Gillings School of Global Public Health and the Council for State and Territorial Epidemiologists (CSTE)

Goals

The course had two goals: to pilot the influenza sentinel site surveillance materials and to train participants on how to set up and run an effective influenza sentinel surveillance system. The audience consisted of surveillance officers and any other public health professionals involved in the influenza surveillance system. The training consisted of PowerPoint presentations, break-out sessions, and a set of pocket cards meant to help reference key topics in the field. The training was used as a forum for QandA and discussion about ways to improve Ethiopia's surveillance system. At the end of the training, participants filled out an evaluation of the course which was used to improve the training materials for future use.

Agenda/Set-up

The training occurred over the course of one day and covered the following topics:

- background and objectives.
- case definitions.
- mechanics of sentinel surveillance.
- roles and responsibilities.
- data reports and analysis.
- system monitoring.
- additional uses of the system and surveillance data.
- laboratory methods.
- case studies.

Outcome

Trainees gave positive feedback on the training course. Next steps include putting the materials through CDC clearance, posting the materials online, and translating the materials into French and Spanish.

Noteworthy Outcomes

The training stimulated discussion amongst participants on how to improve their surveillance systems. Also, the training materials can serve as a useful reference for participants. Positive feedback was received when participants evaluated the training.

Sentinel Site Surveillance Training

Location: Kigali, Rwanda.

Date: June 2010.

Conducted by Members of the CDC international influenza team.

Goals

The course had two goals: to pilot the influenza sentinel site surveillance materials and to train participants on how to set up and run an effective influenza sentinel surveillance system. The audience consisted of surveillance officers and any other public health professionals involved in the influenza surveillance system. The training consisted of PowerPoint presentations, break-out sessions, and a set of pocket cards meant to help reference key topics in the field. The training was used as a forum for QandA and discussion about ways to improve Rwanda's surveillance system. At the end of the training, participants filled out an evaluation of the course which was used to improve the training materials for future use.

Agenda/Set-up

The training occurred over the course of one day and covered the following topics:

- background and objectives.
- case definitions.
- mechanics of sentinel surveillance.
- roles and responsibilities.
- data reports and analysis.
- system monitoring.
- additional uses of the system and surveillance data.
- laboratory methods.
- case studies.

Outcome

Trainees gave positive feedback on the training course. Next steps include putting the materials through CDC clearance, posting the materials online, and translating the materials into French and Spanish.

Noteworthy Outcomes

The training stimulated discussion amongst participants on how to improve their surveillance systems. Also, the training materials can serve as a useful reference for participants. Positive feedback was received when participants evaluated the training.

Writing Workshops

Location: Nairobi, Kenya.

Date: March, 2010; October 2010.

Conducted by epidemiology professors from University of California, San Francisco.

Goals

To help local and regional epidemiologists and laboratory staff finalize their influenza-related manuscripts for publication.

Agenda/Set-up

Short lectures were conducted that outlined the approach to different aspects of writing manuscripts. A significant portion of the time was dedicated to allowing writers complete their analyses and draft their manuscripts. Writers met with mentors on a daily basis to go over their papers.

Outcome

A number of manuscripts were completed.

Noteworthy Outcomes

At least 12 manuscripts have been submitted for publication in peer-reviewed journals and others are nearing completion.

Training for Epi Info™ 3.5.1 Tool

Location: Addis Ababa, Ethiopia.

Date: September 2010.

Conducted by Epi Info Atlanta team.

Goals

The overall objectives of the training were to provide a comprehensive overview and hands-on workshop in using the suite of tools available within Epi Info.

Agenda/Set-up

During the training, students learned how to create survey questionnaires, enter and analyze data from multiple sources and visualize the results through graphs, maps and other presentation methods supported by Epi Info.

Outcome

Four-day training sessions were successfully completed in Addis Ababa, Ethiopia. Training concentrated on helping participants to improve the following abilities: read and analyze multiple data sets submitted by different health facilities at the national level; understand check codes functionalities in order to be able to incorporate business rules into Epi Info data entry screens for data validation; export subsets of data into different data formats like Excel, Text, HTML and Access; merge/import multiple files into a single master database, and; understand Epi Info menu files (.MNU) in order to develop customized applications using Epi Info.

Noteworthy Outcomes

The team successfully demonstrated how to: import Excel data into an MS Access database using Epi Info, export data to different formats including Excel, Text and Access, and create Epi Info customizable menus. The Epi Info team in Atlanta will continue to provide technical assistance to partners in Ethiopia through the Community of Users forum as well as through direct email communications.

Influenza Division Organization

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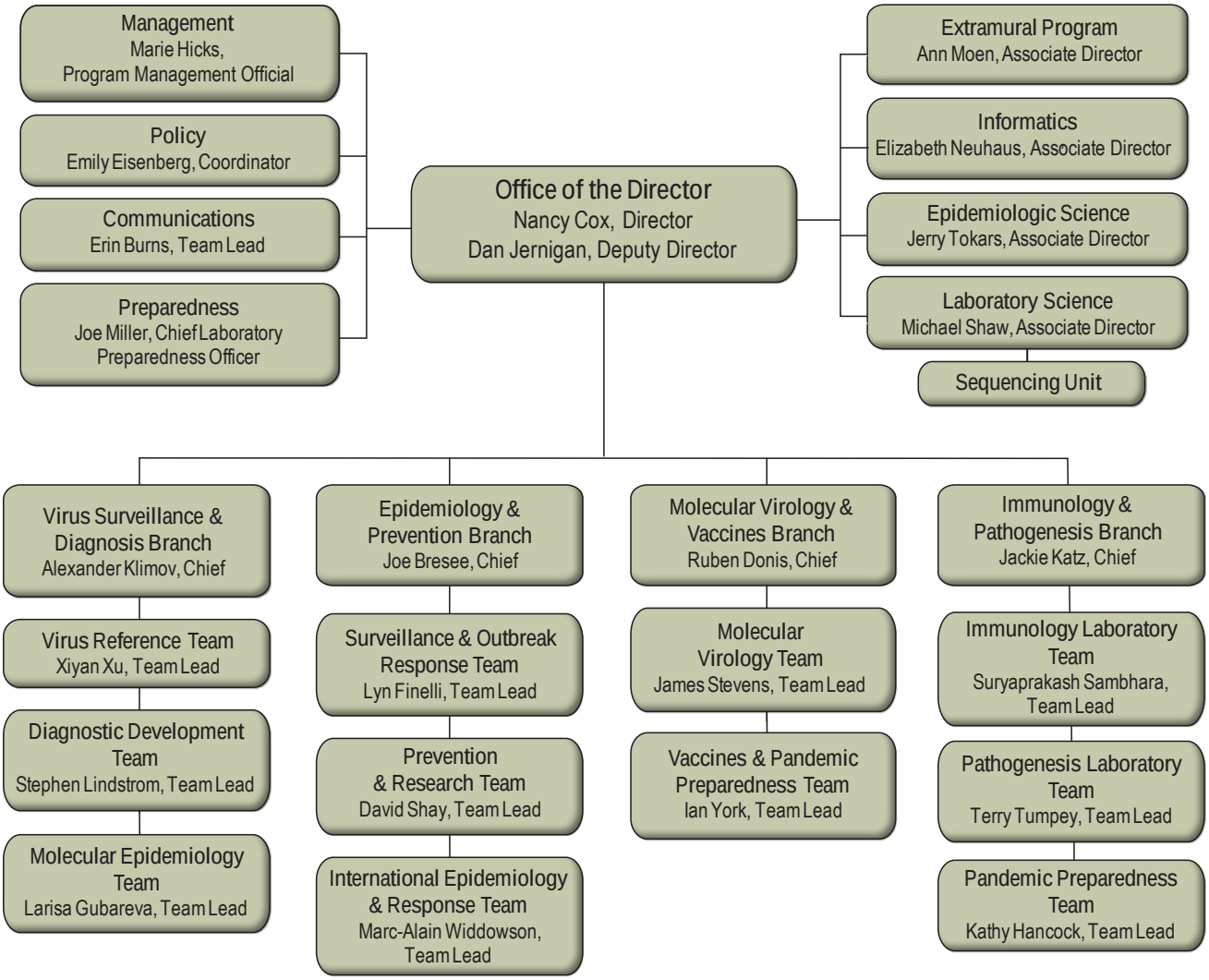
Organizational Chart



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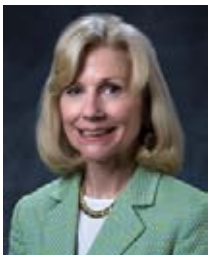
Atlanta-based Staff



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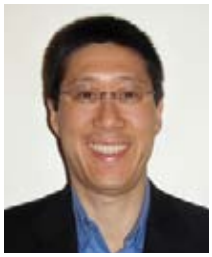

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References

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Acronyms

2009 H1N1	2009 Pandemic Influenza A (H1N1)
AFR	WHO African Region
AFRO	WHO Africa Regional Office
AI	Avian Influenza
AHI	Avian and Human Influenza
AMR	WHO Region of the Americas
APHIS	Animal and Plant Health Inspection Service (USDA)
APHL	Association of Public Health Laboratories
ARI	Acute Respiratory Illness
BEP	Biosecurity Engagement Program
BSL	Biosafety level
CARE	Cooperative for Assistance and Relief Everywhere
CDC	Centers for Disease Control and Prevention
CDC-CAP	CDC Central America and Panama
CoAG	Cooperative Agreement
DFA	Direct Immunofluorescence
DoD	Department of Defense
DVM	Doctor of Veterinary Medicine
ECDC	European Centers for Disease Control
EMR	WHO Eastern Mediterranean Region
EMRO	WHO Eastern Mediterranean Regional Office
EOC	Emergency Operations Center
EQAP	WHO External Quality Assessment Program
EUR	WHO European Region
EURO	WHO European Regional Office
FAO	Food and Agriculture Organization
FDA	United States Food and Drug Administration
FETP	Field Epidemiology Training Program
FELTP	Field Epidemiology and Laboratory Training Program
FY	Fiscal Year

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FMOH	Federal Ministry of Health
GDD	CDC Global Disease Detection
GDP	Gross Domestic Product
GEIS	Global Emerging Infections Surveillance (DoD)
GIP	WHO Global Influenza Program
GISN	WHO Global Influenza Surveillance Network
GOARN	WHO Global Outbreak Alert and Response Network
HA	Hemagglutinin (a protein on the surface of the influenza virus)
HAI (or HI)	Hemagglutination Inhibition Assay
HAI	Health care-associated Infection; Human Animal Interface
HHS	United States Department of Health and Human Services
HPAI	High Pathogenic Avian Influenza
IATA	International Air Transport Association
ICEID	International Conference on Emerging Infectious Disease
ID	CDC Influenza Division
IDSR	Integrated Disease Surveillance and Response
IHR	International Health Regulations
IFA	Immunofluorescence, Indirect Antibody Staining
IEC	Information, Education and Communication
IEIP	International Emerging Infections Program
ILI	Influenza-Like Illness
IRR	Influenza Reagent Resource
LCD-TV	Liquid-crystal Display Television
LPAI	Low Pathogenic Avian Influenza
MD	Medical Doctor
MDCK	Madin-Darby Canine Kidney Cells
MN	Microneutralization Assay
MOH	Ministry of Health
MPA	Master of Public Administration
MPH	Master of Public Health
MSc	Master of Science
NA	Neuraminidase (a protein on the surface of the influenza virus)

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NAI	Neuraminidase Inhibitors
NAMRU	United States Naval Medical Research Unit
NCIRD	National Center for Immunization and Respiratory Diseases
NGO	Non-Government Organization
NI	Neuraminidase Inhibition Assay
NIC	National Influenza Center
NP	Nasopharyngeal swab
NRP	National Response Plan
NVAC	National Vaccine Advisory Committee
NVPO	National Vaccine Program Office
OIE	World Organisation for Animal Health (Office International des Épizooties)
OP	Oropharyngeal swab
PAHO	Pan American Health Organization
PATH	Program Appropriate Technology in Health
PCR	Polymerase Chain Reaction
PPE	Personal Protective Equipment
Pro-MED	Program for Monitoring Emerging Diseases Electronic Outbreak Reporting System
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
RRT	Rapid Response Team
RSV	Respiratory Syncytial Virus
RT-PCR	Reverse Transcriptase Polymerase Chain Reaction
SADC	South African Development Community
SARI	Severe Acute Respiratory Infection
SARS	Severe Acute Respiratory Syndrome
SEAR	WHO South-East Asia Region
SEARO	WHO South-East Asia Regional Office
SMS	Short Messaging Service
SOP	Standard Operating Procedure
SPC	Secretariat of the Pacific Community
TB	Tuberculosis

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UNICEF	United Nations Children's Fund
UPS	Uninterruptable Power Supply
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VTM	Viral Transport Media
WFP	World Food Program
WPRO	WHO Western Pacific Regional Office
WPR	WHO Western Pacific Region
WHO	World Health Organization
WHO CC	World Health Organization Collaborating Center for Reference and Research on Influenza

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Publications

Fiscal Year 2010

Alvarez P, Mattiello R, Rivailler P, Pereda A, Davis CT, Boado L, D'Ambrosio E, Aguirre S, Espinosa C, La Torre J, Donis R, Mattion N. First isolation of an H1N1 avian influenza virus from wild terrestrial non-migratory birds in Argentina. Virology. 2009;396(1):76-84.

Anderson T, Capua I, Dauphin G, Donis R, Fouchier R, Mumford E, Peiris M, Swayne D, Thiermann A. FAO-OIE-WHO joint technical consultation on avian influenza at the human-animal interface. Influenza and Other Respiratory Viruses. 2010;4(S1):1-29.

Balish AL, Davis CT, Saad MD, El-Sayed N, Esmat H, Tjaden JA, Earhart KC, Ahmed LE, El-Halem MA, Hakem M A, Nassif SA, El-Ebiary EA, Taha M, Aly MM, Arafa A, O'Neill E, Xiyan X, Cox NJ, Donis RO, Klimov AI. Antigenic and genetic diversity of highly pathogenic avian influenza A (H5N1) viruses isolated in Egypt. Avian Diseases. 2010;54:329-34.

Barr IG, McCauley J, Cox N, Daniels R, Engelhardt OG, Fukuda K, Grohmann G, Hay A, Kelso A, Klimov A, Odagiri T, Smith D, Russell C, Tashiro M, Webby R, Wood J, Ye Z, Zhang W, Writing Committee of the World Health Organization Consultation on Northern Hemisphere Influenza Vaccine Composition for 2009-2010. Epidemiological, antigenic and genetic characteristics of seasonal influenza A(H1N1), A(H3N2) and B influenza viruses: Basis for the WHO recommendation on the composition of influenza vaccines for use in the 2009-2010 Northern Hemisphere season. Vaccine. 2010;28:1156-67.

Blair PJ, Wierzba TF, Touch S, Vonthanak S, Xu X, Garten RJ, Okomo-Adhiambo MA, Klimov AI, Kasper MR, Putnam SD. Influenza epidemiology and characterization of influenza viruses in patients seeking treatment for acute fever in Cambodia. Epidemiological Infections. 2010;138(2):199-209.

Brooks WA, Goswami D, Rahman M, Nahar K, Fry AM, Balish A, Iftekharuddin N, Azim T, Xu X, Klimov A, Bresee J, Bridges C, Luby S. Influenza is a major contributor to childhood pneumonia in a tropical developing country. Pediatric Infectious Disease Journal. 2010;29(3):216-21

Cowling BJ, Chan KH, Fang VJ, Cheng CK, Fung RO, Wai W, Sin J, Seto WH, Yung R, Chu DW, Chiu BC, Lee PW, Chiu MC, Lee HC, Uyeki TM, Houck PM, Peiris JS, Leung GM. Facemasks and hand hygiene to prevent influenza transmission in households. Annals of Internal Medicine. 2009;151(7):437-46.

Davis CT, Balish AL, O'Neill E, Nguyen CV, Cox NJ, Xu X, Klimov A, Nguyen T, Donis RO. Detection and characterization of clade 7 high pathogenicity avian influenza H5N1 viruses in chickens seized at ports of entry and live poultry markets in Vietnam. Avian Diseases. 2010;54:307-12.

Dawood FS, Dalton CB, Durrheim DN, Hope KG. (Letters) Rates of hospitalization for acute respiratory illness and the emergence of pandemic (H1N1) 2009 virus in the Hunter New England Area Health Service. Medical Journal of Australia. 2010;191(10):573-4.

Dawood FS, Hope KG, Durrheim DN, Givney R, Fry AM, Dalton CB. Estimating the disease burden of pandemic (H1N1) 2009 virus infection in Hunter New England, Northern New South Wales, Australia, 2009. PLoS ONE. 2010;5(3):e9880.

Deyde VM, Nguyen T, Bright RA, Balish A, Shu B, Lindstrom S, Klimov AI, Gubareva LV. Detection of molecular markers of antiviral resistance in influenza A (H5N1) viruses using a pyrosequencing method. Antimicrobial Agents and Chemotherapy. 2009;53(3):1039-47.

Dilantika C, Sedyaningsih ER, Kasper MR, Agtini M, Listiyaningish E, Uyeki TM, Burgess TH, Blair PJ, Putnam SD. Influenza virus infection among pediatric patients reporting diarrhea and influenza-like illness. BMC Infectious Diseases. 2010;10:3.

Dong J, Matsuoka Y, Maines TR, Swayne DE, O'Neill E, Davis CT, Van-Hoven N, Balish A, Yu Hj, Katz JM, Klimov A, Cox N, Li Dx, Wang Y, Guo Yj, Yang Wz, Donis RO, Shu Yl. Development of a new candidate H5N1 avian influenza virus for pre-pandemic vaccine production. Influenza and Other Respiratory Viruses. 2009;3:287-95.

Ebrahim SH, Memish ZA, Uyeki TM, Khoja TA, Marano N, McNabb SJ. Pandemic H1N1 and the 2009 Hajj. Science. 2009;326:938-40.

Girard MP, Katz J, Pervikov Y, Palkonyay L, Kieny MP. Report of the 6th Meeting on the evaluation of pandemic influenza vaccines in clinical trials World Health Organization. Geneva, Switzerland, 17-18 February 2010. Vaccine. 2010;28(42):6811-20.

Gurley ES, Zaman RU, Sultana R, Bell M, Fry AM, Srinivasan A, Rahman M, Rahman MW, Hossain MJ, Luby SP. Rates of hospital-acquired respiratory illness in Bangladeshi tertiary care hospitals: Results from a low-cost pilot surveillance strategy. Clinical Infectious Diseases. 2010;50:1084-90.

Huai Y, Lin J, Varma JK, Peng Z, He J, Cheng C, Zhong H, Chen Y, Zheng Y, Luo Y, Liang W, Wu X, Huang Z, McFarland J, Feng Z, Uyeki TM, Yu H. A primary school outbreak of pandemic 2009 influenza A (H1N1) in China. Influenza and Other Respiratory Viruses. 2010;4:259-66.

Lau LL, Cowling BJ, Fang VJ, Chan K-H, Lau EH, Lipsitch M, Cheng CK, Houck PM, Uyeki TM, Peiris JS, Leung GM. Viral shedding and clinical illness in naturally acquired influenza virus infections. The Journal if Infectious Diseases. 2010;201(10):1509-16.

Memish ZA, McNabb SJ, Mahoney F, Alrabiah F, Marano N, Ahmed QA, Mahjour J, Hajjeh RA, Formenty P, Harmanci FH, Bushra HE, Uyeki TM, Nunn M, Isla N, Barbeschi M, and the Jeddah Hajj Consultancy Group. Establishment of public health security in Saudi Arabia for the 2009 Hajj in response to pandemic influenza A H1N1. The Lancet. 2009;374:1786-91.

Nasreen S, Azziz-Baumgartner E, Gurley ES, Winch PJ, Unicomb L, Sharker MA, Southern D, Luby SP. Prevalent high-risk respiratory hygiene practices in urban and rural Bangladesh. Tropical Medicine and International Health. 2010;15(6):762-71.

Ng S, Cowling BJ, Fang VJ, Chan KH, Ip DK, Cheng CK, Uyeki TM, Houck PM, Peiris JS, Leung GM. Effects of oseltamivir treatment on duration of clinical illness and viral shedding and household transmission of influenza virus. Clinical Infectious Diseases. 2010;50:707-14.

Nguyen HT, Dharan NJ, Le MTQ, Nguyen NB, Nguyen CT, Hoang DV, Tran HN, Bui CT, Dang DT, Pham DN, Nguyen HT, Phan TV, Dennis D, Uyeki TM, Mott J, Nguyen YT. National influenza surveillance in Vietnam, 2006-2007. Vaccine. 2009;28(2):398-402.

Nguyen HH, Tumpey TM, Part H-J, Byun Y-H, Tran LD, Nguyen VD, Kilgore PE, Czerkinsky C, Katz JM, Seong BL, Song JM, Kim YB, Do HT, Nguyen T, Nguyen CV. Prophylactic and therapeutic efficacy of avian antibodies against influenza virus H5N1 and H1N1 in mice. PLoS ONE. 2010;5(4):e10152.

Nguyen HT, Sheu TG, Mishin VP, Klimov AI, Gubareva LV. Assessment of pandemic and seasonal influenza A (H1N1) virus susceptibility to neuraminidase inhibitors in three enzyme activity inhibition assays. Antimicrobial Agents and Chemotherapy. 2010;54(9):3671-7.

Noriega LM, Verdugo RJ, Araos R, Munita JM, Diaz V, Marcotti A, Perez J, Gonzalez P, Thompson L, Canals M, Hoppe A, Mounts AW, Vial PA. Pandemic influenza A (H1N1) 2009 with neurological manifestations, a case series. Influenza and Other Respiratory Viruses. 2010;4:117-20.

Olsen SJ, Thamthitiwat S, Chantra S, Chittaganpitch M, Fry AM, Simmerman JM, Baggett HC, Peret TC, Erdman D, Benson R, Talkington D, Thacker L, Tondella ML, Winchell J, Fields B, Nicholson WL, Maloney S, Peruski LF, Ungchusak K, Sawanpanyalert P, Dowell SF. Incidence of respiratory pathogens in persons hospitalized with pneumonia in two provinces in Thailand. Epidemiological Infections. 2010;138:1811-22.

Reyes L, Arvelo W, Estevez A, Gray J, Moir JC, Gordillo B, Frenkel G, Ardon F, Moscoso F, Olsen SJ, Fry AM, Lindstrom S, Lindblade KA. Population-based surveillance for 2009 pandemic influenza A (H1N1) virus in Guatemala, 2009. Influenza and Other Respiratory Viruses. 2010;4:129-40.

Rodriquez-Noriega E, Gonzalez-Diaz E, Morfin-Otero R, Gomez-Abundis GF, Briseno-Ramirez J, Perez-Gomez HR, Lopez-Gatell H, Alpuche-Aranda CM, Ramirez E, Lopez I, Iguala M, Chapela IB, Zavala EP, Hernandez M, Stuart TL, Villarino ME, Widdowson MA, Waterman S, Uyeki T, Azziz-Baumgartner E, for the hospital Civil de Guadalajara, Fray Antonio Alcalde emerging respiratory infections response team. Hospital triage system for adult patients using an influenza-like illness scoring system during the 2009 pandemic-Mexico. PLoS ONE. 2010;5(5):e10658.

Simmerman JM, Chittaganpitch M, Levy J, Chantra S, Maloney S, Uyeki T, Areerat P, Thamthitiwat S, Olsen SJ, Fry A, Ungchusak K, Baggett HC, Chensuttiwat S. Incidence, seasonality and mortality associated with influenza pneumonia in Thailand: 2005-2008. PLoS ONE. 2009;4(11):e7776.

Suntarattiwong P, Jarman RG, Levy J, Baggett HC, Gibbons RV, Chotpitayasunondh T, Simmerman JM. Clinical performance of a rapid influenza test and comparison of nasal versus throat swabs to detect 2009 pandemic influenza A (H1N1) infection in Thai children. The Pediatric Infectious Disease Journal. 2010;29(4):366-7.

Tinoco Y, Razuri H, Ortiz EJ, Gomez J, Widdowson MA, Uyeki T, Laguna-Torres VA, Kochel TJ, Gilman RH, Montgomer JM. Preliminary population-based epidemiological and clinical data on 2009 pandemic H1N1 influenza A (pH1N1) from Lima, Peru. Influenza and Other Respiratory Viruses. 2009;3:253-6.

Vongphrachanh P, Simmerman JM, Phondkeo D, Pansayavong V, Sisouk T, Ongkhamme S, Bryce GT, Corwin A, Bryant JE. An early report from newly established laboratory-based influenza surveillance in Lao PDR. Influenza and Other Respiratory Viruses. 2010;4:47-52.

Writing Committee of the WHO Consultation on Clinical Aspects of Pandemic (H1N1) 2009 Influenza, Bautista E, Chotpitayasunondh T, Gao Z, Harper SA, Shaw M, Uyeki TM, Zaki SR, Hayden FG, Hui DS, Kettner JD, Kumar A, Lim M, Shindo N, Penn C, Nicholson KG. Clinical aspects of pandemic 2009 influenza A (H1N1) virus infection. New England Journal of Medicine. 2010;362(18):1708-19.

Zaman RU, Alamgir AS, Rahman M, Azziz-Baumgartner E, Gurley ES, Sharker MA, Brooks WA, Azim T, Fry AM, Lindstrom S, Gubareva LV, Xu X, Garten RJ, Hossain MJ, Khan SU, Faruque LI, Ameer SS, Klimov AI, Rahman M, Luby SP. Influenza in outpatient ILI case-patients in national hospital-based surveillance, Bangladesh, 2007-2008. PLoS ONE. 2009;4(12):e8452.

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