

Centers for Disease Control and Prevention

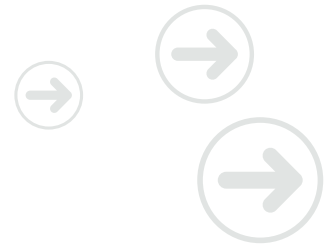
INTERNATIONAL ACTIVITIES REPORT

Fiscal Years 2014–2015



National Center for Immunization and Respiratory Diseases
Influenza Division





Acknowledgements

The U.S. Centers for Disease Control and Prevention's (CDC) Influenza Division would like to acknowledge the World Health Organization (WHO) and 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 Sajata Outin-Blenman, Pamela Kennedy, Ann Moen, and Emily Cramer for editing and producing the International Influenza Report FY 2014 & 2015.

NOTE: The information in this report was compiled by the Influenza Division and does not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Cover Photo Credit

Front Cover from left to right:

A participant during laboratory training at the National Influenza Centre in Bishkek, Kyrgyzstan.

Animal-human interface baseline study in Thai Binh Province, Vietnam.

Medical technologist getting ready to collect a blood sample from a pregnant woman study participant in Kishoreganj District, Bangladesh.

Back Cover from left to right:

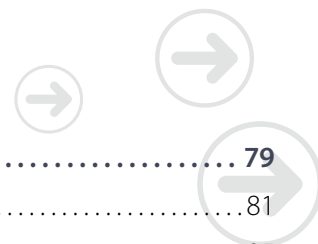
Student performing a PCR laboratory exercise during a training course.

Sampling in Nam Dinh Province, Vietnam during a cross-sectional study of influenza at slaughterhouses.

Students working on a laboratory exercise during the PCR Workshop.

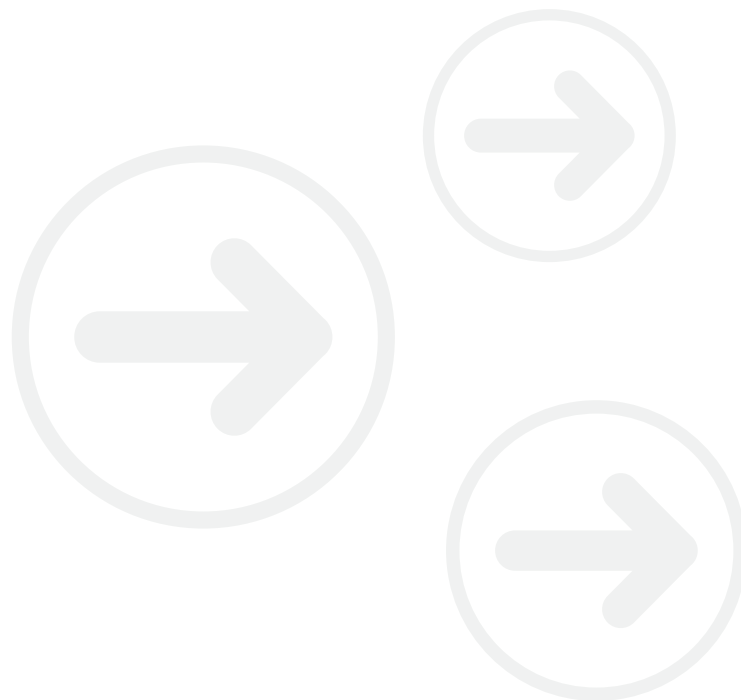
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Influenza Division International Overview





Background

The U.S. Centers for Disease Control and Prevention's (CDC) Influenza Division has a long history of supporting the World Health Organization (WHO) and its global network of National Influenza Centers (NIC). 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, and subsequent 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 work 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 program to support global capacity to prevent and control seasonal influenza and increase pandemic preparedness. Support was made available through cooperative agreements with WHO's Global Influenza Program (GIP) and WHO's regional offices to enhance existing support to these entities. Substantial support via cooperative agreements was also provided to ministries of health in high-risk countries to enhance influenza surveillance and response capabilities. These cooperative agreements, paired with technical assistance, support the provision of training, staffing, direct assistance, supplies and reagents, and formed the foundation for CDC's expanded role in international influenza prevention and control. The Influenza Division 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 prior to the pandemic. First-time investigations of influenza were conducted in response to the pandemic and laboratories that previously could not identify influenza virus were able to diagnose pandemic 2009 H1N1 using molecular techniques. Many countries that previously had not routinely reported influenza were able to report consistently and contribute to the global picture of influenza epidemiology during the pandemic. The global surveillance and response capacity built before the pandemic of 2009 was critical to the rapid global response and disease prevention.

Over the past eleven years the program has undergone remarkable growth [see Maps] and has expanded to provide support to over 50 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), universities, nongovernmental organizations, private industry and other entities to enhance global surveillance and preparedness. Over 20 staff have been placed in the field [see Map] to provide on-the-ground assistance and support to countries and to WHO.

Recognizing that needs vary by country, 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 for and feasibility of a vaccine policy. In 2011, CDC entered a partnership with WHO's Global Action Plan for Influenza Vaccine, to expand prevention of global disease and improve health security through greater use of influenza vaccines worldwide.

While the response to the 2009 H1N1 pandemic showed that recent progress had been made, avian influenza H5N1 outbreaks still pose a significant and ongoing global health threat and a threat to U.S. security. To sustain the gains made in the past years, a broad-based commitment is needed to build and maintain global influenza surveillance that is sustainable (and eventually self-sustainable); this effort requires dedicated, annualized resources and staffing. It is our hope that these HHS/CDC resources and technical assistance will act as a catalyst for countries affected by H5N1, neighboring countries and donor countries to commit resources to establish long-term influenza surveillance, prevention and control, and pandemic preparedness activities. 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.

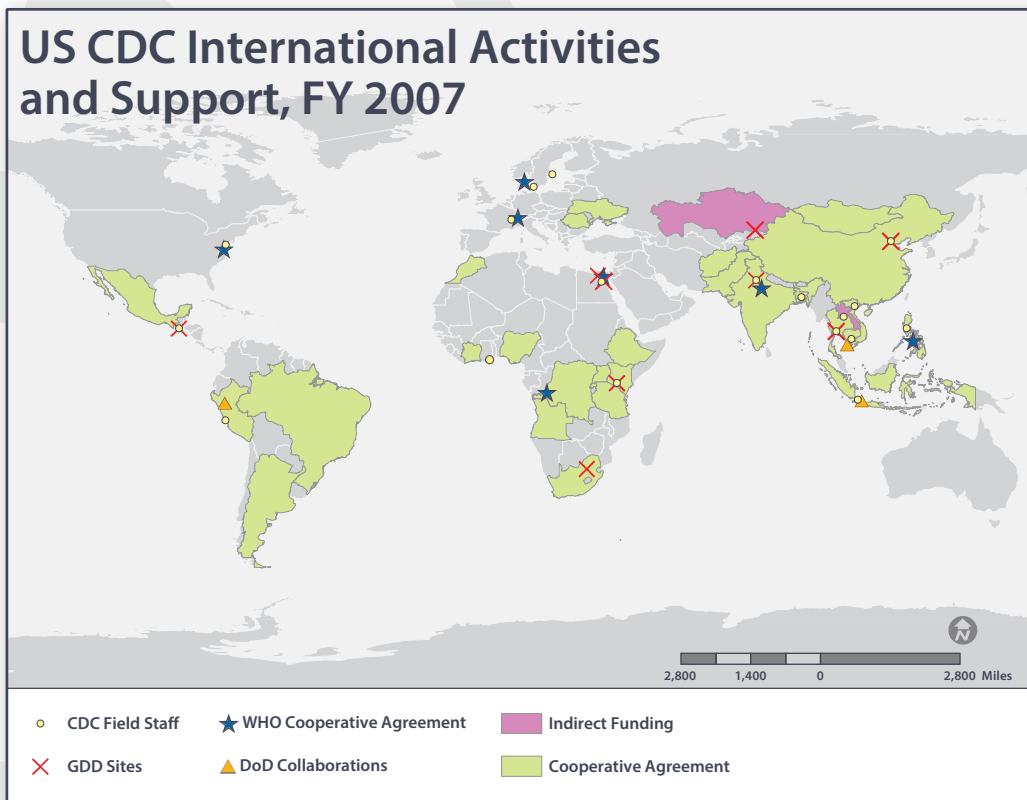
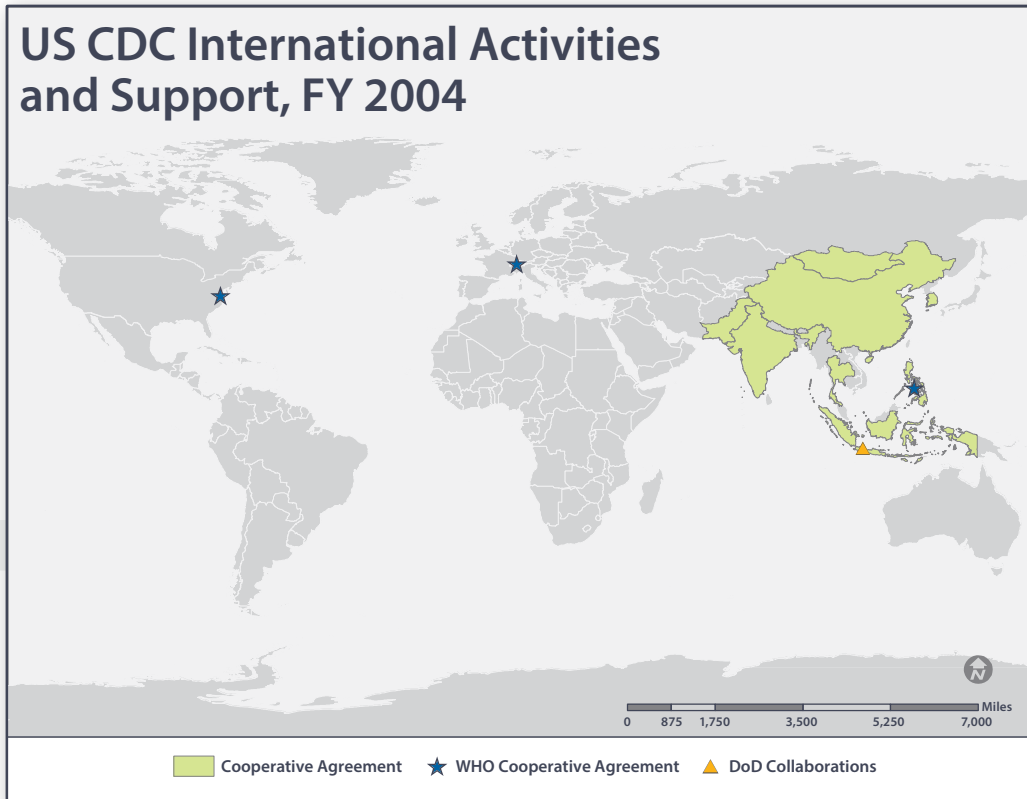
This program has shown substantial benefit beyond influenza. The capacity for laboratory detection and epidemiologic surveillance of respiratory disease has served as the basis for the diagnosis and investigation of other infectious diseases, particularly respiratory pathogens like MERS-CoV. Similarly, we have reports from grantees describing how the foundation that was built for influenza was used to support the Ebola response. 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 2009 pandemic but for many other diseases including Rift Valley fever, dengue, cholera, Ebola, MERS-CoV, and rabies. Evidence shows that the technical assistance provided by the Influenza Division is assisting countries to increase their capacity to comply with the International Health Regulations 2005 (IHR). The Influenza Division program, with its focus on human and avian influenza, contributes 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.

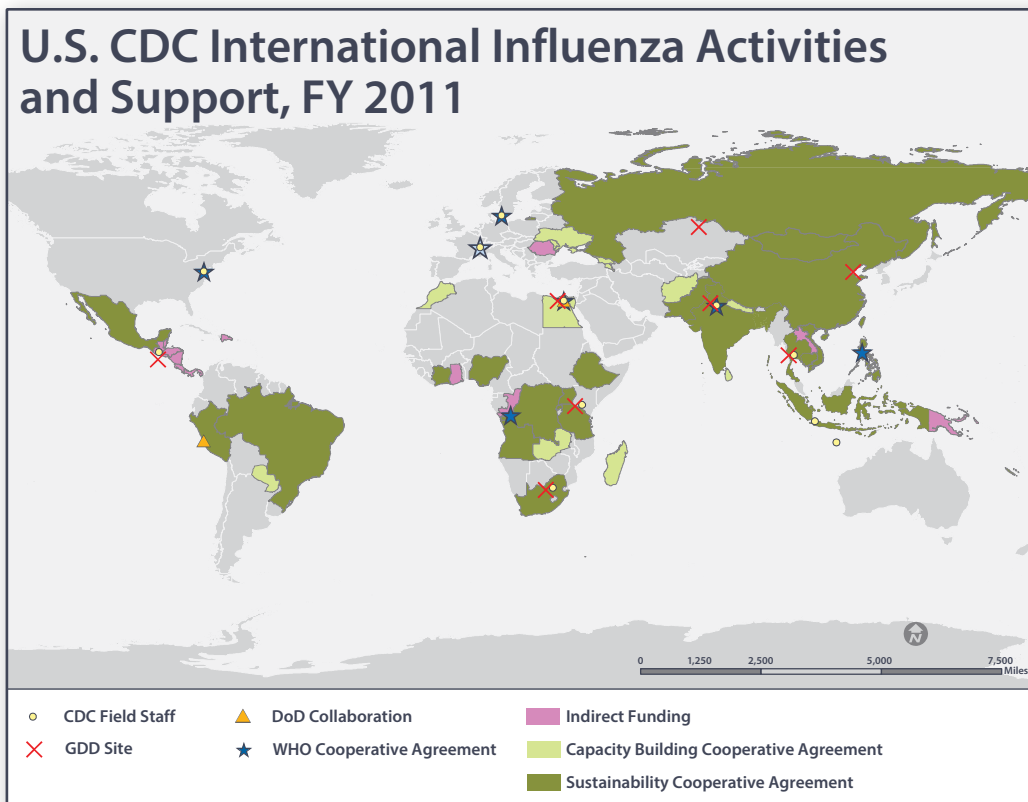
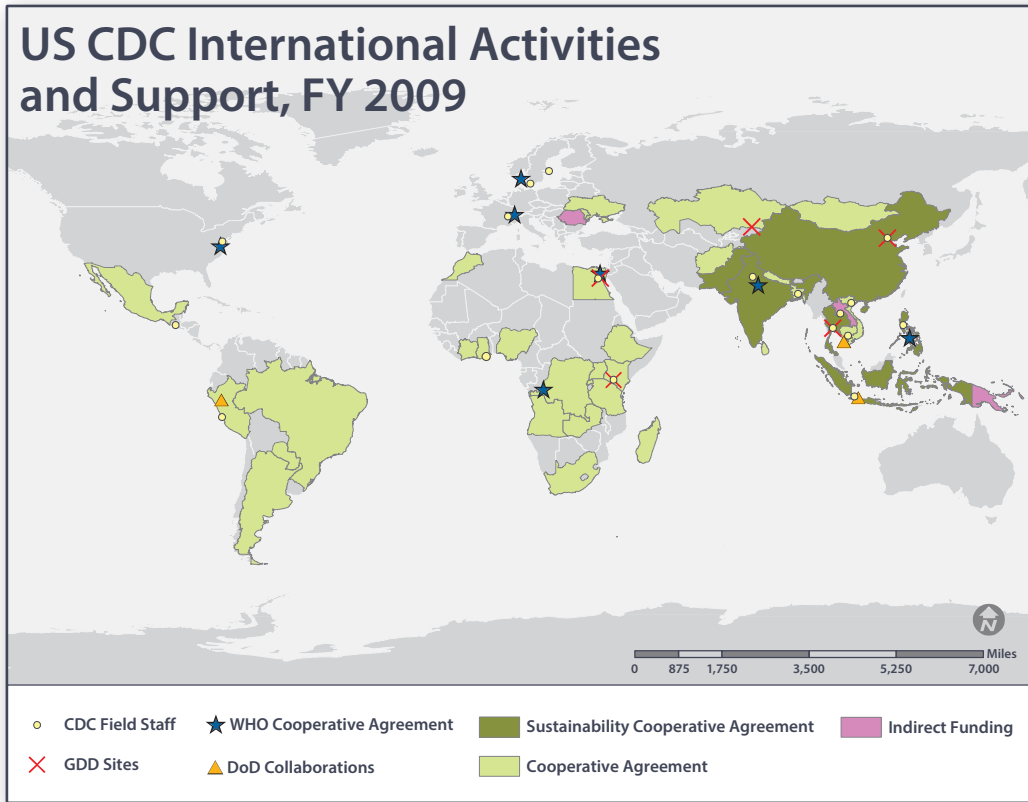
This report is the sixth update on the Influenza Division's international activities and encompasses fiscal years 2014 and 2015.

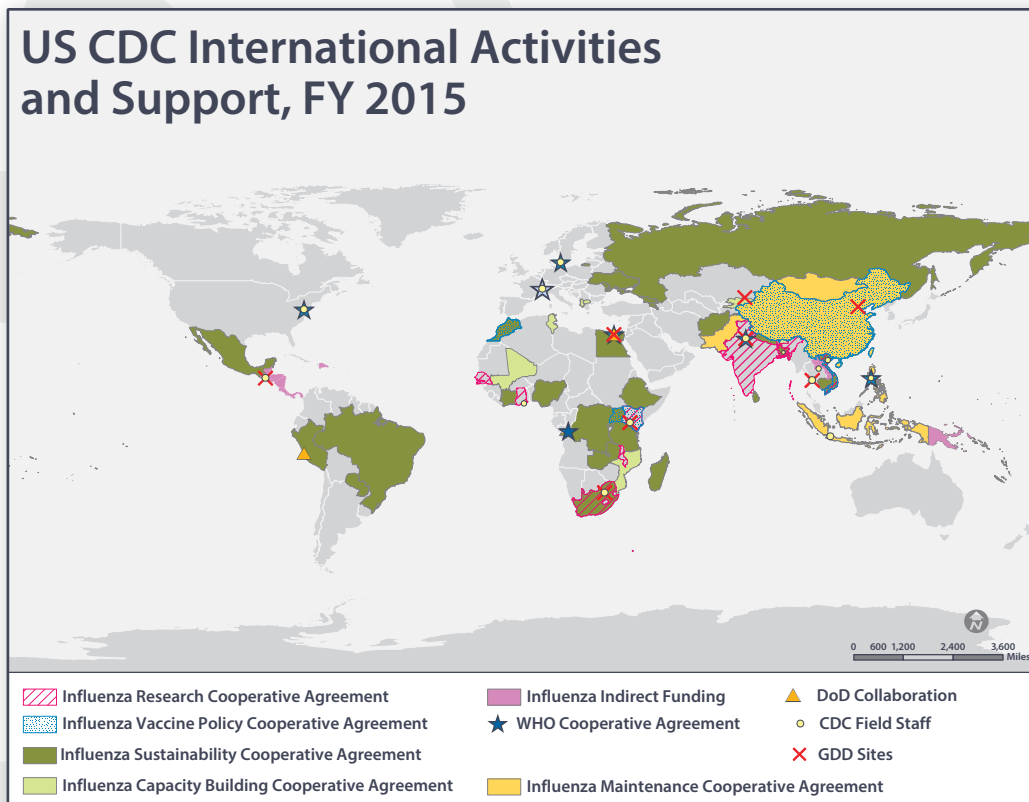
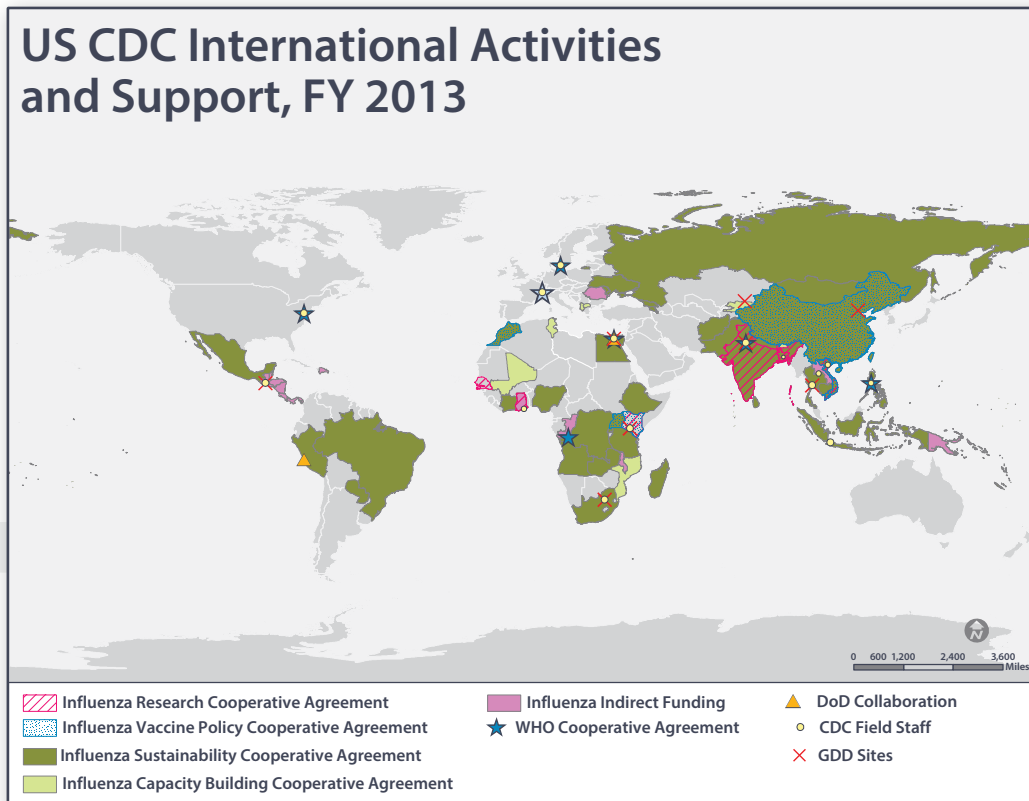


Maps

For accessible explanations of the figures and maps in the section below, see the [Appendix](#), beginning on page 217.







U.S. CDC & WHO Collaborations— Influenza

The HHS/CDC Influenza Division has maintained cooperative agreements with WHO Headquarters and the WHO Pan American Health Organization (PAHO) and the Regional Office for the Western Pacific (WPRO) for many years to address seasonal and pandemic influenza. Since 2006, cooperative agreements have been maintained with all WHO Regional Offices. The main purpose of the cooperative agreements is to address global and regional preparedness for influenza—both human and avian—through support to enhance the WHO Global Influenza Surveillance and Response System (GISRS), and technical support to countries' influenza prevention and control programs. Working with WHO expands the number of countries participating in the global system and more importantly enhances the early warning and communications capacities to improve the chance for early identification of a pandemic.

In recent years, we expanded our focus to also support efforts to increase influenza prevention through vaccination globally. Greater use of influenza vaccines will reduce the burden of influenza every year, but also provide a greatly expanded base of timely vaccine manufacturing to be used during a pandemic. Towards this goal, we have supported activities that will develop the evidence for use of vaccines globally and particularly in partner countries. Activities include supporting partners to develop estimates of influenza-associated disease and cost burden, projects to understand the effectiveness of influenza vaccines in special populations relevant to policy expansion, and supporting countries' policy-making bodies. Information about the project activities for the regional offices is integrated under the specific regions. CDC's Influenza Division provides funding and technical support to WHO Headquarters annually for multiple projects related to influenza, outlined below.

Activities supported through WHO

Influenza Laboratory Surveillance

- Strengthening of global influenza laboratory surveillance through improved diagnostic capacity through provision of reagents and support of training.
- Strengthening global coordination of and communication with GISRS by supporting periodic National Influenza Center (NIC) surveys.
- Supporting NICs to attend the WHO vaccine composition consultations in September and February.

Influenza Epidemiology and Surveillance

- Strengthening influenza monitoring at the global level including development of automated analysis and visual presentation tools.
- Developing a risk 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.
- Developing estimates of influenza deaths during seasonal epidemics and pandemics.
- Developing a tool for community-level risk assessment for H5N1 infection in collaboration with World Organisation for Animal Health (OIE) and Food and Agriculture Organization (FAO) of the United Nations.
- Support for the development of goals and methods for right-size consideration.



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.
- 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 long-term public health capacity and compliance with IHR.

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 mathematical 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.
- Support of WHO's Strategic Advisory Group of Experts to update global vaccine recommendations.
- Support of WHO's Global Action Plan for Influenza Vaccines to expand the availability of influenza vaccines globally.

Pandemic Influenza Preparedness (PIP) Framework

- Support PIP countries in accomplishing activities under their PIP work-plan including support for training and assessments.
- Support and consultation to WHO HQ for Monitoring & Evaluation (M&E) activities.
- Serving as mentors for activities under Burden of Disease (BOD) and other areas as needed.

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 manufactures reagents that scientists need to carry out basic research and develop improved diagnostic tests, vaccines, and detection methods. Public health laboratories across the globe also use reagents they receive from IRR for the surveillance of emerging strains of influenza, such as H1N1, H7N9 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.

Between FY14–FY15, IRR distributed nearly 22,000 reagents for surveillance and research activities to > 400 international laboratories in 126 countries. In addition to the domestic network of public health laboratories in all 50 U.S. states, Washington DC, and Puerto Rico that perform diagnostic testing for influenza, 80% of international laboratories participating in the World Health Organization's Global Influenza Surveillance and Response System (GISRS) are currently registered with the IRR program.

Location	RT-PCR Reagents (Kits and ala carte)			WHO Reagents (Kits and ala carte)			Other IRR Reagents		
	US States, DC, PR	# of labs	# of reagents	US States, DC, PR	# of labs	# of reagents	US States, DC, PR	# of labs	# of reagents
Domestic	52	122	1,773	20	119	1,253	52	197	13,875
International	Countries	# of labs	# of reagents	Countries	# of labs	# of reagents	Countries	# of labs	# of reagents
	112	133	1,685	88	60	1,054	86	115	2,276
Total	113	255	3,458	89	185	2,307	87	312	16,151

Figure 1—During September 1, 2014 to May 30, 2015, IRR had shipped thousands of influenza reagents, including the CDC Human Influenza Virus Real-Time RT-PCR Diagnostic Panel and the WHO Influenza Reagent Kit for Identification of Influenza Isolates, to laboratories and countries all over the world.



Figure 2—Over 400 laboratories have ordered and received influenza reagents from the IRR since September 1, 2014.

Since 2012, the IRR website at www.influenzareagentresource.org has served as the program's online hub for managing the ~1400 requests for influenza reagents that it receives each year. Laboratories can view the IRR's catalog of 700+ influenza reagents and submit their requests electronically, as well as download product information sheets and certificate of analyses. Orders are triaged by CDC on a daily basis, with a team of customer service representatives on hand to coordinate shipping to recipient laboratories and facilitate navigation of international customs if needed.

IRR™
Influenza Reagent Resource

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- Quick Order
- Announcements
- PEP Documents
- Suggest a Reagent
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- QC Testing of IRR Products

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- Bacteria
- Cell Lines
- Genetic Materials
- Kits
- Molecular Clones and Plasmids
- Monoclonal Antibodies
- Non-Influenza Virus
- Panels
- Polyclonal Antibodies and Antiserum
- Proteins
- Viruses

News

- Situation Update: Summary of Weekly FluView...
- UPDATED: Total Doses of Distributed Flu Vaccine fo...
- NIVW - It's Not Too Late to Vaccinate, matte artic...

Influenza Reagent Resource (IRR) was established by the Centers for Disease Control and Prevention (CDC).

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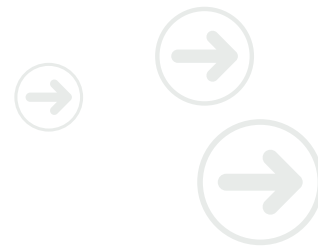
Figure 3—The IRR website provides information about its large influenza reagent catalog and receives online orders from registered laboratories.

Upcoming enhancements to the IRR program include deployment of a customer relationship management system within CDC-IRR operations. The Microsoft Dynamics-based software solution will facilitate IRR ordering and distribution processes. CDC epidemiologists and laboratory subject matter experts will also be able to use this tool to view real-time data metrics related to the IRR inventory as well as the ordering activity of IRR partner laboratories in support of surveillance and research activities. Another exciting development in the IRR program is its involvement with the Global Health Security Agenda. In conjunction with the Division of Viral Diseases and Division of Bacterial Diseases, the IRR will be adding a select catalog of reagents to support the growth of international surveillance for other viral and bacterial pathogens in partner countries.



WHO Region for Africa [AFR]





WHO Region for Africa [AFR]

In fiscal year 2014, there were twelve bilateral cooperative agreements to build or enhance sustainable influenza surveillance in the sub-Saharan region of Africa. These agreements are with ministries of health or institutions designated by a country's Ministry of Health (MOH) to work with the U.S. Centers for Disease Control and Prevention (CDC).

Direct country support through non-research cooperative agreements is established in the following 12 countries:

- Democratic Republic of Congo
- Ethiopia
- Madagascar
- Mali
- Mozambique
- Nigeria
- Republic of Côte d'Ivoire
- Rwanda
- South Africa
- Tanzania
- Uganda
- Zambia

In addition, CDC's direct assistance to the countries listed above supports capacity building in six neighboring African countries, Burkina Faso, Mauritania, Niger, Senegal, Sierra Leone, and Togo, to enhance surveillance systems.

CDC also supports the World Health Organization's (WHO) Regional Office for Africa (AFRO) through a cooperative agreement.

Core activities of CDC bilateral agreements and technical assistance include:

- Building sustainable national capacity for surveillance for seasonal influenza, pandemic influenza and other emerging diseases and preparedness for implementation of the International Health Regulations (2005).
- Contributing surveillance data to WHO's Global Influenza Surveillance and Response System (GISRS).
- Increasing the geographic reach of WHO GISRS.

- Providing early access to critical virus isolates from humans and birds for WHO GISRS.
- Increasing the quantity of shipments and influenza isolates provided by African influenza laboratories for analysis by WHO Collaborating Centers (CC).
- Developing sustainable epidemiologic and virologic surveillance systems for severe influenza, in order to gain an understanding of the burden of disease in the WHO African Region.

CDC also partners with:

The U.S. Naval Medical Research Unit No. 3 (NAMRU-3) in Accra, Ghana supporting Burkina Faso, Mali, Mauritania, and Togo to build influenza surveillance systems.

Institut Pasteur in Paris, France to support activities in Cameroon, Central African Republic, and Senegal.

World Health Organization in Geneva, Switzerland and the U.S. Agency for International Development (USAID) to support activities in Burkina Faso, Malawi, Mozambique, and Republic of Congo.

The Indian Ocean Commission (IOC) in Port Louis, Mauritius to enhance surveillance in Mauritius and build surveillance capacity in the Seychelles.

In fiscal year 2013, CDC expanded its cooperative agreement portfolio to include a Vaccine Policy component.

Country support was established in Kenya and Uganda to introduce or expand the use of seasonal influenza vaccines.

Core activities of these agreements include:

- Conducting a needs assessment to identify barriers to vaccine introduction.
- Developing a three-year action plan to introduce vaccines.
- Implementing the plan.
- Introducing or expanding vaccine use to the target population through development of a national policy.

In addition to the capacity building grants identified above, CDC's Influenza Division also supports research collaborations with institutions in Ghana, Kenya, Malawi, Senegal, and South Africa. These collaborations focus on demonstrating the burden of influenza-associated illness in sub-Saharan Africa, identifying risk factors for severe influenza, measuring influenza-associated morbidity and mortality and documenting influenza vaccine effectiveness.

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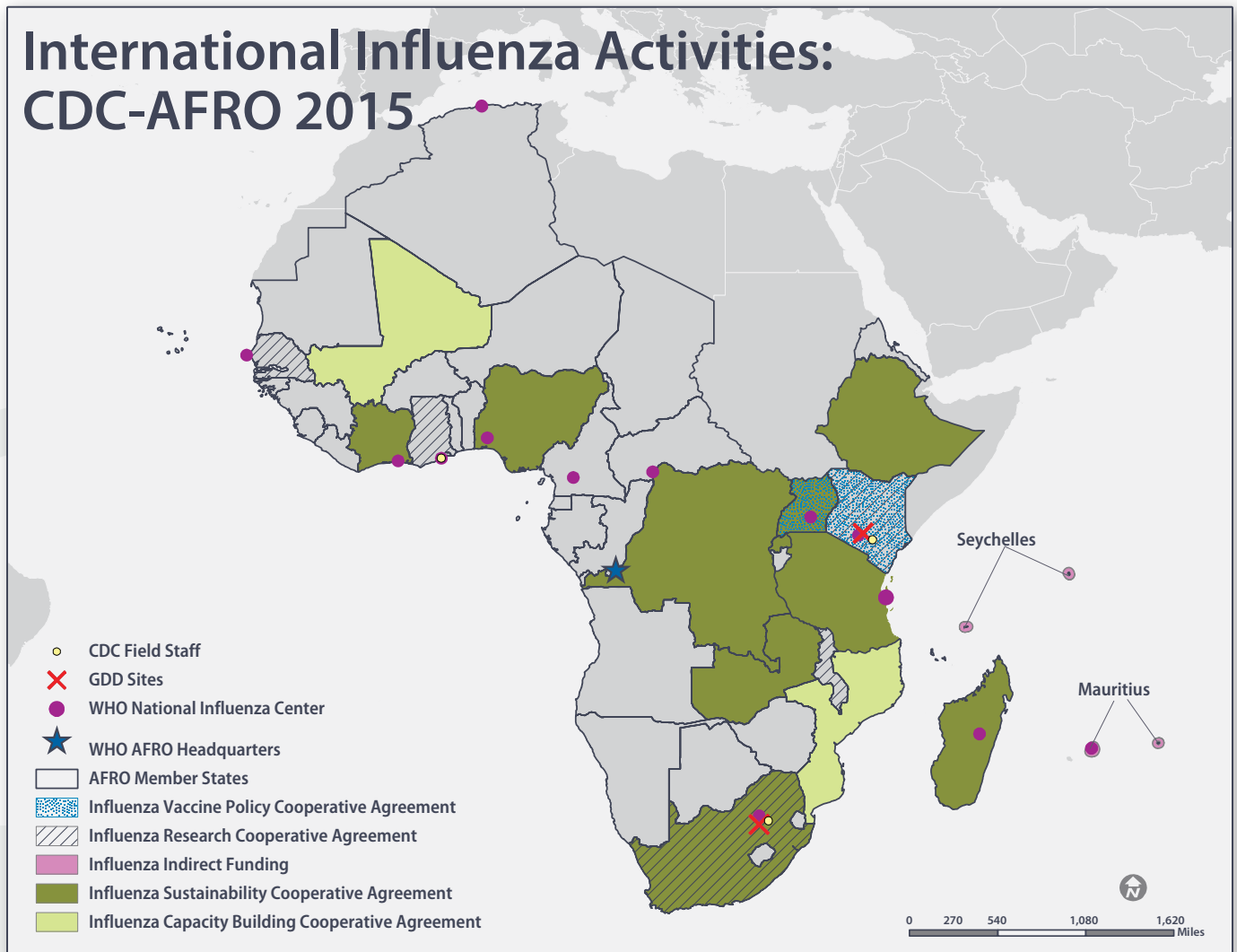
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WHO Regional Office for Africa [AFRO]



HIGHLIGHTS

- Disseminated weekly bulletins on virological surveillance of influenza through the AFR influenza laboratory network.
- Provided strategic guidance, technical and financial support, and coordination to Member States to strengthen the virological and epidemiological surveillance of influenza to better prepare against seasonal, zoonotic, and pandemic influenza threats in the WHO African region.
- Collaborated closely with the Food and Agricultural Organization (FAO) to provide technical guidance and assistance to countries in West Africa that are facing outbreaks of influenza A (H5N1) in poultry.

U.S. CDC DIRECT SUPPORT

The WHO Regional Office for Africa is currently in the fourth year of its five-year cooperative agreement. With the support from U.S. CDC, 30 (64%) of 47 countries in the region have developed and maintained sentinel surveillance and laboratory capacity for the diagnosis of influenza. Support includes technical and financial assistance to Member States to strengthen their national influenza surveillance systems, with a specific focus on influenza-like illness (ILI) and severe acute respiratory infections (SARI). Countries within the network are regularly supplied with laboratory equipment and reagents, thus enhancing and sustaining diagnostic capacity for detection of influenza viruses. This support has also enhanced the laboratory capacity in the region to identify MERS-Coronavirus and Ebola virus.

SURVEILLANCE

During the first quarter of 2015, three countries (Gabon, Mauritania, and Republic of Congo) received support to strengthen their national influenza surveillance systems.

SURVEILLANCE ACTIVITIES

- Reviewed the status of influenza virological surveillance in the African region from 2010 to 2013. Results were published in the November 2014 edition of the Integrated Disease Surveillance and Response quarterly bulletin.
- Worked with the respective governments of Burundi and Mauritania to conduct an assessment of their influenza surveillance systems (July/August 2014). The assessment revealed that both countries do not have functional virological and epidemiological influenza surveillance systems in place.
- Attended the 4th African Network Influenza Surveillance and Epidemiology (ANISE) Meeting held in Cape Town, South Africa (5–6 Dec 2014) and chaired a session on “Setting the Stage for Influenza Vaccine Introduction” during this meeting.

LABORATORY

As of December 2014, the Regional Laboratory Network comprises 30 National Influenza Reference Laboratories. With support from grants, members of the influenza laboratory network are sharing weekly data on influenza virological surveillance.

Between week one and week sixteen (AFRO weekly data updated on 24 April 2015), the networking laboratories tested 9,115 specimens for influenza viruses and found that 1,318 (14%) were positive. The Democratic Republic of Congo was supported to enhance capacity for virological surveillance of influenza.

LABORATORY ACTIVITIES

- Disseminated weekly virological surveillance data through the AFR Influenza Laboratory Network.
- Provided essential reagents and supplies to Algeria, Burkina Faso, Central Africa Republic, Republic of Congo, Senegal, and Togo for enhancing and sustaining laboratory testing of ILI and SARI clinical specimens.
- Provided financial support to the Democratic Republic of Congo in order to strengthen the National Institute of Biomedical Research (INRB) for enhancing virological influenza surveillance.
- Strengthened Zimbabwe’s national influenza reference laboratory with financial support.

PREPAREDNESS

WHO AFRO in collaboration with WHO Headquarters (HQ) is implementing the laboratory and surveillance component of the Pandemic Influenza Preparedness (PIP) framework in two selected countries, Ghana and Tanzania. Both countries are focusing on activities aimed at strengthening their capacities to monitor trends in circulating influenza viruses. In addition, Tanzania is also implementing activities aimed at strengthening its national capacity to detect novel influenza viruses.

Cameroon and Zambia have recently been recruited to join the PIP implementation project. The overall target is to obtain participation from 11 countries in the WHO African region. Efforts are underway to gain participation from seven more countries: Algeria, Burundi, Congo, Madagascar, Mozambique, Sierra Leone, and South Africa. To avoid duplication of efforts, the WHO staff focal point on influenza ensures harmonization of the CDC influenza project and PIP.

PREPAREDNESS ACTIVITIES

- Ghana and Tanzania—Conducted self-assessment surveys of their influenza laboratory using WHO standardized tools.
- Tanzania—Conducted training on influenza specimen collection and shipment for staff

in newly established influenza sentinel sites. Procured IT equipment for the Ministry of Health, laboratories, and sentinel sites to enhance data sharing and ensure monitoring and assessment of influenza events of international concern.

- Ghana National Influenza Center (NIC)—Supported sub-regional influenza capacity by training two staff members from Nigeria and Côte d'Ivoire on influenza virus isolation (18–27 March 2015).
- Ghana—Established 24 sentinel sites for influenza surveillance in all regions, between January and April 2015, as part of influenza preparedness. Sent samples from patients with ILI for assessment by the NIC.

TRAINING

- Participated in and helped facilitate the Influenza Estimating Burden Workshop in Cape Town, South Africa on 4 December 2014.
- Supported three participants from Burkina Faso, Niger, and Togo to attend the Grants Proposal Writing Workshop held in Johannesburg, South Africa from 13–17 April 2015.
- Organized and facilitated a workshop for preparedness and response to influenza and respiratory pandemics in the context of the International Health Regulations (IHR 2005) in Yaoundé, Cameroon. Thirty participants from eleven countries—Angola, Burundi, Cameroon, Gabon, Central African Republic, Democratic Republic of Congo, Sao Tome and Principe, Senegal, Chad and Equatorial Guinea—in the African region attended the workshop (4–8 November 2013).
- Organized a training workshop in Ouagadougou, Burkina Faso on Building the Capacity for Influenza Sentinel Surveillance. Participants were clinicians from sentinel sites, laboratory technicians, and epidemiologists (22–25 April 2014).

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DEMOCRATIC REPUBLIC OF CONGO (DRC)



The rehabilitated National Influenza Laboratory.

HIGHLIGHTS

- Rehabilitated the National Influenza Laboratory which has become one of the best laboratories of the National Institute of Biomedical Research (INRB).
- Extended influenza sentinel surveillance to the northeastern part of the country.
- Began investigation on the estimation of the influenza burden of disease—the pilot survey is underway.
- Developed a database that includes virological and epidemiological data of all suspected cases of influenza as reported by sentinel site staff.

OVERVIEW

The U.S. Centers for Disease Control and Prevention (CDC) provides financial and technical assistance to the Ministry of Health (MOH) through the Kinshasa School of Public Health. An enhanced routine surveillance system currently collects information used to estimate the national influenza burden. At the beginning of 2014, the surveillance system expanded to two additional provinces in DRC.

SURVEILLANCE

In DRC, the Fourth Directorate of the MOH is the institution in charge of disease control. For influenza sentinel surveillance, this Directorate produces and disseminates standard weekly reports that include virological and epidemiological data, and organizes monthly meetings of the DRC Influenza National Technical Committee.

In 2006, DRC started influenza surveillance and it is currently carried out in 11 health facilities located in five out of 11 provinces in the country. Sentinel site staff report suspected influenza cases and when the criteria are met, take samples. The samples taken are sent to the National Institute of Biomedical Research (INRB) within 48 hours. Sentinel site staff are

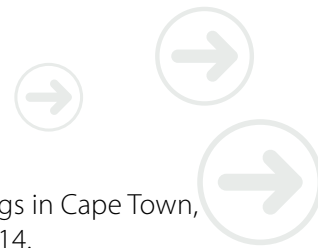
regularly trained and supervised. Supervisory visits are conducted monthly at sentinel sites in Kinshasa and quarterly for those sites located in the provinces.

SURVEILLANCE ACTIVITIES

- Reported 10,495 suspect cases of influenza. Among them, 3,039 (29%) were hospitalized for severe acute respiratory infection (SARI).
- Produced and disseminated 78 weekly reports on influenza surveillance by the Fourth Directorate of the MOH. Reports were also posted to FluNet.
- Conducted 18 supervisory visits at sentinel sites in Kinshasa and six in the provinces.
- Retrained 33 sentinel site staff on completing the notification form, sampling techniques, packaging, conservation and shipping, and reporting.

LABORATORY

The influenza national laboratory is part of the Virology Unit within INRB which is the National Public Health Laboratory. The capacities of this Level II laboratory have been strengthened especially in terms of laboratory equipment and laboratory staff training on RT-PCR technique and virus isolation. INRB analyzes specimens from suspect influenza cases using RT-PCR for typing and subtyping influenza viruses A and B.



Weekly reports on virological findings are produced and disseminated to all stakeholders including sentinel site staff, RDC/MOH, CDC, and WHO. Positive specimens are shared with the WHO Collaborating Center (WHO CC) in Atlanta and thus contribute to the selection of new influenza vaccine strains.

LABORATORY ACTIVITIES

- Identified 340 samples positive for influenza viruses (8.7% positivity rate): 12 (3.5%) were influenza A (H1N1)pdm09 virus, 169 (49.7%) were influenza A (H3N2), 35 (10.3%) were not able to be subtyped and 124 (36.5%) were influenza B.
- Provided 32 influenza A viruses that were not able to be subtyped to the WHO CC in Atlanta.
- Participated in WHO's External Quality Assessment Project (EQAP) for detection of influenza viruses by RT-PCR and in CDC's Influenza Molecular Diagnostic Performance Evaluation.

PREPAREDNESS

Support received through this cooperative agreement helped improve DRC's capacity to rapidly detect and respond to influenza outbreak threats and outbreaks from other causes. Influenza surveillance project staff participated in the management of various epidemics that have occurred throughout the country. Furthermore, they are members of an alliance of health professionals, at all levels of the health pyramid, on disease surveillance and response.

PREPAREDNESS ACTIVITIES

- Participated in the management of the Ebola virus outbreak in Boende (northwestern part of DRC) in December 2014 and in Conakry, Guinea in March 2015.
- Trained staff in the health zones/health districts of Haut-Uélé and Bas-Uélé in disease surveillance and response, November 2013.
- Conducted a train-the-trainer session on Ebola virus disease surveillance in Kinshasa, October 2014.
- Participated in an international meeting to exchange experiences on the fight against Ebola in Côte d'Ivoire, March 2015.

TRAINING

- Attended the ANISE Meetings in Cape Town, South Africa in 2013 and 2014.
- Participated in the Influenza Disease Burden Workshop on 4 December 2014 in Cape Town, South Africa.
- Participated in the CDC/APHL International Advanced Influenza Real-time RT-PCR Workshop 26–30 January 2015 in Antananarivo, Madagascar.

INFLUENZA VACCINE ACTIVITIES

DRC has not yet implemented influenza vaccine activities. However, activities are being planned for the future.

ETHIOPIA

OVERVIEW

With the support of CDC, influenza surveillance in Ethiopia was initiated in 2008. The influenza-like illness (ILI) and severe acute respiratory infection (SARI) sentinel surveillance system is owned by the Ethiopian Public Health Institute (EPHI) and monitored and coordinated by the Public Health Emergency Management Center (PHEMC). In 2009, an emergency operations center under the emergency public health management directorate was established.

SURVEILLANCE

Influenza sentinel surveillance was started in 2008 in two health facilities (Yekatit hospital for SARI and Shiromeda health center for ILI) in Addis Ababa. In 2010, the sentinel sites were expanded to two new health centers (Akaki and Kolfe), and four new SARI sentinel sites (Adama, Adare, Mekele and Felegehiwot Hospitals) were selected from four mega regions (Oromia, SNNP, Tigray and Amhara Regions) respectively.

Currently, eight sentinel sites are conducting surveillance. Of them, five are SARI sites and the other three are ILI sites. Ethiopia has selected twenty priority diseases with mandatory reporting. Among those that are required to be reported immediately are avian-human influenza, pandemic influenza, and SARS.

SURVEILLANCE ACTIVITIES

- Compiled and entered surveillance data into a database using Epi Info.
- Conducted regular descriptive data analysis by time, place and person (trends of the disease over the last four years have been analyzed).
- Monitored completeness and quality of surveillance data and based on the gaps identified, provided feedback to the reporting sentinel sites.
- Collaborated with residents of the Field Epidemiology Training Program (FETP) to conduct supervisory visits to the sentinel sites.
- Conducted on-the-job mentorship activities for staff at the new SARI sites.

HIGHLIGHTS

- Developed and disseminated weekly public health emergency management bulletins to stakeholders.
- Conducted regular meetings of the Influenza Technical Working Group.
- Received surveillance data (case-based and aggregated) from all sentinel sites throughout the year.
- Prepared and implemented the public health emergency management annual plan. Influenza is included in the plan.

LABORATORY

The National Influenza Laboratory (NIL) at EPHI is the only laboratory in the country capable of influenza diagnostic testing. 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 2009. Collaboration between human and animal health laboratory staff is also being supported.

LABORATORY ACTIVITIES

- Provided onsite technical assistance to all sentinel sites in Addis Ababa twice a week.
- Received weekly throat swab specimens from each sentinel site.
- Collected and tested 1,326 specimens by RT-PCR, of which 169 (12.7%) were positive for an influenza virus: 75 for influenza B, 58 for influenza A (H3N2), 6 for influenza A (H1N1), and 30 for influenza A (H1N1)pdm09 (April 2014 to March 2015).
- Reported laboratory results weekly to WHO AFRO.

PREPAREDNESS

The Public Health Emergency Management Center (PHEM) is responsible for preparedness, early warning and response to any public health emergencies including avian and human influenza and pandemic influenza. The PHEM Center is working closely with the national influenza laboratory and coordinates the implementation of influenza sentinel surveillance.



PREPAREDNESS ACTIVITIES

- Printed and distributed 40,000 leaflets on MERS-CoV.
- Distributed the influenza sentinel surveillance implementation guideline to sentinel sites.
- Printed and distributed reporting formats for pandemic influenza, severe acute respiratory syndrome (SARS), and avian-human influenza to all regions.
- Developed an influenza sentinel surveillance sustainability plan that is aligned with public health emergency management activities.

TRAINING

- Conducted training for 80 participants from sentinel sites, regional health bureaus and other relevant sectors on influenza viruses and MERS-CoV.
- Provided an orientation on MERS-CoV for heads and experts from regional Public Health Emergency Management Centers, Regional Public Laboratories, Disease Prevention and Health Promotion Directorates during the PHEM Annual Review Meeting (August 2014).
- Conducted onsite training and mentoring for all SARI and ILI sites.
- Conducted technical review meetings in May and August 2014.

INFLUENZA VACCINE ACTIVITIES

No influenza vaccine-associated activities were implemented during the reporting period.

KENYA

OVERVIEW

In 2013, Kenya was awarded a new cooperative agreement to help develop a seasonal influenza vaccination policy. Funds are being used to compile relevant data to support the introduction of seasonal influenza vaccination in Kenya. Funding is also being used to conduct a pilot/demonstration project to determine the requirements of introducing and vaccinating target populations with seasonal influenza vaccine.

SURVEILLANCE

Influenza sentinel surveillance activities take place in five public health institutions and two refugee camp hospitals, where cases of influenza-like illness (ILI) from one hospital and severe acute respiratory illness (SARI) from all hospitals are identified. With the support of the Kenya Medical Research Institute (KEMRI) and CDC-Kenya, data and specimens are collected to determine the circulation of influenza viruses. We have also been interacting with the KEMRI-Wellcome Trust project that has been conducting respiratory disease surveillance, including influenza surveillance, in the coastal region of Kenya (Kilifi). KEMRI, in collaboration with the Walter Reed Project (WRP) also runs influenza surveillance in military health institutions.

SURVEILLANCE ACTIVITIES

- Analyzed influenza surveillance data from different partners and determined the temporal trends of influenza activity in the country as well as circulating virus types and sub-types.
- Analyzed influenza surveillance data to determine potential optimal timing of a possible seasonal influenza vaccine campaign.

LABORATORY

Received support from KEMRI and CDC to test specimens collected from the sentinel sites for influenza viruses. In addition, the KEMRI/CDC laboratory assisted in testing for MERS-CoV and avian influenza A (H7N9) during outbreak investigations. Some specimens are sent to CDC Atlanta for serological testing.

HIGHLIGHTS

- Conducted an influenza surveillance stakeholder's sensitization meeting on proposed seasonal influenza vaccine introduction.
- Developed a draft influenza vaccination project "data dossier."
- Attended meetings with CDC Atlanta's subject matter experts on the introduction of seasonal influenza vaccine.
- Tasked the influenza sub-committee of the National Immunization Technical Advisory Group of Kenya (KENITAG) with justifying the introduction of influenza vaccination in Kenya.

The National Influenza Center (NIC) will soon move to the Ministry's National Public Health Laboratories (NPHL). This will ensure that influenza sentinel surveillance activities are wholly owned by the Ministry, making it more sustainable and enhancing influenza virus testing capacity.

LABORATORY ACTIVITIES

- Shared virological data on circulating influenza viruses with WHO and other interested stakeholders.
- Enhanced the capacity of NPHL to test specimens collected at sentinel sites for influenza viruses by training staff and utilizing updated equipment.
- Collaborated with CDC and KEMRI on logistics for specimen collection from surveillance sites and shipping to NPHL.

PREPAREDNESS

- Conducted training on outbreak investigations of MERS-CoV and avian influenza A (H7N9) at our sentinel sites and major hospitals in the Rift Valley, Nairobi, and the Coastal regions. During these trainings, identified points of contact responsible for periodic reports and channels through which specimens from suspected cases are shipped to the KEMRI and CDC laboratories. Brochures and posters were developed to educate the public on these conditions. The posters were strategically placed at Jomo Kenyatta International Airport and other main entry points, the Ministry of Health

(MOH) Headquarters, and the Embassies of Saudi Arabia and China. Investigation of suspected cases reported by the facilities has been coordinated.

PREPAREDNESS ACTIVITIES

- Educated health care workers in public and private health facilities in selected regions on MERS-CoV and avian influenza A (H7N9) virus.
- Printed banners on MERS-CoV and avian influenza A (H7N9) virus and placed them at the main ports of entry as well as the Embassies of China and Saudi Arabia.
- Printed informational brochures on MERS-CoV and avian influenza A (H7N9) virus and distributed them to travelers from the Hajj as well as those from China to educate them on what to look for and how to react.
- Hired a consultant to package the influenza data dossier in the format recommended by the KENITAG and SIVAC.

TRAINING

Provided on-the-job training for health care workers from the main health facilities in Rift Valley, Coast, and Nairobi regions on the following:

- Pandemic Influenza Preparedness.
- Influenza A (H7N9) virus and MERS-CoV infections globally and the danger of their spread from their epicenters in Saudi Arabia and China.
- Emerging infectious disease surveillance.
- General disease surveillance.

INFLUENZA VACCINE ACTIVITIES

- Designated Kenya MOH staff to attend the Influenza Vaccine Policy Kickoff Meeting in Atlanta to discuss issues related to seasonal influenza vaccine introduction and learn how the U.S. Advisory Committee on Immunization Practices (ACIP) conducts its activities.
- Conducted a one-day meeting to brief influenza surveillance stakeholders in Kenya on the seasonal influenza vaccine introduction project (June 2014).
- Met with influenza stakeholders in August 2014 and collected information on thematic areas to justify seasonal influenza vaccine introduction to the Kenyan public.
- Compiled a data dossier on information justifying vaccine introduction (February 2015).

RESEARCH

CDC's Influenza Division collaborates closely with the Ministry of Health and other partners to explore strategies for sustainable influenza surveillance, the timing of influenza activity in Kenya, optimal times to vaccinate against influenza, the disease and economic burden of influenza illness among SAGE target groups, and the potential impact of influenza vaccination programs. Research activities include studies to:

- Compare the quality, cost and timeliness of data collection between the smartphone data collection system and the paper-based system for routine influenza surveillance in Kenya 2011–2012.
- Compare case definitions for severe acute respiratory illness and clinical pneumonia for the detection of influenza virus infections among hospitalized patients, Western Kenya, 2009–2013.
- Determine whether the length of specimen storage affects influenza testing results by real-time reverse transcription-polymerase chain reaction through the analysis of influenza surveillance specimens, 2008 to 2010.
- Evaluate point-of-care BD Veritor™ Rapid Diagnostic Test for Influenza in Kenya.
- Explore the etiology of pediatric fever in Western Kenya using a case-control study of falciparum malaria, respiratory viruses, and streptococcal pharyngitis.
- Understand the etiology and epidemiology of severe acute respiratory illness in children aged less than 5 years in Kibera, an urban slum in Nairobi during 2007–2011.
- Identify young infants and children at higher risk of dying from respiratory infections within the hospital setting.
- Explore the role of HIV in the household introduction and transmission of influenza in a slum, Nairobi 2008–2011.
- Review existing data on the influenza-associated disease burden in Kenya, 2006–2013.
- Estimate the burden of influenza virus and RSV among inpatients and outpatients in rural Western Kenya, 2009–2012.
- Describe the demographic, socio-economic and geographic determinants of seasonal influenza vaccine uptake in rural western Kenya, 2011.

- Describe the etiology of pediatric respiratory disease mortality at Kenyatta National Hospital.
- Explore what influenza vaccine formulation should be used in Kenya through a comparison of influenza isolates from Kenya to vaccine formulations, 2007–2013.
- Describe the uptake and effectiveness of a trivalent inactivated influenza vaccine in urban and rural Kenya, 2010–2012.
- Describe influenza activity in Kenya, 2007–2013 by analyzing timing, association with climatic factors, and implications for vaccination campaigns.
- Quantify the economic burden of influenza in Kenya.
- Conduct a cohort study of influenza-associated illness among pregnant women in Western Kenya.
- Explore which maternal influenza vaccine strategies have the greatest impact on disease burden among pregnant women and young infants.



MADAGASCAR



Adventures on one of the dirtiest roads of Madagascar to reach one of the sentinel health care centers investigated during this project.

OVERVIEW

Through a sustainability cooperative agreement, CDC provided support to sustain the capacity of the National Influenza Center (NIC) and Health Authorities for surveillance and diagnosis of influenza-like illness (ILI) and severe acute respiratory infection (SARI) [including Highly Pathogenic Avian Influenza (HPAI) in humans] in Madagascar. Efforts to better understand the epidemiology of influenza in Madagascar and estimate incidence and burden of disease are also supported by the cooperative agreement (CoAg).

SURVEILLANCE

To date, the ILI sentinel surveillance system encompasses 34 health care centers that, on a daily basis, send epidemiological information for several diseases including ILI. Twelve send respiratory specimens for influenza diagnosis to the NIC on a weekly basis. The sentinel network for SARI surveillance is functional and encompasses 17 hospitals throughout the country. One hospital in Antananarivo (capital) recruits all hospitalized SARI cases for virological surveillance. The influenza specific project on SARI surveillance ended in October 2013, and was replaced with an enlarged SARI surveillance project in Antananarivo, focusing on four respiratory viruses of importance in Madagascar (influenza A and B viruses, rhinoviruses, and respiratory syncytial virus [RSV]).

HIGHLIGHTS

- Published a paper on influenza seasonality in Madagascar, pointing out that there is a need for deeper studies to decipher factors and mechanisms that can explain influenza circulation and diffusion (in collaboration with the Fogarty International Center).
- Conducted the 4th Annual Sentinel Surveillance Network Meeting involving 61 participants from SARI surveillance sites.
- Conducted training on Risk Communication related to Public Health Emergency in Mauritius (December 2014).

SURVEILLANCE ACTIVITIES

- Assembled a project focused on surveillance at three pig farms to explore the human-animal interface.
- Completed the influenza-specific SARI project in October 2013 and implemented a general SARI surveillance system.
- Managed ILI and SARI surveillance, including sampling and analysis.
- Organized the 4th Annual Meeting for SARI site managers in Antananarivo (July 2014). The discussion focused on coordination and standardization of data collection (clinical illness and mortality) of malaria and SARI throughout sentinel hospitals.

LABORATORY

Madagascar's NIC enhanced its diagnosis and technical capacities by implementing rRT-PCR allelic discrimination analysis for detection of the substitution conferring influenza A(H1N1)pdm09 viruses resistant to oseltamivir. We also implemented the influenza virus microneutralization assay according to CDC's protocol. The NIC also worked closely with CDC Atlanta and South Africa in collaboration with the Association of Public Health Laboratories (APHL) to implement an international training on rRT-PCR for influenza diagnosis, gathering technicians and scientists from 18 African countries, including participants from Madagascar's NIC.

LABORATORY ACTIVITIES

- Tested 2,583 specimens for influenza diagnosis between October 1, 2013 and April 19, 2015. Among all specimens, 311 were SARI cases that were tested at the NIC using an in-house panel system for the detection of respiratory viruses. Submitted 32 positive isolates and 34 positive swabs to the WHO Collaborating Center (CC) in London as part of the WHO Global Influenza Programme.
- Completed the WHO External Quality Assessment Project (EQAP) Panel 13.
- Investigated a bronchiolitis epidemic in Antananarivo in a children's hospital in early March; results highlighted RSV and human metapneumovirus infections in 67% of specimens collected.

PREPAREDNESS

CDC support allowed the NIC to strengthen both ILI and SARI surveillance systems. All fever sentinel hospital sites participated in a meeting in July 2014 to coordinate and standardize data collection (clinical illness and mortality) of SARI data.

High-risk events vary widely in scope and nature but share one common characteristic: how well we manage these critical events relies heavily on how well we communicate before, during, and after these events. Training on Risk Communication, held in Mauritius in December 2014, helped us to understand the process of risk communication and provided tools for informed decision-making and communications.

PREPAREDNESS ACTIVITIES

- Improved the SARI surveillance system by training 61 clinicians from 17 hospitals from July 15–18, 2014.
- Conducted training on Risk Communication in Mauritius with 20 participants from nine countries (December 2014).
- Supported the Ministry of Health of Madagascar in updating the national contingency plan for 2014–2016.
- Trained Ministry of Health staff on case definition and containment of suspected cases with regard to the Ebola outbreak in West Africa.



Students working on a laboratory exercise during the PCR Workshop.

TRAINING

With CDC support, organized or directed participants to attend the following trainings/workshops through the NIC:

- International Grant Management Training Course for CDC Grantees in Antananarivo, Madagascar, 24–28 February 2014.
- Workshop on introduction to empirical population genetics, Institut Pasteur de Madagascar, Antananarivo, Madagascar, 19–23 May 2014.
- Burden of Influenza Disease Workshop, Cape Town, South Africa, 4 December 2014.
- International Workshop on Risk Communication Related to Public Health Emergency, Flic-en-Flac, Mauritius, 15–17 December 2014.
- CDC/APHL International Workshop on Influenza rRT-PCR Diagnosis, Institut Pasteur de Madagascar, Antananarivo, Madagascar, 27–30 January 2015.

INFLUENZA VACCINE ACTIVITIES

Madagascar's NIC is working to provide new data in support of influenza immunization for high-risk groups. A study on pregnant women is currently ongoing in Moramanga to assess influenza incidence. In the coming months, data on influenza disease burden will also be reviewed.

Severity and impact of influenza will be studied through analysis of several indicators, such as mortality data, truancy, and medication use. Data on influenza strains identified in Madagascar will be analyzed regarding timing of isolation and WHO influenza vaccine recommendations for both Northern and Southern Hemispheres in order to guide public health policies.

MALI



A laboratory technician working at CVD-Mali.

OVERVIEW

Influenza surveillance in Mali is carried out through a cooperative agreement between CDC and the Center for Vaccine Development of Mali (CVD-Mali). The agreement began in 2013 and is intended to assess and improve the national influenza surveillance of Mali. Surveillance is conducted using sentinel sites located in two regions and in the capital city of Bamako. The agreement has strengthened influenza surveillance in Mali and supported capacity building that has enhanced the level of preparedness and response of the country.

SURVEILLANCE

Influenza is on the list of reportable diseases in Mali. Prior to the Center for Vaccine Development of Mali's (CVD-Mali) clinical research on influenza in 2009, there was no surveillance system to monitor influenza activity. In May 2009, CVD-Mali was named the National Influenza Center (NIC) of Mali and acquired necessary equipment and reagents. The first laboratory-confirmed cases of influenza revealed that influenza A (H1N1)pdm09 virus had arrived in Mali. When the country was awarded the cooperative agreement, the project was presented to health authorities to endorse the initiative. Currently, influenza surveillance is conducted at three SARI sites and five influenza-like illness (ILI) sites.

HIGHLIGHTS

- Procured laboratory supplies and reagents.
- Assessed the national epidemiological surveillance system.
- Enhanced the national influenza surveillance protocol.
- Selected and activated sentinel sites.

SURVEILLANCE ACTIVITIES

- Trained sentinel site staff on influenza case definition, sample collection, and shipment.
- Developed a centralized database to integrate clinical and laboratory data.
- Performed regular supervisory visits to influenza sentinel sites in Sikasso and Mopti (monthly) and Bamako (weekly).
- Collected samples and case report forms from sentinel sites in Sikasso and Mopti and sent them to the NIC.
- Shared weekly reports with sentinel sites, the Ministry of Health, CDC, and WHO Country Office, and entered information into FluNet.



Dr. Boubou Tamboura and Dr. Adama Mamby Keita at the Grants Proposal Writing Workshop in Johannesburg, South Africa.



Photo taken during a site visit in 2015.

LABORATORY

Before the cooperative agreement, the NIC in Mali had the capacity to test for influenza viruses. The cooperative agreement supports the laboratory by providing logistical and technical support to sentinel sites. Laboratory supplies received from CDC have helped strengthen surveillance activities.

LABORATORY ACTIVITIES

- Conducted IATA training regarding procedures for shipment of dangerous goods for laboratory staff.
- Provided extensive training to NIC laboratorians on influenza virus typing, subtyping, PCR, RT-PCR, and reverse genetics techniques.
- Participated in WHO's External Quality Assessment Project (EQAP) for the detection of influenza virus type by RT-PCR with successful results (100%).

PREPAREDNESS

Pandemic influenza preparedness and planning has advanced considerably in Mali. The Ministry of Health implemented an integrated disease surveillance and response system which will soon include influenza. Mali developed a national strategic plan for influenza surveillance and response. Sentinel site staff were trained on suspected case detection and NIC laboratory capacity has improved.

TRAINING

- Participated in the Grant Management Training in Madagascar.
- Acquired IATA certification training for seven NIC staff members.
- Trained trainers in collaboration with CDC.
- Trained select sentinel staff members (laboratory technicians, nurses, doctors, and epidemiologists).
- Invited to present at the ANISE Meeting in Cape Town, South Africa (December 2014).
- Participated in a Grants Proposal Writing Workshop in Johannesburg, South Africa (Laboratory Head, NIC and the Project Coordinator).
- Participated in a training workshop on Laboratory Diagnosis of Influenza and other Emerging Respiratory Viruses, November 2013 in Accra, Ghana (Laboratory Technician).

INFLUENZA VACCINE ACTIVITIES

The goal of Mali's NIC is to introduce a seasonal influenza vaccination program within the next five years. In order to achieve this goal, we will identify barriers to achieving the introduction of a seasonal influenza vaccination. By the end of year five of this cooperative agreement, we will gather data on influenza disease burden and seasonality. These data will be used as tools to advocate for vaccine introduction, specifically for high risk groups such as pregnant women and children.

MOZAMBIQUE



A group photo of health facility staff during the Influenza Workshop, September 2014.

OVERVIEW

In 2009, the National Institute of Health (INS) began working toward the establishment of the sentinel surveillance system for influenza and other acute respiratory illnesses (ARI) in order to build up the national capacity for early detection and rapid response to threats posed by these pathogens. The U.S. Centers for Disease Control and Prevention (CDC) cooperative agreement awarded in 2013 supports the INS objectives and has accelerated the implementation and strengthening of influenza surveillance in Mozambique, it has also supported capacity building, enhancing the level of preparedness and response of the country.

SURVEILLANCE

Between 2009 and 2010, the World Health Organization (WHO) and CDC supported the creation of national capacity for influenza surveillance and laboratory diagnosis. In 2013, the system identified an influenza virus in an outbreak in Maputo City. In 2013, influenza surveillance in sentinel sites was initiated. Three sentinel hospitals in Maputo City were selected for influenza-like illness (ILI) and severe acute respiratory infection (SARI) surveillance, with a focus on diagnosing influenza. In 2014, the system was reviewed and the INS was advised to strengthen the system in these sentinel sites before expanding to other sites and to focus on activities related to SARI surveillance. Currently, the recruitment of dedicated

HIGHLIGHTS

- Enhanced the quality of epidemiological and virological data collection and continuous data sharing with both local and global influenza surveillance networks.
- Strengthened the national response to influenza outbreaks.
- Established and strengthened the routine surveillance system based on sentinel sites.
- Generated consistent data related to influenza seasonality and epidemiology.

staff has improved the data and sample collection, laboratory testing, and weekly reporting to WHO from these sites.

SURVEILLANCE ACTIVITIES

- Conducted two assessments and supervisory visits to the INS laboratory and influenza sentinel sites in collaboration with CDC and the Association of Public Health Laboratories (APHL).
- Updated the influenza sentinel surveillance strategies and tools following WHO requirements and CDC recommendations, significantly increasing data quality and sample collection.
- Developed an Access database incorporating currently defined data elements.
- Discussed and shared yearly and monthly data analysis outputs with national doctors and other interested persons.

LABORATORY

The INS Laboratory works closely with CDC, WHO, and the National Institute for Communicable Diseases (NICD) in South Africa to strengthen laboratory analysis activities.

INS laboratorians have trained extensively with WHO and NICD scientists on influenza virus typing, subtyping, single and multiplex real-time RT-PCR, virus isolation, cell culture and specimen shipment. There has been notable progress in laboratory capacity to respond to the current demand. The quality of the data reported to GISRS has also improved.

LABORATORY ACTIVITIES

- Tested 725 specimens; 60 (8.3%) were positive for an influenza virus (about 55 were from sentinel hospitals).
- Standardized cell culture and virus isolation techniques.
- Trained three laboratory staff on laboratory techniques (real time multiplex RT-PCR for respiratory viruses, MDCK cell culture and influenza diagnosis by real-time singleplex RT-PCR) in South Africa and Madagascar.
- Trained a laboratory staff member on IATA Shipping Guidelines for Infectious Substances in Congo-Brazzaville.
- Achieved a high score on WHO's EQAP panel in 2013.

PREPAREDNESS

CDC support through WHO has advanced pandemic influenza preparedness and planning considerably in Mozambique. The National Committee for Disaster Management (INGC), together with partnering ministries, has continued to work on a national pandemic plan while the Ministry of Health (MOH) and WHO have led the development of a health sector response plan. Annually, refresher trainings are organized for public health staff (medical directors, focal points, and surveillance and laboratory technicians from sentinel sites) in the provincial sentinel sites. Every month the INS organizes a surveillance technical meeting to monitor data and trends in sentinel surveillance-based activities.

PREPAREDNESS ACTIVITIES

- Conducted regional pandemic trainings in the Southern, Central, and Northern provinces to adapt and update local and national preparedness plans for influenza and other acute respiratory illness outbreaks.
- Established focal points at all national and provincial levels in accordance with the MOH national plan for disease surveillance.
- Provided epidemiological data tools and sample collection kits in all provinces.



Mr. Almiro Tivane providing lectures during the Influenza Workshop in September 2014.

TRAINING

INS continues to provide technical assistance and re-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.

- Identified two INS staff (Project Coordinator and Financial Project Coordinator) to attend the Grants Management Training in Madagascar.
- Identified six INS laboratory staff to attend training on laboratory techniques in cell culture, RT-PCR, virus isolation for influenza and other respiratory viruses and specimen shipment in South Africa, Madagascar, Japan and Congo-Brazzaville.
- Conducted seven trainings and/or workshops for 67 health staff involved in sentinel surveillance work in all sites.
- Conducted two trainings for 60 provincial health staff on influenza outbreak preparedness.
- Participated in WHO influenza surveillance and influenza burden of disease meetings in South Africa.
- Participated in timely outbreak reporting in the U.S.

INFLUENZA VACCINE ACTIVITIES

No vaccine activity occurred. Influenza vaccine is not part of the Immunization Program.

NIGERIA



The H7N9 Surveillance Team in Abuja, Nigeria.

OVERVIEW

The Nigerian Federal Ministry of Health (FMOH) has been collaborating with the U.S. Centers for Disease Control and Prevention (CDC) on influenza control since 2006. This support has enabled Nigeria to establish a system for early detection and effective response to avian and pandemic influenza. To improve integration, coordination and sustainability, the project was placed under the Nigeria Centre for Disease Control. Currently there are four sentinel surveillance sites, located in four tertiary health institutions in four of the six geopolitical zones of the country. Each of these sites has an influenza-like illness (ILI) component in the outpatient clinic and a severe acute respiratory infection (SARI) component in the inpatient unit.

SURVEILLANCE

Surveillance activities continued with improvement in the turn-around time. With a focus on avian influenza A (H7N9) virus, two additional SARI surveillance sites were established and activated, one in each of the two geopolitical zones (South-south and North-east parts of the country) not covered by the National Influenza Surveillance System (NISS). The program improved its data collection to capture additional data from the sentinel sites that are key to the estimation of the disease burden due to influenza.

HIGHLIGHTS

- Confirmed influenza positivity in 262 (60.0%) out of 437 samples from acute respiratory infection (ARI) cases not meeting the criteria for temperature specification for ILI, and received comparable results with that from classical definition of ILI.
- Established two sentinel sites for influenza A (H7N9) surveillance in two geopolitical zones not previously covered by NISS.
- Participated in proficiency testing for MERS-CoV with acceptable results.
- Participated in laboratory confirmation of Ebola virus disease (EVD) from suspected cases during the outbreak in Nigeria.

SURVEILLANCE ACTIVITIES

- Established two additional sites at University of Port Harcourt Teaching Hospital and Abubakar Tafawa Balewa University Teaching Hospital; trained identified teams; activated the sites to carry out SARI surveillance for influenza A (H7N9) virus for one year (November 2013-February 2014).
- Received 1,736 oropharyngeal and nasopharyngeal samples from SARI and ILI cases.
- Received 437 oropharyngeal and nasopharyngeal samples from ILI-like acute respiratory infection cases not meeting the temperature specification for ILI.
- Carried out a one-day stakeholders' meeting to review the one year implementation of NISS sustainability plan (September 2014).
- Convened a one-day stakeholders' meeting to adapt WHO's guidelines (2014) for the new SARI case definition and deliberated on gaps and strategies for estimating influenza disease burden in Nigeria using the WHO Manual for estimating disease burden associated with seasonal influenza (September 2014).
- Reported influenza activities in the Nigeria Weekly Epidemiology Report and submitted weekly epidemiology reports through FluID.



A photo taken during the H7N9 Surveillance Review Meeting.

LABORATORY

The National Influenza Reference Laboratory maintained uninterrupted performance with administrative and laboratory operational tools available in sufficient quantities. The project had two of its laboratory staff leave to pursue higher education and one staff transferred to another position. They were replaced through complementary posting of new laboratory staff. There was demonstrable progress in the establishment of the laboratory's cell culture diagnostic capacity. In its ongoing quest to attract the Government's attention for financing, the laboratory supported the Federal Government of Nigeria in the diagnosis of EVD and other viral hemorrhagic fevers, especially Lassa fever, dengue and yellow fever during the July and August 2014 EVD outbreaks.

These efforts have highlighted the expanded capacity of the laboratory to diagnose other viral diseases in addition to influenza. The laboratory has positioned itself for broader recognition and is currently exploring alternative financing to support sustainability.

LABORATORY ACTIVITIES

- Tested 1,718 samples from ILI and SARI cases and 262 samples from ARI cases received from the sentinel sites during both budget years.
- Submitted 51 influenza-positive samples to a WHO Collaborating Center (CC), some of which contributed to the 2014 WHO seasonal influenza vaccine strain selection.

- Acquired equipment necessary for influenza diagnosis using the cell culture technique in a bid to become a National Influenza Centre (NIC).
- Acquired primers for Ebola, Lassa, dengue and yellow fever viruses, from alternate sources, and utilized them for screening and confirmation of samples from suspected cases of Ebola virus disease.
- Provided weekly virology reports through the WHO AFRO Laboratory Network and FluNet.
- Performed well on WHO's External Quality Assessment Project (EQAP).

PREPAREDNESS

NISS redoubled its efforts in pandemic preparedness by forging collaboration with key Ministries, Departments and Agencies and highlighting plans to detect and prevent any influenza epidemic or pandemic in the country. In addition, discussions were held on sharing influenza data with the Federal Ministry of Agriculture and National Primary Health Care Development Agency's (NPHCDA) Immunization Department for enhanced surveillance and utilization of influenza surveillance data to inform introduction of an influenza vaccination and programming.

PREPAREDNESS ACTIVITIES

- Convened stakeholders meeting to strengthen collaboration among NISS, the surveillance and pandemic preparedness components of NCDC, the animal component of influenza surveillance, and immunization component of NPHCDA in the spirit of "One World, One Health, One Medicine".
- Facilitated the coordination of national efforts to strengthen the detection and diagnostic capacity for dangerous zoonotic pathogens in Nigeria.
- Collaborated with some State Ministries of Health, State Ministries of Agriculture and Nigeria Field Epidemiology and Laboratory Training Programme (NFELTP) to investigate handlers and human contacts of influenza A (H5N1) virus-infected birds during the zoonotic outbreak that affected 20 of the 36 states (plus Federal Capital Territory) of the Federation.



An H7N9 Training Session in October 2014.

TRAINING

- Attended training on laboratory diagnosis of influenza and other emerging respiratory viruses organized by Noguchi Memorial Institute for Medical Research in Accra, Ghana (November 2013).
- Trained two staff on Molecular Diagnosis and Serology of Infectious Diseases at the Nigerian Institute of Medical Research in Lagos, Nigeria (February 2014).
- Attended the 4th African Network for Influenza Surveillance and Epidemiology (ANISE) Meeting in Cape Town, South Africa (December 2014).
- Attended the CDC/APHL International Advanced Influenza Real-Time RT-PCR workshop in Antananarivo, Madagascar (January 2015).
- Attended training on cell culture and isolation of influenza viruses at Noguchi Memorial Institute for Medical Research, in Accra, Ghana (March 2015).

INFLUENZA VACCINE ACTIVITIES

There was no influenza vaccination activity but there was an awareness meeting with the agency responsible for immunization to discuss the relevance of influenza data in influencing decisions on vaccination policy and program.

REPUBLIC OF CÔTE D'IVOIRE



The annual review meeting in March 2014.

OVERVIEW

This cooperative agreement provides supplementary support to the Ivorian Government in order to ensure the sustainability of the influenza surveillance system over time. Among other objectives, this funding will enable an estimation of the burden of disease from influenza in Côte d'Ivoire. Moreover, it will facilitate the development of an influenza vaccine policy based on surveillance data, as well as improve detection and control of influenza and other severe respiratory illnesses.

SURVEILLANCE

The influenza surveillance network in Côte d'Ivoire is included in the Disease Early Warning System that was established in 2000. The influenza surveillance system was able to detect and investigate two outbreaks. In February 2014, an outbreak of influenza A (H3N2) virus was detected in a village north of Abidjan. One hundred twenty-four influenza cases were identified, including 12 deaths among children aged 1–11 years. The deaths were in persons with acute respiratory infection (ARI) associated with malnutrition. In April 2015, a second outbreak was detected in a city south of Abidjan. Ten cases of influenza A (H1N1) pdm09 virus infection, three in persons who were hospitalized, were recorded.

In March 2014, the annual project review meeting held in Korhogo allowed focal points to learn about attack rate, base reproductive rate, generation

HIGHLIGHTS

- Developed and disseminated weekly public health emergency management bulletins to stakeholders.
- Conducted regular meetings of the Influenza Technical Working Group.
- Received surveillance data (case-based and aggregated) from all sentinel sites throughout the year.
- Prepared and implemented the public health emergency management annual plan. Influenza is included in the plan.

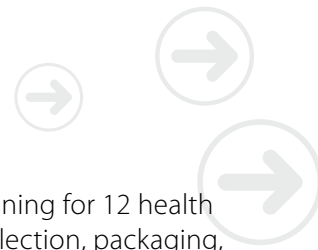
intervals, and vaccine efficacy. Also, the project team developed a sustainability plan in November 2013, and submitted it to CDC.

SURVEILLANCE ACTIVITIES

- Conducted two annual review meetings to assess the activities being implemented within the influenza surveillance network—the 6th in Korhogo (March 2015) and the 7th in San Pedro (June 2015).
- Developed a sustainability plan for the influenza surveillance network in November 2013.
- Conducted five supervisory visits to influenza sentinel sites by epidemiologists and a virologist from both Institut National d'Hygiène Publique (INHP) and Institut Pasteur de Côte d'Ivoire (IPCI).
- Collected data for estimating influenza burden.
- Detected and investigated two outbreaks outside of Abidjan in February 2014 and April 2015.

LABORATORY

The National Influenza Center (NIC) of Côte d'Ivoire is located at IPCI. The influenza project provided consumables and reagents each year for the diagnosis of influenza. Since 2013, in light of the increase in the number of samples that the NIC must analyze, additional supplies and reagents were purchased for the project. These materials enabled the isolation of influenza viruses during this period. In the same timeframe, 4,224 specimens from suspected cases were analyzed by the laboratory (positivity rate of 11.1%); 176 were influenza B virus, 67 influenza



A (H1N1)pdm09, 175 influenza A (H3N2), and 48 influenza A not able to be subtyped. There were three cases of co-infection with influenza A (H3N2) and (H1N1)pdm09 viruses and one case of influenza A (H1N1)pdm099 and influenza B viruses.

LABORATORY ACTIVITIES

- Collected 52 samples of viruses from October–December 2014, and shipped them to the WHO CC in Atlanta for sequencing.
- Assigned the head of the NIC to participate in quality management training in France at Agence Française de la Normalisation (AFNOR) and helped conduct and evaluate a management policy based on quality (January 2014).
- Trained a virologist on influenza sequencing and phylogenetic analysis at CDC Atlanta in November 2014.

PREPAREDNESS

In the framework of preparedness against pandemic and avian influenza threats, INHP purchased personal protective equipment (PPE) for health workers, and improved the capacities of the quick-response investigation team for local epidemics and clusters. The project organized sensitization and communication visits targeting health care workers, poultry farmers and dealers, community leaders, administrative and political authorities throughout the country.

PREPAREDNESS ACTIVITIES

- Acquired PPE which will be used to fight against epidemic or pandemic influenza, other acute respiratory infections, and emerging and/or re-emerging infectious diseases.
- Developed a functional, quick-response investigation team at the central level and in 82 health districts and sentinel sites.
- Organized a training for health care workers and key stakeholders involved in border surveillance.

TRAINING

- Conducted district-level training for 12 health professionals on sample collection, packaging, and shipping of biological specimens (July 2014).
- Designated the Head of Epidemiological Surveillance of INHP and the Head of the NIC to attend the ANISE Meeting in Cape Town, South Africa (December 2014).
- Identified an epidemiologist to attend the Conference of the International Society for Diseases Surveillance in Philadelphia, PA (December 2014).
- Identified two participants from INHP and IPCI to attend the Grants Proposal Writing Workshop in Johannesburg, South Africa (April 2015).
- Conducted training for 18 health professional workers on influenza outbreak investigation, sample collection, packaging, and shipping of biological specimens (July 2015).

INFLUENZA VACCINE ACTIVITIES

Côte d'Ivoire, within the framework of the Partnership for Influenza Vaccine Introduction (PIVI), plans to organize a mass influenza vaccination campaign in 2015; the campaign will focus on pregnant women to protect this high risk group from severe influenza infections.

This vaccination program aims to reduce the morbidity and mortality from influenza in pregnant women and protect their newborns and infants up to six months. The mass vaccination will take place in the eight health districts of Abidjan.

To this end, Côte d'Ivoire submitted an Operational Work Plan (PAO) to the Task Force for Global Health. The plan was developed in collaboration with WHO and the United Nations Children's Fund (UNICEF). For Côte d'Ivoire, this important campaign will target 200,000 pregnant women. The total amount of vaccine required is 210,000 doses. The campaign will be organized in two phases in 2015.

RWANDA



Nasopharyngeal swab collection at Gihundwe District Hospital sentinel site.

OVERVIEW

CDC supports the Rwanda Biomedical Center (RBC) in preparedness and communication, surveillance and disease detection, and response and containment to improve Rwanda's capacity to identify and manage outbreaks of avian and pandemic influenza. The influenza surveillance network in Rwanda is currently composed of six sentinel surveillance sites (two referral hospitals and four district hospitals), and the Rwanda Biomedical Center/National Reference Laboratory Division (RBC/NRL) serves as the National Influenza Testing Centre and the Rwanda Biomedical Center/Epidemic Infectious Diseases Division (RBC/EID) as the support coordination institution.

SURVEILLANCE

Sentinel surveillance for severe acute respiratory illness (SARI) and influenza-like illness (ILI) is implemented in pediatric, adult, and maternity inpatient and ambulatory wards. Epidemiological data along with respiratory samples are collected and analyzed to characterize patients. From October 1, 2013 to September 30, 2015, 2,956 cases including 2,594 (88%) SARI and 362 (12%) ILI cases were identified. Of these, 239 (8%) tested positive for an influenza virus: 181 (76%) and 58 (24%) were influenza A and B virus, respectively. Among influenza A viruses, 131 (78%) were A (H3N2) and 50 (28%) were A (H1N1)pdm09.

HIGHLIGHTS

- Shipped samples to a WHO Collaborating Center (CC) for the first time.
- Performed characterization of other respiratory pathogens for the first time using RT-PCR Multiplex.
- Completed manuscript summarizing six years of influenza surveillance in Rwanda.
- Performed antigenic characterization of influenza viruses circulating in Rwanda for the first time and identified their relation to the annual influenza vaccine compositions.

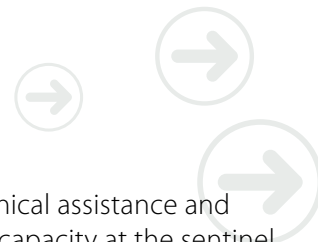
The network reports weekly to WHO FluNet and has strains posted to GISAID. The program is working to establish virus isolation capacity to achieve National Influenza Center (NIC) status and determine estimates of burden of disease for medically-attended influenza for use in policy decision making.

SURVEILLANCE ACTIVITIES

- Collected data and developed a protocol and data collection tools for estimates of burden of disease for medically-attended influenza.
- Conducted eight quarterly supervisory visits to the sentinel sites.
- Investigated and confirmed two suspected outbreaks of ILI and SARI due to influenza A (H1N1)pdm09 virus.
- Reviewed the Integrated Disease Surveillance and Response (IDSR) framework to include both ILI and SARI case definitions according to WHO's new case definitions.

LABORATORY

Since 2008, the National Reference Laboratory, situated in Kigali, has been the National Influenza Testing Centre. The laboratory is a Biosafety Level II (BSL-2) with some enhanced BSL-3 procedures. It has supported the influenza surveillance system network with RT-PCR assays for detection of influenza A and B viruses and avian influenza A (H5N1) virus using CDC-provided primer/probes and protocols.



The NRL has also performed detection of other respiratory pathogens using multiplex RT-PCR reactions that detect the following pathogens: influenza A and B viruses, coronaviruses (HCoV) NL63, 229E, and OC43, parainfluenza viruses 1-4, human metapneumovirus (hMPV) A and B, adenoviruses, enteroviruses, respiratory syncytial virus (RSV) A and B, rhinoviruses, parechovirus, bocavirus, *Mycoplasma pneumoniae*, *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Staphylococcus aureus*.

LABORATORY ACTIVITIES

- Tested 2,956 respiratory specimens (362 ILI/2,594 SARI cases) for influenza with a detection rate of 8% (239/2,956).
- Submitted a total of 53 positive samples to the WHO CC Atlanta as part of WHO's Global Influenza Surveillance and Response System (GISRS).
- Reported weekly testing results to WHO FluNet.
- Participated in six supervisory visits and provided logistical support to sentinel hospitals in the influenza surveillance network.

PREPAREDNESS

The occurrence of Ebola virus disease (EVD) outbreaks in West Africa triggered a high level response. CDC in collaboration with the Ministry of Health and other partners such as USAID (EPT, PREDICT), WHO, and partnering ministries and institutions such as the Rwanda Biomedical Center/Epidemic Surveillance and Response Division (RBC/ESR) and RBC/NRL actively participated in preparedness and response activities.

PREPAREDNESS ACTIVITIES

- Developed and tested the National Emergency Preparedness and Response Plan.
- Updated standard operating procedures (SOP) for detection, confirmation, and management of potential specimens from persons suspected of having EVD or other viral hemorrhagic fevers.
- Participated in Ebola virus (EBV) preparedness and response meetings.
- Participated in EBV simulation exercises.

TRAINING

CDC continued to provide technical assistance and training to build organizational capacity at the sentinel sites and national levels to ensure optimal functioning of the sentinel surveillance system, quality of data, prompt data analysis and information sharing, and integration of the ISS into the national integrated disease surveillance and response system for effective transition from a donor-funded to a country-led program.

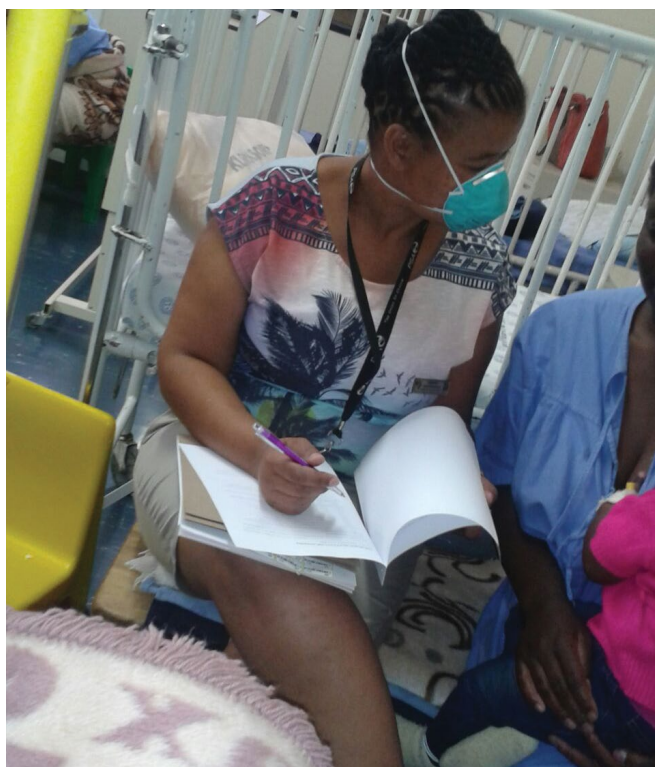
During the reporting period, the following trainings were organized and/or attended:

- Multiplex PCR Testing at the National Institute for Communicable Diseases (NICD), South Africa for two laboratory technicians from the National Reference Laboratory.
- Influenza Surveillance Refresher Training at the University Teaching Hospital of Butare for 20 health care workers.
- Medical Burden of Disease Estimates Training for 12 health care providers.
- Data Analysis Training using STATA software facilitated by CDC Rwanda for four senior influenza surveillance staff at Rwanda Biomedical Center.
- Advanced RT-PCR Training in Antananarivo, Madagascar was attended by one laboratorian.

INFLUENZA VACCINE ACTIVITIES

No influenza vaccine-associated activities have been implemented during the reporting period.

SOUTH AFRICA



Seipati Matshogo, research assistant, from Klerksdorp/Tshepong Hospital Complex (KTHC), conducting an interview.

OVERVIEW

CDC collaborates with the National Institute for Communicable Diseases (NICD)/National Health Laboratory Service (NHLS) to strengthen laboratory and epidemiologic capacity in South Africa.

SURVEILLANCE

The severe acute respiratory illness (SARI) and the influenza-like illness (ILI) programs continue at hospitals and outpatient clinics across the country. The SARI surveillance programme has been renamed pneumonia surveillance as the programme moves towards a national multi-pathogen programme that will include both acute and more chronic respiratory illness case definitions. The SARI programme tests for RSV, influenza A and B viruses, adenoviruses, human metapneumovirus, parainfluenza viruses 1, 2, 3, rhinoviruses and enteroviruses. The pneumonia surveillance programme will include testing for the following pathogens: *Pneumocystis jiroveci*, *Mycobacterium tuberculosis*, *Streptococcus pneumoniae*, *Bordetella pertussis*, *Haemophilus influenzae* type B,

HIGHLIGHTS

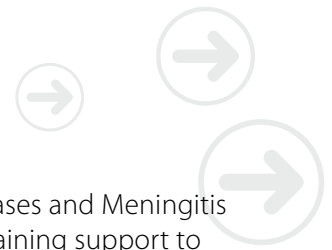
- Implemented national pneumonia surveillance protocol.
- Received core sustainable funding for surveillance through the National Department of Health.
- Published annual health care workers handbook on influenza.
- Published annual vaccine recommendations in South African Medical Journal.
- Established laboratory assays for influenza virus complete genome PCR and next-generation genome sequencing.

atypical bacterial causes of pneumonia (*Legionella species*, *Chlamydia pneumoniae* and *Mycoplasma pneumoniae*), coronaviruses (OC43, 229E and HKU1) and bocavirus.

Testing for these pathogens will allow for a full description of the causes of pneumonia in our setting. The ILI surveillance programme enrolls patients using a standard case definition of ILI and provides a platform for the influenza shedding study and an asymptomatic control cohort to enable better description of the risk factors for ILI and SARI in our high HIV prevalent setting.

SURVEILLANCE ACTIVITIES

- Reported to WHO on our annual influenza season to inform vaccine strain selection.
- Drafted the national influenza policy following two stakeholder meetings with the National Department of Health (NDoH).
- Supported NDoH on vaccine and clinical treatment guidelines for the 2013 and 2014 influenza season.
- Integrated the SARI surveillance system into a more comprehensive pneumonia surveillance and will move into the GERMS-SA programme to allow more national representation.
- Posted updates on novel coronavirus and other influenza-related international outbreaks weekly on NICD's webpage.



LABORATORY

The NIC processed a total of 6,537 samples in 2014. Influenza virus isolation was attempted on clinical samples and about 67% (50/75) were successful. The majority of influenza A virus isolates (n=35) were influenza A/H3N2 which dominated the season. Of the 50 influenza virus isolations obtained, 43 were from influenza A viruses and seven were from influenza B viruses. A total of 46 virus isolates could be characterized antigenically by hemagglutination inhibition assay (HAI) of which 70 % (32/46) were influenza A(H3N2). Of the influenza A(H3N2) viruses serotyped 69% (22/32) showed normal reactivity to the A/Texas/50/2012 vaccine strain reference antiserum. Almost 100 complete or near complete influenza A/B genomes were sequenced.

LABORATORY ACTIVITIES

- Performed inter-laboratory quality assurance testing with Seychelles and Zambia.
- Attended the 9th Annual Sequencing, Finishing, and Analysis in the Future meeting in Santa Fe, New Mexico (May 2014).
- Provided a report on the final results for sero and molecular surveillance for influenza A viruses in South African pigs surveyed nationally during 2013 to the Department of Agriculture, Forestry, and Fisheries (DAFF) and other stakeholders.

PREPAREDNESS

As part of our strategy to build partnerships for surveillance activities at the animal-human interface, we conducted HAI assays on pig serum samples as part of a collaboration with DAFF to ensure the ability to detect exposures to swine-origin influenza viruses and that necessary reagents are available in the laboratory. Several discussions with stakeholders in the ostrich industry took place regarding monitoring of staff with influenza-like symptoms.

PREPAREDNESS ACTIVITIES

- Designated staff to participate in the Good Emergency Management Practice Workshop: “Strengthening capacity to respond to animal diseases emergencies” presented by the Crisis Management Centre, Animal Health (CMC-AH) FAO; the Animal and Plant Health Inspection Services (APHIS), United States Department of Agriculture (USDA) and DAFF (25–29 August 2014).
- Attended meetings at WHO on “Influenza Severity Assessment” in April 2014 and November 2014.

TRAINING

The Centre for Respiratory Diseases and Meningitis (CRDM) continues to provide training support to southern African countries and to the staff working at the surveillance sites.

The following activities/trainings occurred:

- Trained visiting scientists from Rwanda and Mozambique on the multiplex real time RT-PCR assay (September 2013).
- Trained the virology laboratory at the University Teaching Hospital in Lusaka on influenza virus isolation techniques (November 2013).
- Helped screen pilgrims returning from Hajj in Saudi Arabia for the MERS-CoV virus and influenza A and B viruses.
- Assisted CDC South Africa with a site visit and influenza surveillance training in Maputo, Mozambique (September 2014).
- Appointed Dr. Cheryl Cohen as a member of the WHO Working Group on the Burden of Influenza Disease, 2014–2016.

INFLUENZA VACCINE ACTIVITIES

During this period, CRDM advised NDoH on the risk groups for influenza to assist with the national guidelines on influenza vaccination.

CRDM publishes the annual vaccine guidelines in the South African Medical Journal. In addition, NICD publishes a health care workers handbook on influenza which is circulated to stakeholders and published on NICD’s web page.

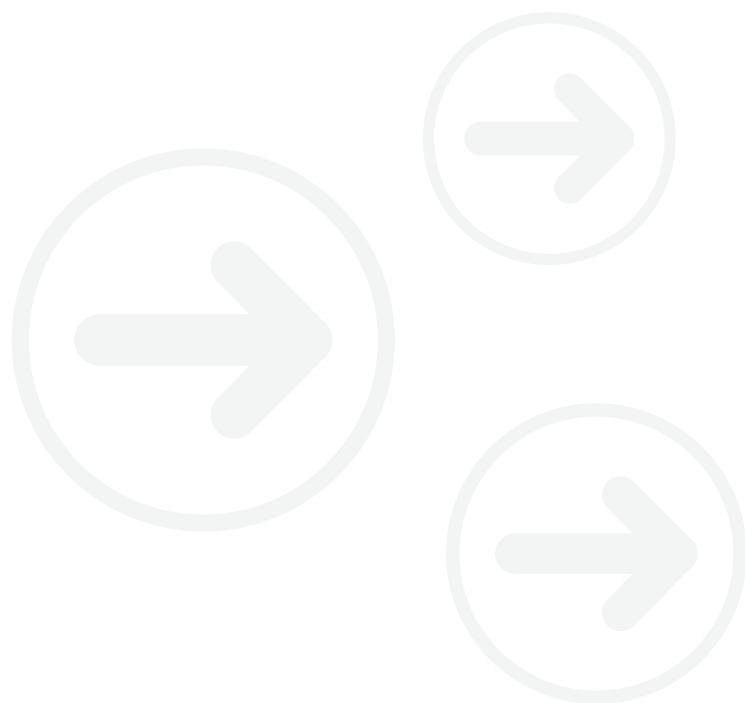
CRDM published a peer-review paper on the effectiveness of influenza vaccine for 2010 to 2013. A survey on knowledge, attitudes and practices related to influenza vaccine was also published in this period.

RESEARCH

CDC’s Influenza Division has collaborated with the National Institute for Communicable Diseases in South Africa to conduct severe acute respiratory illness surveillance at five hospitals and influenza-like illness at two sites. From this platform we have identified risk factors for influenza-associated hospitalization and death including HIV-infection, pulmonary tuberculosis infection, age <2 years and age ≥65 years. With data from health utilization surveys we have also estimated the burden of disease among children, adults and pregnant women. In

addition, newer studies have assessed the duration of viral shedding in HIV-infected and HIV-uninfected adults and children. Likewise, household transmission of influenza viruses has been studied to assess the role of HIV and TB infection in disease transmission. Research projects include studies to explore:

- Disease and economic burden of respiratory illness associated with influenza.
- Transmission of influenza viruses among HIV-infected and HIV-uninfected household members.
- Prospective cohort study of influenza viral shedding in HIV-infected and -uninfected adults.
- Attributable fraction and risk factors for influenza-associated severe acute respiratory illness hospitalization in a high HIV prevalence setting.
- Effectiveness of trivalent inactivated influenza maternal vaccination among pregnant women and their newborns.





TANZANIA



Ms. Maria Kelly, laboratory scientist, conducting a demonstration on the donning of PPE.

OVERVIEW

The Ministry of Health and Social Welfare (MoHSW), Preventive Services Department through its Epidemiology and Diseases Control section collaborates with the U.S. Centers for Disease Control and Prevention (CDC) to sustain influenza surveillance networks and respond to seasonal and pandemic influenza in Tanzania. Influenza epidemiologic surveillance is done in six sentinel surveillance sites [five sites for severe acute respiratory infection (SARI) and influenza-like illness (ILI) and one for ILI-only].

SURVEILLANCE

The influenza sentinel surveillance system is based on the laboratory confirmation of samples collected from patients meeting the influenza-like illness (ILI) standard case definition and all SARI cases from the sentinel sites at the National Influenza Center (NIC). In this reporting period, four sentinel sites were financially supported to conduct influenza surveillance. Weekly SARI reports are sent to the MOHSW through the Integrated Disease and Surveillance Response (IDSR) system from the sentinel sites, and reports on aggregated data are shared with all stakeholders, including top management of MoHSW, the World Health Organization (WHO) Country Office, CDC Tanzania, sentinel sites and other partners. Through this surveillance, MoHSW has been able to identify the circulating influenza viruses in the country, share samples with the WHO Collaborating Center (CC) in Atlanta, and build capacity on preparedness, early detection and rapid response to influenza and other emerging and re-emerging viral diseases.

HIGHLIGHTS

- Identified the epidemiology of circulating influenza viruses.
- Strengthened laboratory capacity to attain NIC status.
- Established country capacity to control outbreaks and pandemics as evidenced during the influenza A (H1N1)pdm09 virus outbreak in 2009 where only one death occurred in the country.
- Shared viruses with the international community for quality control and development of vaccine.

SURVEILLANCE ACTIVITIES

- Collected influenza epidemiological data from four sentinel sites where 5,056 patients were enrolled into surveillance.
- Supported sentinel surveillance sites with mentorship and training of new/additional staff.
- Shared SARI weekly data through IDSR with the national level, WHO, and CDC Atlanta.
- Conducted supervisory visits to the existing four sentinel sites to provide mentorship, on-the-job training, inventory of project equipment/assets, feedback to site authorities, and discuss sustainability issues.
- Shared influenza surveillance information at national and international meetings.

LABORATORY

The National Influenza Laboratory (NIL) has built significant capacity in terms of human resource and equipment and attained NIC status in November 2014. In addition, the National Health Laboratory Quality Assurance and Training Center, of which the NIC is part, was accredited by the Southern African Development Community Accreditation Services with ISO15189 standard in April 2014 and awarded a certificate of honor for the accredited laboratories during the ASLM 2014 Meeting in Cape Town, South Africa.

The epidemiological picture of influenza viruses circulating in the country is now well known. From October 2013 to May 11, 2015 a total of 2,000 specimens were tested for influenza viruses using real-time RT-PCR; out of those, 270 (13.5%) were positive,

of which 191 (71%) were influenza A viruses and the rest 79 (29%) were influenza B. Among the influenza A viruses, 185 were influenza A (H3N2) and six were A (H1N1)pdm09. Out of the positive samples, 111 were subjected to cell culture. Laboratory capacity has been strengthened not only for influenza viruses, but also for other emerging and reemerging infections. The experiences and resources gained through influenza surveillance were used to respond to other emerging and reemerging diseases (e.g., Rift Valley fever, dengue, and chikungunya) and for Ebola.

LABORATORY ACTIVITIES

- Performed RT-PCR testing on 2,000 samples; out of those, 111 samples were subjected to virus cell culture.
- Shared 73 virus isolates with the WHO CC in Atlanta.
- Participated in WHO's External Quality Assessment Project (EQAP) with excellent scores.
- Procured reagents and supplies for laboratory specimens collection and testing.
- Provided feedback on influenza laboratory results sent weekly from sentinel sites.

PREPAREDNESS

The MOHSW continues to work with CDC, the United Nations, and other stakeholders on the implementation of the preparedness and response plan for avian and pandemic influenza and other emerging and reemerging infectious diseases. The plan is multi-sectoral, involving the key ministries and other stakeholders. However, preparedness activities were carried out at a very minimal pace due to a lack of funding available to implement the plan. The MOHSW-CDC cooperative agreement is concentrated on surveillance activities. The National Task Force to deal with emerging and reemerging diseases is in place to deal with preparedness activities and will respond to any outbreak that may occur. The committee is divided into five subcommittees including coordination, surveillance, case management, logistics, and social mobilization and public awareness.

PREPAREDNESS ACTIVITIES

- Strengthened surveillance at points of entry in collaboration with other stakeholders including immigration officers.
- Distributed personal protective equipment (PPE) to all districts in an effort to prepare for the threat of Ebola and other emerging infectious diseases.

- Developed a national team and divided into five subcommittees; coordination, surveillance, case management, logistics and public awareness.
- Developed public communication materials in collaboration with UNICEF.

TRAINING

- Designated a team member to attend a short course on Computer Aided Qualitative Data Analysis in New Delhi, India.
- Trained 24 Regional and Council Health Management team members on disease surveillance and outbreak response.
- Conducted refresher training on influenza surveillance and other emerging infectious diseases, including Ebola, for newly employed health care workers at sentinel surveillance sites.
- Conducted training on improving laboratory capacity and surveillance for pandemic influenza preparedness for health care providers from 13 provinces in the country.
- Attended training on molecular diagnosis of respiratory diseases at the National Institute for Communicable Diseases (NICD) in Johannesburg, South Africa.

INFLUENZA VACCINE ACTIVITIES

Although currently there is no influenza vaccine program in Tanzania, the country recognizes that vaccination is the most effective way to prevent influenza and therefore is important particularly among high-risk groups such as young children, pregnant women, the elderly and persons with underlying medical conditions. With the currently available data, we are able to estimate only the relative burden of influenza for influenza-like illness (ILI) and severe acute respiratory illness (SARI); however, incomplete data, mainly on patient outcome, make accurate estimates a challenge.

- We have started collection of additional data including denominator data from a well-defined catchment area in order for us to be able to estimate the incidence of influenza-associated morbidity (hospitalizations and outpatient visits) as well as influenza-associated mortality. Accurate data and calculation of burden of disease can inform the government and assist them in developing a national action plan for influenza vaccine introduction in the country.

UGANDA

OVERVIEW

Since 2008, the Centers for Disease Control and Prevention (CDC) has provided funding to the Uganda National Influenza Center (NIC). The aim of the cooperative agreement is to consolidate achievements in influenza surveillance from the first round of funding and develop a sustainability plan. In 2014, new funding was provided by CDC to assist Uganda in defining a road map for introduction of seasonal influenza vaccines and their increased use through a process of informed analysis of available scientific evidence and assessment of the needs and barriers.

SURVEILLANCE

We have maintained an efficient routine influenza surveillance system in Uganda that collects, analyzes and reports quality data on severe acute respiratory infections (SARI) and/or influenza-like illness (ILI), and it includes virologic and epidemiologic data on both children and adults. The system collects, analyses and reports epidemiologic and virologic data on both mild and severe influenza-associated disease from sentinel sites using case definitions and epidemiologic and laboratory protocols consistent with global standards. Priority is given to collecting SARI data from five of our surveillance sites: Arua Regional Referral Hospital, Mbarara Regional Referral Hospital, Tororo District Referral Hospital, Fort Portal Regional Referral Hospital and Entebbe General Hospital. Kawaala Health Centre IV, Kitebi and Lobule Health Center III only do surveillance for ILI. Entebbe General Hospital and Koboko District hospital do surveillance for both ILI and SARI. We initiated surveillance for MERS-CoV and avian influenza A (H7N9) virus at three other sentinel sites in Kampala.

SURVEILLANCE ACTIVITIES

- Improved database for epidemiology and virology data.
- Reviewed and updated our sustainability plan.
- Collected samples regularly and shared data through the Ministry of Health (MOH) Weekly Epidemiology Newsletter, FluNet, and WHO AFRO's system weekly.
- Organized new staff training at the sentinel site in Fort Portal so surveillance could be restarted.

HIGHLIGHTS

- Hosted two Symposia where we disseminated data on influenza in Uganda.
- Inaugurated the Uganda National Immunization Technical Advisory Group (UNITAG).
- Presented the National Immunization Policy to Uganda Parliament.
- Organized a meeting for the Influenza Technical Committees of the UNITAG and KENITAG (Kenya National Immunization Advisory Group) to explore possibilities for collaboration.

LABORATORY

The laboratory received 2,093 SARI samples and 1,781 ILI samples from the sentinel sites. All samples were tested. We did not discard any samples, an indication that the sample collection, storage, and transportation are doing well. There were 178 (8.5%) SARI and 275 (15.4%) ILI samples positive for an influenza virus. All positive samples were subtyped. Of the SARI influenza-positive samples the majority (72%) were influenza A (H1N1)pdm09 virus while for the ILI influenza-positive samples 52% were influenza A (H3N2) virus. Virus isolation was carried out on the positive samples, and 112 isolates were obtained. The laboratory sent two shipments of over 200 isolates to the WHO CC in Atlanta. The laboratory participated in WHO's EQAP, Panel 14 and improved the laboratory database. During this period, reagents were received to test for avian influenza A (H7N9) virus and MERS-CoV. Three sentinel sites were initiated in Kampala for this surveillance, but as of now no samples have tested positive for influenza A (H7N9) virus or MERS-CoV.

LABORATORY ACTIVITIES

- Tested all samples from the sentinel sites for influenza viruses.
- Maintained and cleaned the data in the virological laboratory database.
- Shipped isolates to the WHO CC in Atlanta as part of WHO's GISRS.
- Participated in WHO's EQAP with 100% score for the 13th time.

- Conducted training reviews of sentinel staff at all sentinel sites and at regional review sessions.
- Responded to a questionnaire from WHO AFRO on virological and epidemiological surveillance in the region.

PREPAREDNESS

The NIC is part of the National Task Force for pandemic preparedness in the country. Data are reported to the Surveillance and Response committee of the National Task Force. The committee meets quarterly and the National Task Force meets twice a year. However during outbreaks the committee meets more regularly, sometimes three to four times a week. While there were no influenza outbreaks, as members of the Task Force, we participated in the Marburg and the Crimean-Congo hemorrhagic fever (CCHF) outbreaks in the country. We were involved in training personnel for surge capacity in blood collection and shipment in preparedness for Ebola.

PREPAREDNESS ACTIVITIES

- Trained neighboring countries on preparedness for disease outbreaks.
- Presented influenza surveillance data to the National Task Force on Pandemic Preparedness, including our surveillance for MERS-CoV and influenza A (H7N9) virus.
- Prepared a document on risk for introduction of avian influenza A (H5N1) virus into Uganda in light of the poultry outbreaks in West Africa.
- Participated in the quarterly and semi-annual meetings of the National Task Force.
- Trained staff on surge capacity for laboratory activities, field sample collection and transportation in preparation for an Ebola outbreak.

TRAINING

- Designated one laboratorian to attend a training on PCR and sequencing techniques at the National Institute for Communicable Diseases (NICD), South Africa.
- Designated two laboratorians to attend a training on virus sequencing at Los Alamos Laboratories, USA.
- Designated all staff to attend various trainings on Biosecurity and Biosafety provided by Sandia Laboratories.

- Participated in the Burden of Disease Webinar.
- Participated in the Burden of Disease Workshop at the ANISE Meeting in South Africa.
- Designated staff members to attend training by Supporting Independent Immunization and Vaccine Committees (SIVAC) on conducting data/publication reviews for support of influenza vaccination activities.
- One of our staff attended the grants writing training in South Africa conducted by CDC.

INFLUENZA VACCINE ACTIVITIES

A survey was conducted to identify gaps and/or barriers to the introduction of influenza vaccination. We also participated in the establishment of the Uganda NITAG and are members of the Influenza Technical Committee of the UNITAG.

We attended several workshops supported by SIVAC: a training workshop for NITAGs in East and South Africa in Naivasha, Kenya from August 4–7, 2014; and February 23–25 2015, a UNITAG workshop for inauguration and orientation of NITAG members to committee roles, responsibilities, and methods of work.

We also attended a Joint Influenza Workshop of the KENITAG and UNITAG Flu Vaccine Working Groups held on March 9–10, 2015 in Entebbe.

We developed a plan for seasonal influenza vaccination introduction activities into Uganda, and continued to collect, compile and analyze SARI data for burden of influenza disease evidence in Uganda.



ZAMBIA



A clinician taking a respiratory sample at the University Teaching Hospital in Lusaka.

OVERVIEW

The overall goal of Zambia's influenza program is to strengthen influenza surveillance and the surveillance of other communicable diseases by bolstering the public sector laboratory and surveillance capacity for influenza-like illness (ILI) and severe acute respiratory infection (SARI).

SURVEILLANCE

A prospective, sentinel surveillance system for ILI and SARI was established in 2008 and is currently operating in Zambia. This system originally consisted of two SARI and two ILI sites in Lusaka and two SARI and two ILI sites in Ndola, Lusaka and Ndola being the two most populous cities in the country. During 2013, in order to strengthen operations by focusing efforts, the sites were scaled down to two SARI sites and one ILI site in Lusaka, plus one SARI site and one ILI site in Ndola.

Data from ILI surveillance provide information on the burden of influenza and contribute to an understanding of circulating viruses, while the SARI cases contribute to an understanding of circulating viruses and are relevant for estimating the burden of severe morbidity. Virus isolates are shipped to a World Health Organization (WHO) Collaborating Center (CC) for further analysis. Weekly summary data are uploaded to FluNet and emailed to key stakeholders in Zambia as well as to other cooperating partners.

HIGHLIGHTS

- Reviewed the performance of the influenza sentinel surveillance program since inception.
- Organized a stakeholder meeting to discuss sustainability.
- Investigated over 1,600 cases of respiratory disease for influenza virus infection as well as for other respiratory viruses.
- Strengthened virus isolation capacity; and regularly shipped isolates to a WHO CC.

SURVEILLANCE ACTIVITIES

- Investigated over 1,600 cases of respiratory disease from the sentinel sites for influenza virus infection through improved management and closer supervision of the program.
- Conducted regular supervisory and training visits to sentinel sites to support surveillance activities and orient new staff as necessary.
- Initiated collection of denominator data.
- Maintained weekly reporting of SARI/ILI results to stakeholders and to FluNet.
- Organized a standard operating procedures (SOP) writing workshop

LABORATORY

The UTH Virology Laboratory (UTHVL) which has been functioning as Zambia's National Influenza Center (NIC) worked closely with CDC, the National Institute for Communicable Diseases (NICD) in Johannesburg, South Africa and the WHO CC in London to strengthen influenza laboratories. Zambian scientists have now been trained in various procedures including influenza virus typing, subtyping, RT-PCR, real-time RT-PCR, sequencing techniques as well as virus isolation and identification. The establishment of this capacity has led to significant enhancements benefiting both Zambia and the Global Influenza Surveillance and Response System (GISRS).

LABORATORY ACTIVITIES

- Tested 1,615 influenza specimens collected at sentinel sites as part of routine surveillance and from outbreak investigations.

- Increased virus isolation and sent several shipments to a WHO CC following training by NICD scientists.
- Continued to perform very well on both WHO's External Quality Assurance Project (EQAP) and CDC performance panels.

PREPAREDNESS

CDC support has contributed to advanced pandemic influenza preparedness and planning in Zambia. The Ministry of Health (MOH) Directorate of Disease Surveillance, Research and Control, led the development of a health sector response plan under the umbrella of the National Disaster Management Committee. The MOH has established multi-sectoral Epidemic Preparedness Committees down to the district level. In the period under review, the MOH continued training and supporting these committees and, through them, responded to various epidemic threats.

PREPAREDNESS ACTIVITIES

- Held discussions with the main veterinary school in the country, which is conducting animal influenza surveillance nationwide, regarding cooperation in surveillance for zoonotic diseases (including early detection of novel influenza viruses).
- Supported the MOH in various ways in the implementation of the national Ebola virus disease (EVD) Preparedness and Response Plan developed in reaction to the 'public health emergency' posed by the West African EVD outbreak.
- Experienced gain in the establishment of the ISS program is being used by the MOH in the process of creating a National Public Health Institute (NPHI) with an integrated National Public Health Laboratory (NPHL).

TRAINING

The influenza sentinel surveillance program, through CDC and other partners, 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.

During this period, the following training activities took place:

- Annual orientation and training workshops for all health staff involved in ISS activities at all sentinel sites.
- Refresher training for laboratory scientists at the sub-national influenza laboratory at the Tropical Diseases Research Center (TDRC), Ndola.
- Training of one PhD-level virologist in sequencing techniques and influenza virus genotyping at the WHO CC in London.
- Training of one scientist in advanced molecular methods at the Pasteur Institute in Madagascar.
- Participation in several international conferences and workshops provided valuable learning opportunities for staff.

INFLUENZA VACCINE ACTIVITIES

There is a need to strengthen the national policy on influenza vaccination. Influenza vaccines are used on an ad-hoc basis. Seasonal vaccines are used mainly in the private sector, and in the public sector, vaccines have been given to high-risk groups in outbreak settings. Data being collected by the ISS program on influenza disease burden will greatly assist policy formulation.



Partner Countries

BURKINA FASO

With the support of CDC, influenza surveillance in Burkina Faso was initiated in 2009. After the 2009 influenza pandemic, the Ministry of Health designated the Institute of Research in Health Sciences (IRSS) as the National Influenza Reference Laboratory of Burkina Faso (NIRL-BFA). NIRL-BFA continues to build laboratory and epidemiologic surveillance capacity to determine seasonality and burden of influenza disease in the country. Through training for laboratorians and surveillance officers, NIRL-BFA has also improved the capacity of laboratories to detect influenza viruses.

A national protocol for influenza surveillance was drafted by the Ministry of Health (MoH) and NIRL-BFA in 2009-2010. Since 2012, surveillance for ILI has increased to six sites. The preliminary results show an influenza virus prevalence of 6.7% in 2010-2012.

Notable progress in laboratory surveillance capacity has been achieved over the past three years, and the success of this partnership has led to significant enhancements beneficial for Burkina Faso.

- Tested 1,799 specimens by RT-PCR from 2013 to 2015, and 230 (12.8%) were positive for an influenza virus.
- Conducted six supervisory visits to Ouagadougou sites and a monthly visit to Bobo-Dioulasso sites.

No vaccine activities occurred in Burkina Faso for the period 2013–2015. The goal of the MoH and NIRL-BFA is to introduce a seasonal influenza vaccination program within the next five years.

MAURITANIA

Mauritania is a country on the Atlantic (West) coast of Africa. Much of Mauritania is made up of the Sahara desert, and because of the drought conditions that affected most of that region of Africa in the 1970s, a large proportion of the population is nomadic.

The collaboration between the Ministry of Health/DLM (Direction de la Lutte contre la Maladie), CDC, and the Institut National de Recherches en Santé Publique (INRSP)/National Public Health Research Institute of Nouakchott started in 2010. In 2011, with support from CDC and NAMRU-3, Mauritania began influenza surveillance.

INRSP advocates to Ministry of Health for strengthening epidemiological surveillance capabilities for influenza in order to determine seasonality and burden of disease through sentinel site surveillance across Nouakchott.

CDC and NAMRU-3 helped strengthen the capacity of the influenza laboratory through the acquisition of a RT-PCR machine, a biosafety cabinet, and influenza reagents, in addition to coordinating multiple national and regional trainings. The U.S. Embassy supported the influenza laboratory by donating refrigerators and an air conditioner.

Significant progress in laboratory surveillance capacity was achieved over the past four years, and the success of this partnership has led to substantial improvements benefiting Mauritania. The influenza surveillance network in Mauritania now includes an influenza laboratory and two sentinel sites.



Abdelkader, a laboratory technician, working in INRSP's influenza laboratory.

MAURITIUS

In collaboration with the Institut Pasteur of Madagascar, the first cooperative agreement with Mauritius began in 2013. The cooperative agreement period is for five years. Additional funds were made available by CDC through a cooperative agreement for the purchase of a real-time PCR machine through WHO AFRO and the local WHO Country Office.

A comprehensive ILI and SARI surveillance system was established in January 2013. SARI and ILI surveillance occurs year round, but illness peaks between the months of May through August. Surveillance is also carried out yearly amongst pilgrims returning from the Hajj. They are screened for respiratory viruses including influenza, RSV, HMPV, and MERS-CoV. With the help of CDC, the laboratory acquired NIC status. In an average week, the laboratory receives and processes 30 respiratory samples. The NIC provides support to all surveillance sites by providing viral transport media and sample collection kits through the laboratory transport system.

A pandemic preparedness plan has been drafted and circulated to all stakeholders at appropriate levels within the Ministry of Health and Quality of Life (MOHQL). Every year, the Ministry of Social Security, in collaboration with the MOHQL, provides 80,000 doses of influenza vaccine for the elderly. The MOHQL purchases another 20,000 doses for healthcare workers, vulnerable groups including immunocompromised patients (diabetics, HIV, and patients on immune suppressants), pregnant women, and children under the age of two. Vaccination activities start the last week of April and end the last week of June or continue until the stock is depleted.

NIGER

In May 2009, influenza surveillance was initiated in Niger by the Centre de Recherche Médicale et Sanitaire (CERMES) in collaboration with the Institute Pasteur of Paris (IPP), World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC).

Niger's influenza surveillance system has five sentinel sites. Surveillance data is shared weekly with WHO AFRO and the MoH. In April 2015, a case of avian influenza A (H5N1) virus in poultry was confirmed, motivating the surveillance system to work in collaboration with the veterinarian laboratory.

Laboratory technicians participated in various regional trainings organized mainly by CDC and WHO. Reagents and positive controls are obtained through CDC's Influenza Reagent Resource (IRR). The laboratory has a capacity to detect influenza A and B viruses, to subtype A viruses (H3N2, H1N1pdm09, H7N9, H5N1) and to detect MERS-CoV. The laboratory coordinates all influenza surveillance activities such as sentinel site training and sample shipments.

- Tested 3,091 specimens for influenza viruses.
- Participated in WHO's EQAP.

The recent reappearance of avian influenza A (H5N1) virus in poultry prompted formation of an integrated plan to reactivate all necessary measures to fight influenza outbreaks. Influenza vaccination is not part of the immunization program in Niger although certain groups (health workers, children <5 years, and pregnant women) have been vaccinated.

SENEGAL

Since 2012, with the financial and technical support of DHHS and CDC, the Senegalese influenza surveillance system has been enhanced to detect additional clinical syndromes and the laboratory identification of other respiratory viruses. This improved system, now called the 4S Network, is based on reporting nonspecific indicators as epidemiological data to the healthcare authorities, and on random sampling for laboratory-based testing.

The network has been expanded from three ILI sentinel sites, all in Dakar (2011), to 14 sentinel sites (2015) with two SARI sites. Weekly reports are prepared and transmitted by the Ministry of Health (MoH) to regional and district public health staff, as well as national and international partners.

Notable progress in laboratory diagnostic capacity has been achieved over the past four years, and the success of this partnership has led to significant enhancements benefiting both Senegal and GISRS. The 4S Network supports other laboratories on a regional level. Laboratorians from Guinea, Togo, and Mauritania have been trained on influenza detection and identification techniques.

- Tested 3,437 specimens for influenza viruses.
- Submitted 98 influenza-positive samples to WHO CC's in Atlanta and London.

Pasteur Institute of Dakar, in collaboration with the Ministry of Health, continues to build laboratory and epidemiologic surveillance capacity to determine the burden of influenza disease.

SEYCHELLES

ILI and SARI surveillance in Seychelles both began in October 2013. ILI sentinel surveillance is conducted in six health care centers, four of those on the island of Mahe, one on the island of Praslin, and one on the island of La Digue. They send daily epidemiological information for several diseases including ILI.

SARI sentinel surveillance is conducted in four hospitals throughout the country, two of those are on the islands of Praslin and La Digue. The sentinel sites are monitored periodically by the Disease Surveillance and Response Unit to verify registers and entry of data. They use checklists and questionnaires as evaluation tools.

The Molecular Diagnostic Unit (MDU) of the Seychelles Public Health Laboratory began analyzing samples from sentinel sites in October 2013, for the detection of influenza A (H1N1, H3N2, H1N1pdm09) and influenza B viruses. The MDU successfully participated in WHO's External Quality Assessment Project (EQAP) Panel 13.

- Tested 269 specimens for influenza viruses.
- Supported the Ministry of Health of Madagascar in updating the National Contingency Plan for 2014–2016.

In July 2014, all sentinel hospital site staff members participated in data collection training in order to coordinate and standardize data collection (clinical illness and mortality) on SARI cases. Staff have also attended trainings on Risk Communication, Grants Management, and Influenza rRT-PCR Diagnosis.

SIERRA LEONE

In 2011, the World Health Organization (WHO) selected eight countries in sub-Saharan Africa, including Sierra Leone, to strengthen sentinel surveillance efforts through the project, Strengthening Influenza Sentinel Surveillance in Africa (SISA). Prior to this effort, Sierra Leone had no influenza surveillance activities.

Sierra Leone conducts sentinel surveillance for influenza. The Central Public Health Reference Laboratory (CPHRL) provides logistical support to sentinel sites in the influenza surveillance system in Sierra Leone. From October 2013 to May 2015, the laboratory analyzed 160 samples from four sentinel sites.

Laboratory staff participated in WHO training on shipment of biological substances. Laboratory staff also received training at Noguchi Memorial Institute for Medical Research on laboratory diagnosis of influenza and other emerging diseases.

Currently, there are no influenza vaccination activities in the country. However, this an area to explore in the near future.

TOGO

Avian influenza A (H5N1) virus occurred in Togo during 2007 and 2008. Samples from two human suspect cases were sent to Institut Pasteur of Dakar but the results were negative. The 2009 influenza pandemic increased the necessity to build a national influenza laboratory.

With the support of partners such as NAMRU-3, CDC and WHO, the influenza laboratory was established and has been functional since May 2010.

Today, Togo is conducting routine surveillance for influenza A (H5N1), sentinel surveillance for ILI in two sites (one civilian and one military) in the capital city Lomé, and SARI sentinel surveillance in three sites throughout the country.

- Participated in the Pandemic Preparedness Roundtable Simulation Exercise with USCOM AFRICA.
- Contributed to influenza vaccine strain selection by submitting isolates to WHO.

Research Activities in Partner Countries

GHANA

CDC's Influenza Division developed a research cooperative agreement with the Noguchi Memorial Institute for Medical Research in 2013. Together we established a respiratory disease surveillance platform in Shai-Osudoku and Ningo-Prampam Districts in the Greater Accra Region of Ghana. Patients with influenza-like illness and hospitalized patients with severe acute respiratory illnesses are enrolled in surveillance at nine health facilities. Other health facilities within the district provide weekly aggregate data on the number of respiratory diseases and number of patients meeting the ILI and SARI case definitions. Additional studies include measuring the incidence of influenza in HIV-infected and HIV-uninfected adults and the impact of influenza infection on pregnancy outcomes.

MALAWI

CDC's Influenza Division has partnered with the Malawi-Liverpool Wellcome Trust Clinical Research Programme located at Queen Elizabeth's Central Hospital (QECH) in Blantyre, Malawi since 2011. Influenza surveillance is conducted among children and adults seeking care at QECH. In addition, we have collaborated to assess nosocomial transmission of influenza viruses and RSV in the pediatric high dependency unit, the impact of HIV and malaria on transplacental transfer of antibodies to influenza viruses, the incidence and severity of influenza among HIV-infected and HIV-uninfected adults, and determine changes in influenza genomics that may impact the severity or transmissibility of influenza viruses.

SENEGAL

Research activities are being conducted through a partnership with PATH, the Institut de Recherché pour le Développement (IRD), and Institute Pasteur de Dakar.

These activities include three separate but related vaccine trials. Vaccination and follow-up activities are completed for all three trials, and analyses are underway with manuscripts anticipated in 2015–2016.

- A large-scale randomized controlled trial to evaluate the impact of inactivated influenza vaccine (IIV) among vaccinated children and their communities, through indirect effects or "herd immunity."
- A randomized controlled trial of the safety and immunogenicity of an influenza vaccine containing an immune response-boosting adjuvant (MF59-adjuvanted IIV).
- A randomized controlled trial of the efficacy of live, attenuated influenza vaccine (LAIV) in reducing influenza among LAIV-vaccinated children compared to those receiving a placebo.





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WHO Eastern Mediterranean Region [EMR]

A teal-colored world map is shown in the upper half of the page. Four circular arrows, each containing a right-pointing arrow, are overlaid on the map. One arrow is positioned over the Eastern Mediterranean region (including the Middle East and Eastern Europe), and the other three are positioned over Southeast Asia, East Asia, and Australia. The background of the map is a dark teal color, and the landmasses are a lighter teal color. The lower half of the page is a light teal color with a white diagonal line running from the top left to the bottom right, creating a sense of depth and movement.



WHO Eastern Mediterranean Region [EMR]

Currently there are five bilateral influenza cooperative agreements in the Eastern Mediterranean Region of the World Health Organization (WHO). 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 Eastern Mediterranean Region.

Direct country support through non-research cooperative agreements is established in the following five countries:

- Afghanistan
- Arab Republic of Egypt
- Morocco
- Pakistan
- Tunisia

Two additional cooperative agreements were awarded for FY13, with work beginning in FY14. One additional capacity building cooperative agreement was awarded to Tunisia. Morocco was awarded a cooperative agreement for the development of influenza vaccine policy.

In addition, CDC supports the WHO Regional Office for the Eastern Mediterranean (EMRO) through a cooperative agreement.

The core activities of cooperative agreements and technical assistance between WHO/EMRO and CDC are:

- To enhance the quality, sensitivity and effectiveness of surveillance systems for influenza and severe acute respiratory infections (SARI) as well as sustaining and further enhancing the laboratory capacities of National Influenza Centers (NIC) for timely detection of novel influenza viruses;

- To develop the capacities of the countries to use routinely collected surveillance data to improve their understanding of influenza epidemiology to better inform the national health authorities on appropriate preventive and control strategies for influenza; and
- To support the development of appropriate public health policies that will promote the introduction and increased use of seasonal influenza vaccines in at-risk population groups in the region.

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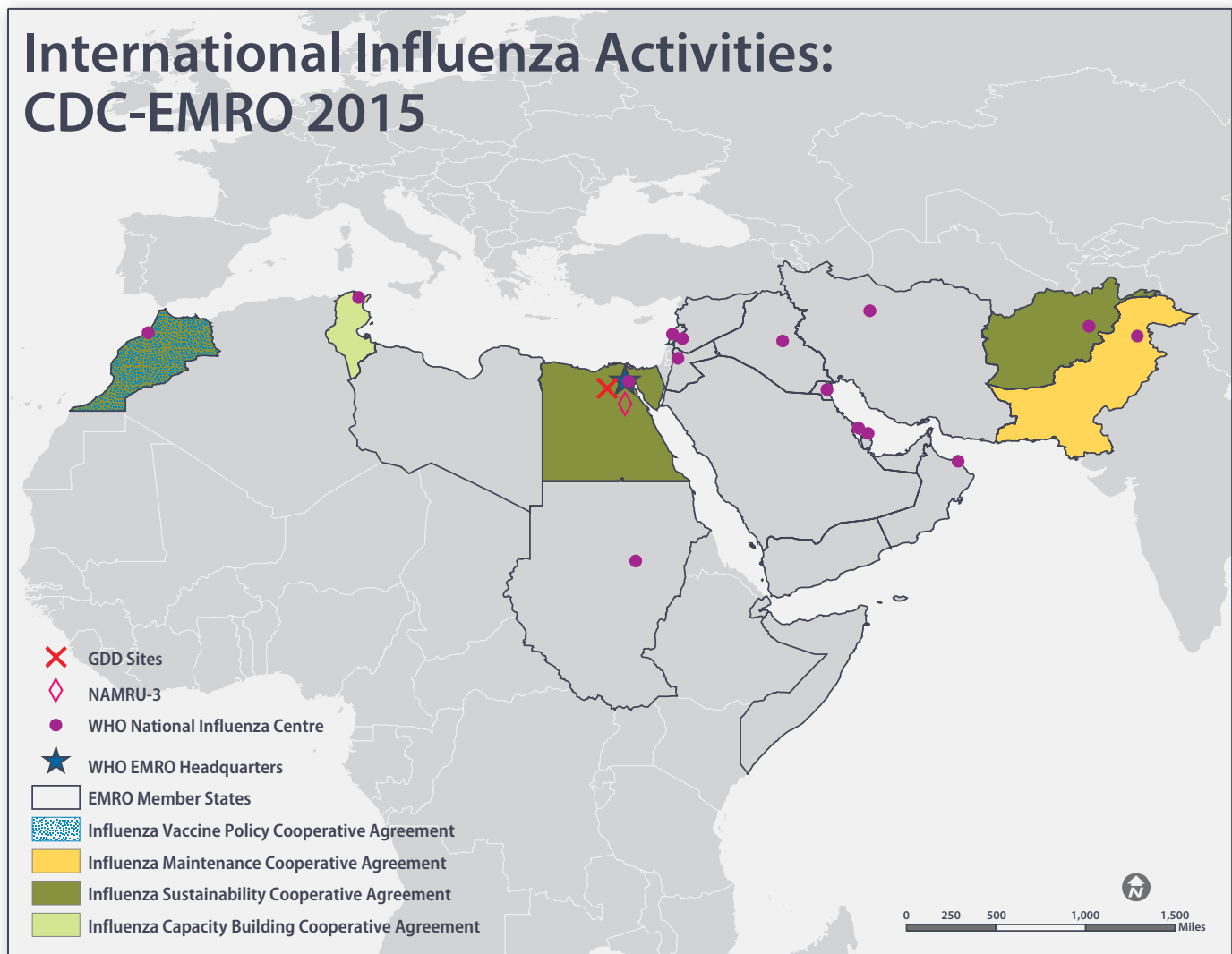
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WHO Regional Office for the Eastern Mediterranean [EMRO]



HIGHLIGHTS

- Established surveillance systems for severe acute respiratory infection/influenza-like illness (SARI/ILI) in 18 countries in the region.
- Recognized 16 National Influenza Centers in the region with varying capacities for influenza virus isolation, sequencing and antiviral resistance testing.
- Formalized the activities of the Eastern Mediterranean Acute Respiratory Infection Surveillance (EMARIS) network.
- Enhanced public health capacities for detection and diagnosis, investigation, and response to outbreaks of influenza A (H7N9) in the region.
- Developed guidance for surveillance of influenza in refugee and displaced population settings.



U.S. CDC DIRECT SUPPORT

A five-year cooperative agreement on strengthening surveillance and response for seasonal and pandemic influenza in the Eastern Mediterranean Region of WHO began in September 2011 and is currently in its fourth year.

The WHO Eastern Mediterranean Regional Office (WHO/EMRO), based in Cairo, Egypt, serves 21 member states and one territory with an overall regional population of more than 538 million. Technical and financial support are provided to the countries through three main work streams: (i) enhancing the quality and sensitivity of the surveillance systems for influenza-like illness (ILI) and severe acute respiratory infection (SARI), (ii) developing the capacities of countries to use routinely collected surveillance data to improve their understanding of influenza epidemiology and (iii) supporting the development of appropriate public health policies that will promote introduction and increased use of seasonal influenza vaccines in at-risk population groups in the region. Guidance, standards and tools are regularly developed and shared with the countries for this purpose.

SURVEILLANCE

In accordance with the gaps identified during the 2009 influenza pandemic, the current support to WHO/EMRO is directed towards strengthening surveillance and response capacities of the countries in the region through establishing and enhancing sentinel surveillance systems for SARI and ILI.

The main goal of this support is to enable the countries to collect quality epidemiological and virological surveillance data on influenza and influenza-associated illnesses in a timely and reliable fashion. Surveillance information is also being used to better understand the circulation patterns of seasonal influenza viruses, including types and sub-types in the region, as well as the epidemiology of influenza, its seasonality and risk factors for severe disease. The evidence coming out of the surveillance data will be used to inform policy decisions regarding effective strategies for prevention and control of influenza in the region.

SURVEILLANCE ACTIVITIES

- Conducted technical missions to Tunisia, Qatar, and Saudi Arabia to establish and/or enhance sentinel surveillance systems for SARI and ILI.
- Conducted a scientific consultative meeting on influenza at the animal-human interface in order to develop a strategic framework for joint risk assessment, surveillance, and response for zoonotic and novel influenza viruses.
- Conducted technical missions to Saudi Arabia during Hajj in 2013 and 2014 to advise on effective preparedness measures for preventing the international spread of influenza associated with the pilgrims.
- Conducted a sub-regional meeting in Amman, Jordan on improving preparedness for epidemic influenza in the region.
- Organized the second inter-country meeting of the Eastern Mediterranean Acute Respiratory Infection Surveillance (EMARIS) network in 2013 to review and evaluate SARI and ILI surveillance systems in the region.
- Extended technical support to Egypt and Pakistan during the winter of 2013–2014 to investigate the underlying causes of severe illness associated with influenza.
- Conducted a consultative meeting in Tunisia to develop guidance for surveillance of influenza in refugees and displaced populations.

LABORATORY

There are 16 functional NICs in the region, and WHO/EMRO in close collaboration with the US Naval Medical Research Unit-3 (NAMRU-3) conducts periodic visits to all these NICs for assessment of their capacity to perform influenza virus sequencing, detect novel or unsubtypeable viruses, and test for antiviral susceptibility. Ten (63%) of the 16 NICs regularly participate in the WHO External Quality Assessment Project (EQAP). As a result of the support, eight NICs currently have full capacity for influenza virus sequencing and three NICs have full capacity for antiviral susceptibility testing. Work is currently underway to fully integrate the activities of the NICs with SARI surveillance in the countries, especially focusing on integrating epidemiological and virological data.

LABORATORY ACTIVITIES

- Conducted a training course in collaboration with NAMRU-3 for laboratory technologists on identification, detection, and diagnosis of influenza A (H7N9) virus for all countries in the region.
- Conducted technical assessment missions to the NICs in Afghanistan, Lebanon, and Sudan in order to enroll them in WHO's EQAP.
- Conducted technical missions in collaboration with NAMRU-3 to Bahrain, Egypt, Jordan, Oman, and Morocco for periodic assessment of the capacities of NICs for sequencing of seasonal influenza viruses as well as to identify gaps in capabilities for molecular detection of novel respiratory viruses.
- Conducted a refresher training course in collaboration with NAMRU-3 on viral isolation for NICs in Afghanistan, Iraq, Lebanon, and Sudan.

PREPAREDNESS

Drawing on the institutional lessons learned during the 2009 influenza pandemic, public health preparedness for epidemic and pandemic influenza was strengthened in the region through technical and financial support from CDC. In-country rapid response teams have been established in 20 (91%) of 22 countries in the region and trainings have been provided to these teams for field investigation and response to epidemic and pandemic influenza.

A mechanism for country coordination and rapid information sharing was established throughout the region which links the work streams supported by the cooperative agreement with countries' emergency operations centers and ministries of health.

Guidance, best practice documents and tools have been developed to assess and measure the severity of influenza, estimate the burden of influenza-associated hospitalizations, and develop supportive policies for introduction and increased use of seasonal influenza vaccines in the region.

PREPAREDNESS ACTIVITIES

- Developed appropriate risk communication messages and related information products for high-risk groups.
- Deployed a rapid response mission in Egypt to assess the public health risk associated with the increase of human infections from influenza A(H5N1) virus.
- Conducted a regional workshop in Casablanca, Morocco on enhancing SARI surveillance for early detection, recognition, and response to influenza epidemics and other respiratory outbreaks.
- Deployed field missions to Libya, Jordan, Iraq, Palestine, Tunisia, and Kuwait during the winter of 2014–2015 to assess the public health risk associated with severe influenza infections.

TRAINING

WHO/EMRO in collaboration with the Member States organized the following sub-regional and national training courses:

- **Rapid Response Training**—focused on field investigations and response to outbreaks of influenza A (H7N9) virus in humans.
- **Critical Care for Severe Influenza Cases Training (Egypt)**—focused on standardizing critical care for the treatment of patients with severe viral pneumonia.
- **Sub-regional Training (Oman)**—focused on appropriate data collection, analysis, and field investigation techniques for surveillance and response to a respiratory outbreak caused by a novel influenza virus. Twenty-four participants from 11 countries attended.
- **Sub-regional Training Workshop on Estimation/Measurement of Influenza Burden**—focused on measuring the incidence of, and risk factors for, influenza using population SARI/ILI data. Fifteen participants from Egypt, Pakistan, Morocco, Oman, and Jordan attended this course.



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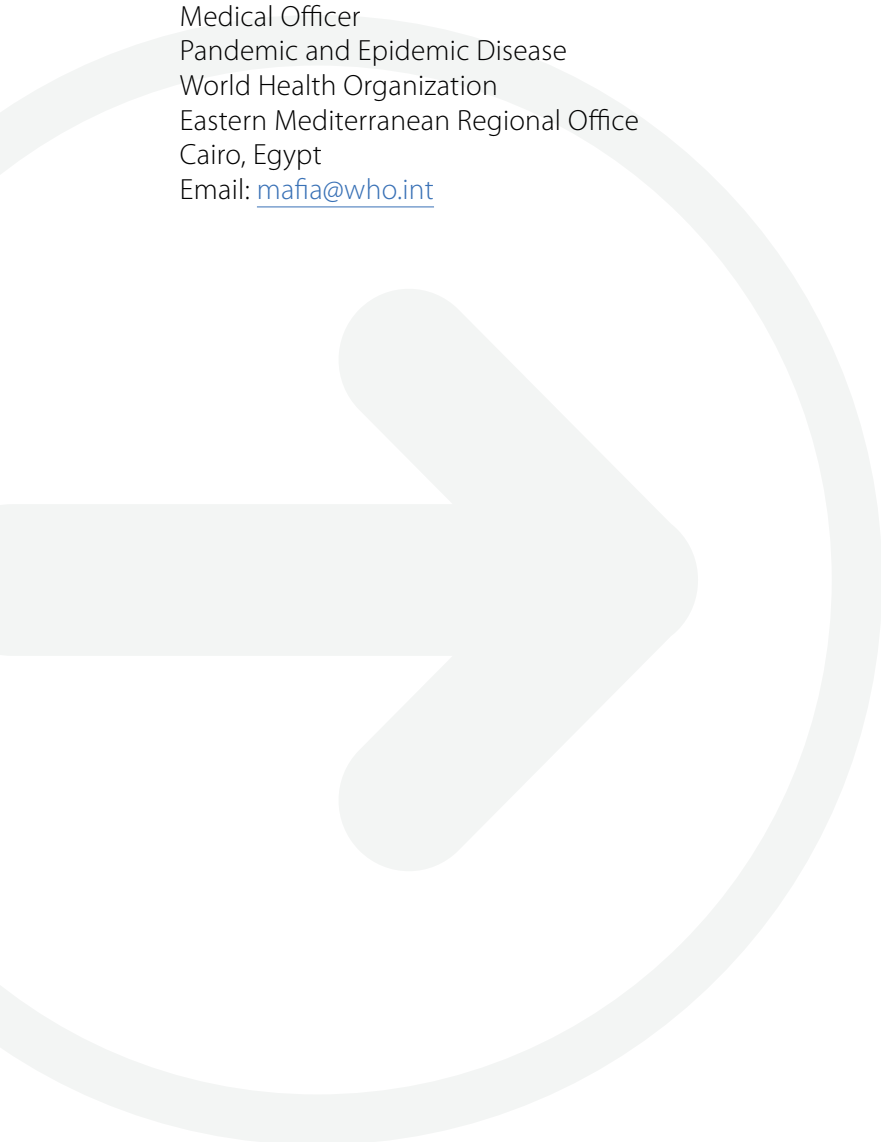
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AFGHANISTAN



The Baba Mountain range of the Hindu Kush between Kabul and Kandahar

OVERVIEW

The Islamic Republic of Afghanistan's Ministry of Public Health (MOPH) received their first cooperative agreement funding from the U.S. CDC for capacity building in 2006. Fiscal year 2011 was the last year of the initial cooperative agreement funding. These funds have supported the Afghan Public Health Institute (APHI), a division of MOPH, in a number of activities, including: planning and conducting pandemic preparedness and response activities, establishing surveillance for influenza-like illness (ILI) and severe acute respiratory infection (SARI), building laboratory capacity for testing specimens for influenza viruses, health education, and training activities. After successful completion of the first cooperative agreement, a second agreement for sustainability was awarded; that agreement will end in September 2016.

SURVEILLANCE

The primary disease surveillance system in Afghanistan is the Disease Early Warning System (DEWS), established in 2006, with technical support from WHO and financial support from USAID. DEWS is a sentinel site-based surveillance system for weekly reporting of infectious disease morbidity and mortality, operating in public and private health facilities. DEWS collects data for 15 reportable diseases including influenza. DEWS receives data from 430 sentinel sites allocated throughout the 34 provinces of the country. The system is being upgraded to

HIGHLIGHTS

- Conducted pandemic influenza preparedness and response training for all 34 provinces.
- Conducted nationwide assessment of SARI/ILI surveillance sites.
- Conducted specimen collection training for all 34 provincial public health laboratory technicians.
- Revised SARI and ILI data collection forms.
- Developed and installed a new ILI/SARI database.

establish surveillance sites in all public health facilities nationwide; to introduce community based surveillance reporting through community health workers; to cover more private health facilities; and to work toward implementation of IHR 2005 in Afghanistan.

SURVEILLANCE ACTIVITIES

- Collected ILI and SARI epidemiologic data and laboratory specimens from eight sentinel sites in eight regions; specimens were sent for testing to the National Influenza Centre (NIC) at the Central Public Health Laboratory (CPHL).
- Detected, investigated, and responded to three pneumonia outbreaks with 136 associated cases in the past year as a result of ILI and SARI surveillance.
- Reported 3,421,878 acute respiratory illness (ARI) cough and cold cases and 646,895 ARI pneumonia cases.

LABORATORY

CPHL, a national reference laboratory and NIC, supports the DEWS surveillance program by testing specimens for confirmation of suspected outbreaks; it also supports testing for routine disease surveillance. In 2014, the laboratory performed a total of 2,457 tests on specimens received from all the DEWS regions. The NIC has worked closely with DEWS and MOPH to establish state-of-the-art laboratories.

NIC staff have been trained extensively through the support of international partners including WHO, NAMRU-3, and the U.S. Department of Defense (DOD) on influenza virus typing, subtyping, PCR, real-time PCR, and other techniques. Notable progress in laboratory surveillance capacity has been achieved over the past five years.

LABORATORY ACTIVITIES

- Worked with CDC's Influenza Reagent Resource to supply the laboratory with reagents for influenza surveillance.
- Collected 648 ILI and 385 SARI samples, of which approximately half have been processed.
- Completed an assessment of the NIC in collaboration with WHO.
- Conducted training on sample collection for 34 provincial laboratory technicians.



A village in Kabul

PREPAREDNESS

The national surveillance system in Afghanistan captured data on both indicator-based surveillance and event-based surveillance. The system shares information on new circulating viruses and outbreaks with all stakeholders. When required, the system sends and receives alerts for situations of concern.

PREPAREDNESS ACTIVITIES

- Conducted four coordination meetings among DEWS coordinators and provincial officers to enhance the surveillance activities and improve better action on outbreak detection and responses.
- Conducted an IHR coordination meeting.
- Strengthened the screening process for suspected cases of MERS-CoV and Ebola virus, particularly during the Hajj season in support of IHR 2005.
- Supplied the NIC with reagents through IRR to perform influenza testing.
- Conducted a Rapid Response Training for DEWS and CDC officers.
- Assessed all influenza surveillance sentinel sites based on the approved checklist from WHO and submitted the report for further action.

TRAINING

- Conducted refresher trainings for 350 DEWS focal points in all 34 provinces.
- Conducted two rounds of rapid response training for pandemic influenza preparedness and response for DEWS provincial officers, CDC provincial officers, and NGOs.

INFLUENZA VACCINE ACTIVITIES

No activities completed for influenza vaccination due to budget constraints.

ARAB REPUBLIC OF EGYPT



OVERVIEW

A cooperative agreement with the Ministry of Health and Population (MOH) provides support to conduct epidemiologic and laboratory surveillance for influenza and to build capacity in Egypt's National Influenza Center (NIC) to detect and isolate seasonal and novel influenza viruses.

SURVEILLANCE

The influenza surveillance system is regularly monitored through site visits. The improved regional laboratory capacity, strengthened through training, has supported improvements in the national surveillance system. Egypt designed a forecasting model, based on the current surveillance system, to estimate how many cases of influenza A (H5N1) virus infection are likely to occur annually. The severe acute respiratory infection (SARI) surveillance system has been leveraged for the detection and testing of suspected cases of MERS-CoV. A standardized case definition for SARI was distributed to all surveillance sites nationwide in order to ensure standardized reporting. Egypt has been reporting influenza-like illness (ILI) results to WHO FluNet regularly, and a weekly report of all influenza programs (sentinel, national, and follow up of returned Hajj pilgrims) is sent out to stakeholders and decision makers. Surveillance data are analyzed and the findings are discussed at the crisis committee meetings; these discussions resulted in the early detection of the most recent avian influenza outbreak. These discussions also guided the implementation of better policies leading to positive results, such as early detection and diagnosis and in turn resulted in decreasing the case fatality rate compared with that seen in the early outbreak of 2014–2015.

SURVEILLANCE ACTIVITIES

- Coordinated the epidemiology and laboratory sectors of both the MOH and veterinary authorities to improve national risk assessment for avian influenza and other zoonotic diseases.
- Conducted multiple field investigations for communicable diseases, assessing both the epidemiologic and environmental situation in various governorates.

HIGHLIGHTS

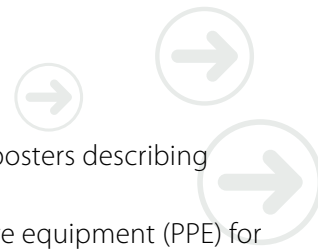
- Assessed the overall effectiveness of the influenza A (H5N1) virus surveillance system.
- Developed preparedness and response plans for a potential MERS-CoV outbreak.
- Revised health communication messages through analysis of specific risk factors for possible transmission of infection.
- Conducted in-depth studies and cluster investigations including consultations with external experts.
- Strengthened electronic systems for timely sharing of data and information across all levels of the Ministry of Health and Population (MOH).

- Conducted field visits to monitor influenza A (H5N1) virus national surveillance sites and provide on-the-job training.
- Established unified database for acute respiratory illness (ARI) and influenza surveillance.
- Provided reports online for sentinel surveillance sites (ILI/SARI).
- Improved diagnostic capacity of the subnational laboratories.
- Expanded geographical representativeness of influenza surveillance, early detection, and improved diagnosis, including the capacity for influenza virus subtyping in cooperation with the NIC and Vacsera.

LABORATORY

Working in coordination with the EMR regional reference laboratory at NAMRU-3, Egypt has tested a backlog of samples obtained from the influenza surveillance system dating from 2012. Other laboratory activities included monitoring visits to the national and sentinel site laboratories.

Epidemiology and laboratory-linked surveillance for SARI and pneumonia was strengthened, and now includes surveillance for MERS-CoV, as well as avian influenza A (H7N9) and (H9N2) viruses. The influenza A (H5N1) virus surveillance system has been strengthened and refined.



The capacity of the Central Public Health Laboratory (CPHL) has been improved with upgrades in equipment and supplies, as has the sub-national laboratories that have also benefited from increased staff training. Two new sub-national laboratories are now functioning, bringing the total to seven laboratories throughout the country.

LABORATORY ACTIVITIES

- Coordinated with reference laboratories in the Region to examine samples collected and stored since 2012.
- Strengthened epidemiologic and virologic surveillance of SARI and pneumonia.
- Added MERS-CoV and avian influenza A (H7N9) and (H9N2) diagnosis to the ARI surveillance system.
- Upgraded the CPHL and built capacity in influenza virus detection and diagnosis at sub-national laboratories.
- Improved laboratory confirmation: throat swabs from suspected cases are tested using RT-PCR in CPHL and NAMRU-3.

PREPAREDNESS

The capacity of rapid response teams at the governorate and district levels was upgraded and enhanced through training, case studies, field activities and outbreak response. Influenza and Ebola preparedness plans were designed and disseminated. Support was provided to improve response at the district level through training, provision of supplies, equipment and education, information and communication materials. A bulletin was disseminated on influenza surveillance, notifiable disease surveillance, and international health regulations.

PREPAREDNESS ACTIVITIES

- Upgraded and enhanced the capacity of the designated rapid response team at the governorate and district levels through training case studies and field activities for actual outbreaks.
- Trained senior preventive health staff at the governorate and district levels on tools and skills for monitoring trends and patterns of emerging pathogens among health care personnel.
- Distributed communications materials to raise awareness of MERS-CoV (100,000 brochures; 1,000,000 leaflets; 20,000 posters describing the

case definition and 40,000 posters describing prevention methods).

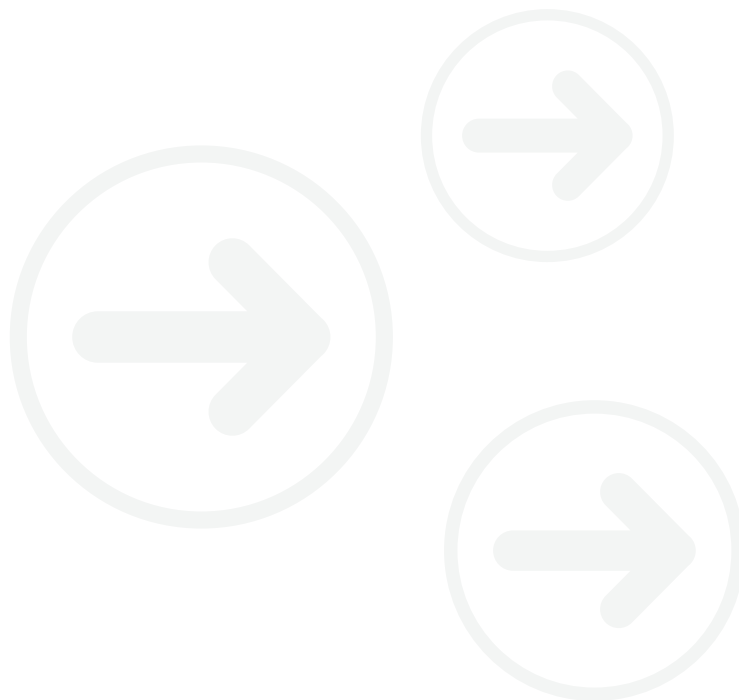
- Procured personal protective equipment (PPE) for Ebola preparedness.
- Established a hotline for responding to public inquiries.
- Conducted two training courses on outbreak investigation, descriptive statistics and analysis, rapid response team staffing, specimen collection and laboratory confirmation, food-borne diseases, and control of infectious diseases for 140 governorate level health staff.
- Conducted 4-way linking, crisis committee and supreme committee regular meetings.
- Conducted rapid risk assessment for influenza in collaboration with the CDC/WHO joint mission.

TRAINING

- Conducted 26 workshops on effective health education messages.
- Conducted 30 workshops on avian influenza surveillance and case management.
- Conducted five workshops on the National Emerging Disease Surveillance System (NEDSS) for directorate and district-level influenza surveillance officers.
- Conducted ten workshops in 21 governorates for directorate and district teams.
- Conducted ten two-day training courses on risk communication for directorate-level attendees.
- Conducted eight training sessions on the early warning system for communicable and emerging diseases.
- Conducted 16 intensive training sessions on influenza surveillance activities in Sharkia.
- Conducted 100 workshops for capacity building of healthcare workers and laboratory technicians at community healthcare facilities.
- Conducted 11 workshops on SARI surveillance for physicians, sanitarians, and laboratory technicians.
- Conducted 20 training sessions for laboratory technicians at the subnational laboratories.
- Conducted three orientation workshops to review the plan of action and update the avian influenza case definition.

INFLUENZA VACCINE ACTIVITIES

There is a well-established influenza vaccination policy which is obligatory for healthcare workers and Hajj/Umra travelers. Vaccines are also available for high-risk groups.



MOROCCO



INH Assessment Meeting with EPI Focal Point and other responsible staff of the regional laboratories (16 regions) in December 2014.

OVERVIEW

Fiscal year 2015 is the fourth year of the U.S. Centers for Disease Control and Prevention's (CDC) cooperative agreement with the National Institute of Hygiene (NIH) which hosts the National Influenza Center (NIC). Morocco's NIC has conducted virological surveillance using a network of volunteer private practitioners from eight large cities since 1996. In 2007, extension of the existing influenza surveillance network began with new sentinel sites opening across the entire country. The cooperative agreement awarded by CDC in 2011 has helped to build capacity for integrated laboratory and epidemiologic surveillance for influenza-like illness (ILI) and severe acute respiratory infections (SARI); has strengthened influenza surveillance; and has enhanced the level of preparedness and response.

SURVEILLANCE

Morocco's MOH uses multiple surveillance systems to characterize the epidemiology of influenza, both for the observation of seasonal influenza trends, and to be prepared in the event of a pandemic. SARI is tracked through a network of eight regional hospitals where syndromic and virologic data are collected. ILI is tracked through a network of 380 health units and a network of 110 private physicians. Eight of the 380 health units collect both syndromic and virologic data.

SURVEILLANCE ACTIVITIES

- Assessed the capacities of the sixteen regions involved in virologic and epidemiologic influenza surveillance.

HIGHLIGHTS

- Updated the manual of integrated epidemiologic and virologic influenza surveillance and included risk factor and denominator data.
- Increased the capacity of eight regional laboratories to perform RT-PCR to detect influenza and other respiratory viruses.
- Completed the vaccine campaign by early January 2015 and 62.5% of doses were successfully administered to target populations.

- Conducted site visits and training on sentinel surveillance at the eight sites selected to conduct ILI and SARI surveillance activities.

LABORATORY

Morocco's virologic influenza surveillance network includes one NIC and eight regional laboratories. The NIC has the capacity to conduct RT-PCR testing for influenza viruses and 15 other respiratory viruses, virus culturing, HAI testing, DFA testing, sequencing and phenotypic analysis of drug susceptibility. The eight regional laboratories are equipped with PCR machines.

LABORATORY ACTIVITIES

- Received ILI samples from both a private physicians' network and from a health unit network; received SARI samples from SARI sites in regional hospitals.
- Tested a total of 794 specimens for influenza viruses.
- Submitted a total of 40 influenza-positive samples to a WHO CC.
- Conducted 16 supervisory visits and provided training and logistical support to laboratories in the influenza surveillance network.

VACCINE POLICY

In 2013, Morocco started actively working towards developing a seasonal influenza vaccine policy as part of a cooperative agreement with the U.S. Centers for Disease Control and Prevention (CDC).

In November 2014, the Moroccan Ministry of Health received a donation of 123,310 doses of seasonal influenza vaccine from the Task Force for

Global Health (TFGH) through the Partnership for Influenza Vaccination Introduction (PIVI) that allowed expansion to the current target populations (health care professionals, health professions students, and pilgrims to the Hajj) to include diabetics and elderly institutionalized persons.

VACCINE POLICY ACTIVITIES

Preparedness activities and accomplishments focused on mobilization strategies following the vaccine donation by TFGH for the 2014–2015 Influenza Vaccination Campaign:

- Developed circulars providing information regarding the availability and administration of influenza vaccine.
- Distributed circulars to target populations and agency heads at all levels (regional, provincial and individual health centers).
- Developed new pamphlets and posters that utilized more culturally relevant images geared towards health profession students.
- Utilized national media (television, radio, and social media) and print media outlets to generate awareness of the campaign and promote acceptability and availability of the vaccine among diabetic NGO members.

- Leveraged existing communication and health education infrastructure with the diabetic NGOs to promote seasonal influenza vaccine and influenza prevention annually. They also participated in World Diabetes Day by incorporating vaccine days into World Diabetes Day events and media announcements.

TRAINING

The Department of Epidemiology at the Ministry of Health and the NIC continue 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 2015, the following trainings were organized in Morocco:

- Sentinel Surveillance for Health Workers (in the selected eight regions).
- RT-PCR for laboratories.

Vaccine Policy

Technical assistance and training was provided to ensure the working group (WG) members responsible for the implementation of the 2014 vaccine campaign



Students waiting outside of a clinic to be vaccinated.

were familiar with qualitative study methodology, especially the focus groups (FG) approach (e.g. FG size, moderator guide, and FG composition).

- Organized one FG working group meeting.
- Organized one teleconference with CDC experts.
- Hosted a CDC expert during their visit.

This training allowed the WGs to follow successive steps for recruiting a national expert (e.g. establishment of the terms of reference, call for application, expert selection, and protocol validation).

INFLUENZA VACCINE ACTIVITIES

Of 123,310 doses of influenza vaccine provided through TFGH donation, 46% were designated for diabetics, 31% for healthcare personnel, 20% for health students and 3% for elderly institutionalized persons.

In the 2014 vaccine campaign, a weekly follow up was conducted to assess how much vaccine was used. Of 83 provinces, 65 returned data to the central level as of March 23, 2015. These provinces indicated they received 110,092 doses and of these, 65,018 (62.5%) were successfully administered. Uptake was highest among diabetics (68.2%), followed by health professionals (54.8%). Uptake among health students varied by type of institution (5.2% for students in faculties and 60.5% for those in institutes) and uptake among elderly was extremely high (98.1%), most likely reflecting easier vaccine delivery to a residential population.

Overall, 12.3% of vaccine was redeployed to maximize use of vaccine, although these data were not consistently recorded by all provinces.



Students being vaccinated during the 2014–2015 Influenza Vaccination Campaign.

PAKISTAN

OVERVIEW

Pakistan has had a cooperative agreement with the U.S. Centers for Disease Control and Prevention (CDC) since 2006 that supports development of state-of-the-art laboratories at designated sentinel sites in Pakistan for rapid confirmation of human and novel influenza viruses. Significant progress has been made despite continuing social and political challenges.

A total of eight sentinel sites are located in the outpatient departments of major provincial tertiary care hospitals, as well as one hospital in the federal capital, Islamabad. Sites were selected on the basis of representative geographic distribution, high population density, and patient turnover rate.

SURVEILLANCE

There was no sentinel site, laboratory-confirmed influenza surveillance prior to the cooperative agreement. Currently, eight sentinel sites are reporting influenza-like illness (ILI)/severe acute respiratory infection (SARI) cases to the National Institute of Health (NIH) with reporting of data to the Ministry of National Health Services, Regulation and Coordination on a regular basis.

SURVEILLANCE ACTIVITIES

- Modified case definitions, standard operating procedures (SOP) for sampling, storage, and sample transportation.
- Supported provincial health departments and high-risk districts for influenza and other respiratory pathogen surveillance including MERS-CoV.
- Designated some NIH staff members to work as resource personnel in practical trainings focused on infection control, use of personal protective equipment, sample collection, and packing and transport for the Pakistan Field Epidemiology & Laboratory Training Program (FELTP) in response to the recent Ebola epidemic in West Africa.

HIGHLIGHTS

- Developed SOPs and protocols for laboratory techniques.
- Strengthened laboratory capacity by completing biosafety enhancements, installing laboratory equipment and training personnel.
- Designated NIH as the national laboratory for viral diagnostics; authorized NIH as the testing laboratory for avian influenza A (H7N9) virus and MERS-CoV.

LABORATORY

LABORATORY ACTIVITIES

- Processed and reported over 14,100 samples with 2,332 (16.5%) positive for an influenza virus since 2007.
- Provided logistical and technical support to all sentinel site influenza laboratories.
- Shared seasonal and pandemic virologic data through online submission to FluNet on a regular basis.
- Initiated indigenous sequencing of isolated influenza viruses with technical support from CDC.
- Submitted influenza virus samples regularly through WHO's Global Influenza Surveillance and Response System (GISRS) to CDC to be included for consideration in annual Northern Hemisphere vaccine recommendations.

TRAINING

Physicians, public health professionals and laboratory personnel have been trained through a program that was conducted throughout Pakistan.

Trainings included Rapid Response Training for Public Health Professionals; Workshop on Biostatistics and Statistical Software (Epi Info and SPSS) for laboratorians, hospital and university researchers; practical training on real-time RT-PCR for surveillance site laboratory personnel and FELTP laboratory staff; bio-risk management course for laboratorians, hospitals and university researchers, and veterinarians; and infectious substances shipping training.



SUSTAINABILITY

The sentinel network established under the cooperative agreement will serve as a model for the development of a Public Health Laboratories Network in the country under the Global Health Security (GHS) Initiative and for International Health Regulations (IHR) implementation.

Infrastructure, trained personnel, and experience from the laboratory-based influenza surveillance initiative will be sustained by expanding the preparedness and detection capacity for other infectious diseases of public health importance such as MERS-CoV, Ebola, Dengue fever, and Crimean-Congo hemorrhagic fever (CCHF).



TUNISIA



Professor Afif Ben Salah giving a presentation on influenza at a meeting.

OVERVIEW

The U.S. Centers for Disease Control and Prevention's (CDC) five-year capacity building cooperative agreement with Institut Pasteur de Tunis (IPT) began in September 2013. The project aims to gradually address all gaps in influenza surveillance in Tunisia, building on the previous strengths of the system. The main objective is to build an appropriate and effective surveillance and control system compliant with international standards of quality and sustainability. Specifically, it aims to conceive and implement an integrated plan for influenza surveillance and control; to develop an information management system (IMS) for the automatic achievement of needed tasks and functions; to develop a training plan for all actors in influenza surveillance and control; to prepare for effective interventions in a sustainable manner; to develop a quality plan to foster good practices; to enhance the preparedness for a potential pandemic; and to develop a communication plan to increase awareness and improve behaviors in order to reduce the risk of transmission.

SURVEILLANCE

Prior to the cooperative agreement influenza surveillance in Tunisia consisted of sentinel surveillance for influenza-like illness (ILI) at 268 (10%) primary health care centers. Severe disease surveillance was limited to identification of viruses by the National Influenza Center (NIC) on request from different intensive care units and pneumology wards across the entire country.

HIGHLIGHTS

- Developed surveillance protocol (data collection forms and procedures).
- Strengthened security for both influenza surveillance staff and patients.
- Trained all personnel involved in the influenza program on the new surveillance application.
- Produced a surveillance manual for influenza.

In 2014, severe acute respiratory infection (SARI) surveillance was formally started and seven SARI sites were established to provide coverage for the country. This system allows the identification of circulating viruses each season. However because thorough clinical and epidemiological data are not recorded for severe cases, these cases are not typically captured by the surveillance system. The burden of disease is estimated using the proportion of all healthcare visits attributable to ILI. This method does not account for severe or fatal infections. Parameters of transmission are not estimated.

Recently, using support from CDC the Ministry of Health implemented an electronic surveillance system to improve the quality and completeness of surveillance data related to acute respiratory infection (ILI and SARI cases related to influenza and other pathogens). This project provides the opportunity to improve surveillance of influenza and other respiratory viruses, including emerging and novel agents, by integrating SARI surveillance and strengthening the capacities of the NIC so that it will evolve into a regional WHO Collaborating Center (CC) (BSL3 laboratory with capacity to culture respiratory viruses).

To improve the influenza surveillance system and to ensure effective preparedness, Tunisia reviewed and produced a new plan for the influenza surveillance network. Tunisia also strengthened sentinel surveillance by establishing seven new SARI sites and 24 ILI collaboration centers, and by updating and standardizing data collection forms for SARI and ILI.

SURVEILLANCE ACTIVITIES

- Established a sampling scheme to ensure the validity of inferences regarding the burden of influenza.

- Conducted training workshops to enhance the skills of health workers in sampling specimens.
- Strengthened the surveillance system with the addition of seven SARI sites in 2014, including one pediatric site.

LABORATORY

Since 1980, the NIC in Tunisia has operated as part of the virology unit of the microbiology laboratory of Charles Nicolle Hospital in Tunis. Samples are collected from the sentinel surveillance network covering the 24 governorates and state or private hospitals and transported to the laboratory for analysis. Since 2008, first-line technology used is the real-time RT-PCR following protocols validated by WHO and CDC. Collaboration with different teams from different world renowned laboratories (WHO CC London, CDC Atlanta, NIC of Madrid) has enabled the laboratory to ensure reliability of results and a mastery of molecular biology techniques applied to surveillance. Influenza virus typing, subtyping, RT-PCR and sequencing are routinely performed. For the 2013–2015 influenza seasons, the quality of biological surveillance was maintained despite the safety challenges within the country.

LABORATORY ACTIVITIES

- Processed and tested 1,706 specimens.
- Participated in WHO's External Quality Assessment Project (EQAP) with a score of 100%.
- Detected 347 influenza viruses: 102 were influenza A(H3N2); 119 were influenza A (H1N1) pdm09; and 126 were influenza B.
- Conducted trainings on nasopharyngeal sampling to improve the quality of samples and standardize procedures.

TRAINING

A training plan was developed to provide required technical assistance to the team to efficiently and effectively manage the project according to international standards.

Between 2014 and 2015, the following trainings and meetings were organized in Tunisia:

- Conducted two steering committee meetings.
- Designated representatives from the SARI centers and ILI sites to participate in two meetings to develop an interaction plan linking SARI and ILI structures to the NIC and DSSB, as well as linking in other entities dealing with surveillance in Tunisia.
- Conducted two training workshops (one in the North and the other in Central Tunisia) for 94 health staff involved in sentinel surveillance.
- Designated representatives from seven SARI centers to participate in a workshop on biosafety and management of biological risks.

INFLUENZA VACCINE ACTIVITIES

Received 270,000 doses of influenza vaccine for the 2014–2015 season from the Directorate of Basic Health Care (DSSB).

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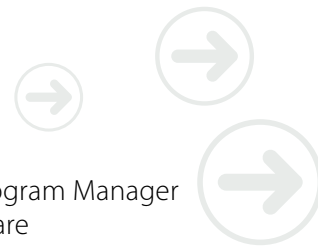
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WHO European Region [EUR]





WHO European Region [EUR]

Currently, there are seven bilateral influenza cooperative agreements that support influenza activity in the European Region. These cooperative agreements are with ministries of health or other institutions that work with the U.S. Centers for Disease Control and Prevention (CDC) to build capacity in order to routinely identify, diagnose and respond to seasonal and pandemic influenza.

Direct country support through non-research cooperative agreements is established in the following seven countries/entities:

- Armenia
- Georgia
- Kyrgyzstan
- Moldova
- Russian Federation
- SECID: The Southeast European Center for Surveillance and Control of Infectious Diseases—(Priority countries—Albania, Bosnia and Herzegovina, Kosovo,* Macedonia, and Montenegro)
- Ukraine

In addition, CDC supports the World Health Organization (WHO) Regional Office for Europe via a cooperative agreement to provide technical and coordination support to Member States.

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 influenza-like illness (ILI) and severe acute respiratory infections (SARI), which includes making routine contributions to WHO's Global Influenza Surveillance and Response System (GISRS) and implementing International Health Regulations 2005 (IHR).
- To develop and train local rapid response and containment teams.

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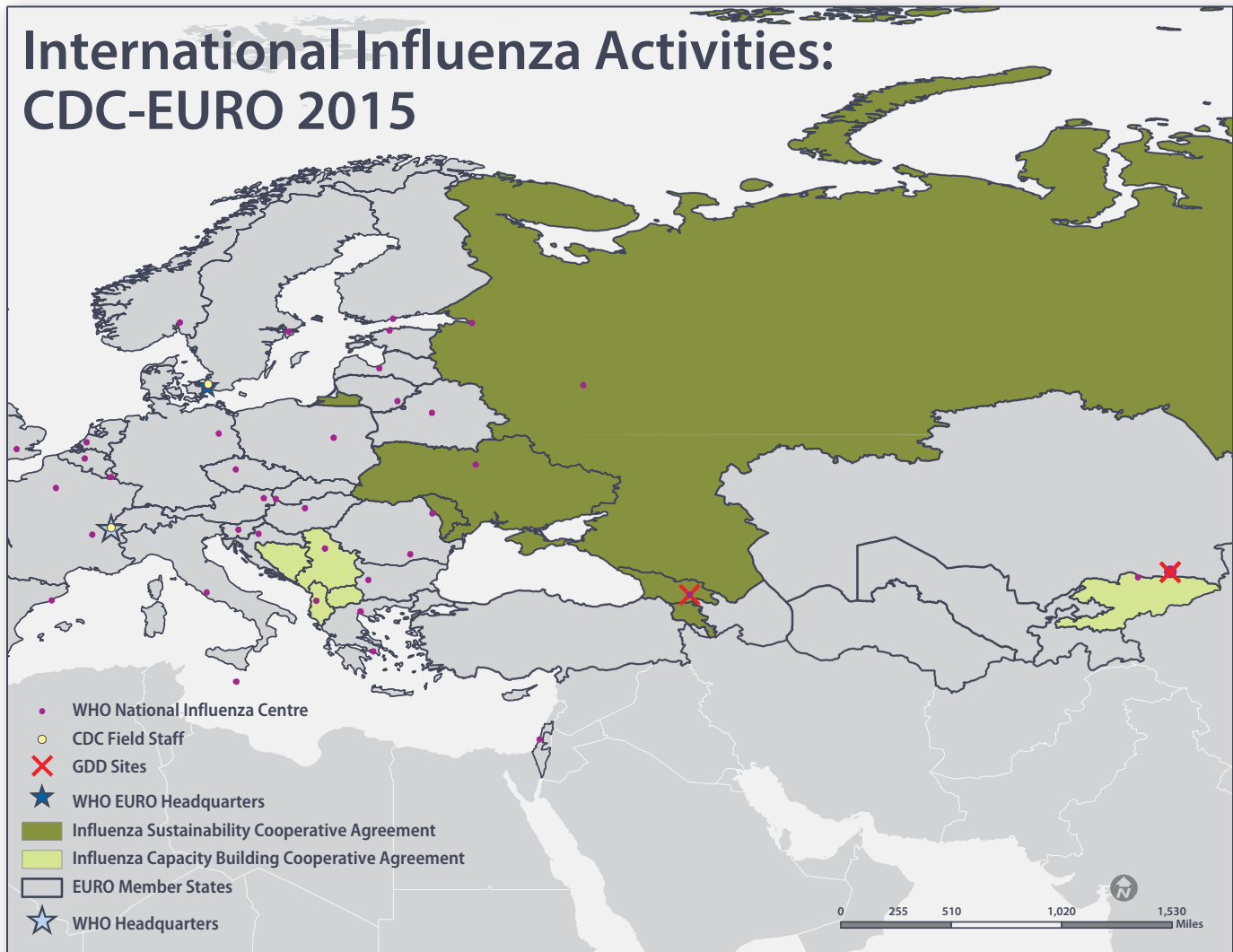
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**This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.*

WHO Regional Office for Europe [EURO]



HIGHLIGHTS

- Launched the new joint WHO/Europe and European Centre for Disease Prevention and Control (ECDC) influenza surveillance platform and bulletin, *Flu News Europe*, for 53 countries in October 2014.
- Held the Fourth Joint WHO Regional Office for Europe/ECDC Meeting on Influenza Surveillance (2014).
- Organized a Flu Awareness Campaign in October 2014 with a focus on increasing uptake of seasonal influenza vaccine in high risk groups.
- Deployed two Influenza and Respiratory Pathogens Program (IRP) staff to Sierra Leone and one to Liberia to support the response to Ebola.
- Published 11 articles in international, peer-reviewed journals, including a multicountry SARI risk factor study.
- Updated and translated into Russian the WHO Regional Office for Europe Influenza website.

U.S. CDC DIRECT SUPPORT

The WHO Regional Office for Europe (WHO/Europe) in Copenhagen, Denmark, serves 53 Member States with a population exceeding 900,000 million. Influenza activities are conducted by the Influenza and Other Respiratory Pathogens Programme (IRP).

The second five-year cooperative agreement (CoAg) began in September 2011 and entered its fourth year in October 2014. In addition to financial support, since 2009 a CDC-seconded senior epidemiologist has strengthened IRP. CoAg activities are grouped around the following technical areas: surveillance and laboratory; seasonal influenza vaccine; burden of disease; pandemic preparedness and early warning; and communication and advocacy. IRP also collaborates with CDC staff on the development of trainings (e.g. data management training) and tools (e.g. influenza surveillance assessment tool).

Coordinating influenza surveillance and providing support to countries in the WHO European Region is a major activity of the CoAg. Until October 2014, IRP ran the regional influenza surveillance platform and published the weekly surveillance bulletin, EuroFlu, in English and Russian.

WHO/Europe also continues to provide training and technical assistance to member states to strengthen influenza surveillance. In addition, WHO/Europe supports National Influenza Centres (NIC) throughout the region by providing external quality assessment (EQA) programs, and by supporting virus strain characterization, and sharing of influenza viruses within the Global Influenza Surveillance and Response System (GISRS).

SURVEILLANCE

The WHO Regional Office for Europe strives to strengthen epidemiological and virological components of sentinel surveillance for influenza, including outpatient surveillance for influenza-like illness (ILI) and acute respiratory infection (ARI), and hospital-based surveillance for severe acute respiratory infections (SARI). The activities in this area include collecting, analyzing and publishing in Flu News Europe weekly surveillance data from 50 countries; developing capacity to use surveillance data to estimate the burden of influenza to prioritize national influenza vaccination programmes; increasing uptake of seasonal influenza vaccine; and supporting activities at the national level aimed at implementing

International Health Regulations core capacities for early warning and response. Countries of the Newly Independent States, where sentinel surveillance has recently been established, and selected countries of South-Eastern Europe (SEE) continued to be the main focus of the work at the country level from 2013 to 2015.

SURVEILLANCE ACTIVITIES

- Continued development of epidemic thresholds for SARI surveillance based on the Moving Epidemic Method.
- Supported strengthening of influenza surveillance in the region, including assistance to SEE countries through a CoAg with CDC.
- Expanded the Flu Awareness Campaign, a multimedia event, with six member states participating in the 2014–2015 season.
- Developed tools to support reviewing, monitoring and strengthening national surveillance systems, including an electronic surveillance assessment tool and a feasibility tool for select SARI sentinel sites.
- Enhanced disease surveillance for severe influenza in the region, with 15 countries routinely conducting SARI surveillance by 2015.
- Conducted inter-country meetings and missions to three countries to support calculation of estimates of clinical and economic influenza burden.
- Continued the development of guidelines to increase influenza vaccine uptake in targeted populations (i.e. pregnant women and health care workers) based on the Tailoring Immunization Programmes for Influenza.

LABORATORY

In the European Region, 41 (77%) of 53 countries with influenza surveillance have a National Influenza Centre (NIC) recognized by WHO. Through the CoAg, NICs in the WHO European Region receive training in influenza laboratory techniques, support to improve laboratory quality, assistance with shipment of viruses to WHO Collaborating Centres for reference and research on influenza, and reagents for influenza testing. A total of 44 (83%) countries in the WHO European Region share influenza viruses with GISRS, and 16 (30%) monitor and report weekly data on antiviral susceptibility to WHO.



Laboratory technician during a simulation exercise at the National Influenza Laboratory, National Virology Centre, National Centre for Public Health, Ministry of Health, Republic of Moldova.

LABORATORY ACTIVITIES

- Increased the number of laboratories in the region participating in the WHO External Quality Assurance Programme from 34 in 29 countries in 2007 to 63 in 48 countries in 2014.
- Provided support for 28 countries to ship viruses and clinical specimens to the WHO CC in time for the WHO Consultation on the Composition of Influenza Virus Vaccines (VCM) for the Northern Hemisphere 2015–2016 influenza season. Of these, 16 countries used the WHO Shipment Fund Project.
- Provided three national trainings on shipping infectious substances; participants were 60 specialists from national, regional, and sub-regional levels and reference laboratories in Tajikistan, Turkmenistan, and Uzbekistan.
- Conducted a training course for 17 virologists from the European Region on laboratory preparedness for emerging respiratory pathogens.

- Organized and held the training “Introduction to Laboratory Quality Management and the Laboratory Quality Stepwise Implementation (LQSI) tool” for all SEE countries and for all Newly Independent States (NIS).
- Organized the WHO course “Strengthening capacities of influenza laboratory experts” for NICs.

PREPAREDNESS

In the period from October 1, 2013 to September 30, 2015 several outbreaks highlighted the continued importance of pandemic preparedness. The main events during the last two years have been the ongoing outbreak of Middle East respiratory syndrome coronavirus (MERS-CoV) in the Arabian Peninsula, which exported cases to the WHO European Region; human cases of avian influenza A(H7N9) virus infection in China, a country which borders the WHO European Region; a substantial rise in the number of human cases of avian influenza A(H5N1) virus infection in Egypt; and the largest ever outbreak of Ebola virus in Western Africa, including a number of cases imported to Europe.

These outbreaks with their complexities and challenges emphasized the need for WHO and its member states to continue to strengthen core capacities of the International Health Regulations and pandemic preparedness

PREPAREDNESS ACTIVITIES

- Held critical care training for a total of 140 intensive care clinicians in five countries.
- Held a workshop on outbreak response to avian influenza A(H7N9) virus infections and other emerging pathogens in three countries (Kyrgyzstan, Tajikistan, and Turkmenistan).
- Held a Joint ECDC and WHO/Europe Consultation on pandemic and all hazard preparedness in November 2013.
- Switzerland and Germany published a revised pandemic preparedness plan, which brings the total to eight countries having published revised pandemic preparedness plans since the 2009 pandemic.
- Reorganized the WHO/Europe web site on pandemic influenza and translated it into Russian.
- Conducted laboratory preparedness surveys for avian influenza A(H7N9) virus and MERS-CoV.

- Provided technical assistance in the European Region and West Africa during outbreaks caused by MERS-CoV, avian influenza virus, and Ebola virus.
- Conducted a workshop on outbreak investigation and response for South-eastern European countries in collaboration with the South East European Center of Infectious Diseases Surveillance and Control (SECID) in July 2015.

TRAINING

- Conducted a joint ECDC and WHO/Europe consultation on pandemic and all-hazard preparedness in Slovakia (November 2013).
- Conducted Data Management Training for South East European (SEE) Countries in collaboration with CDC in Greece (April 2014).
- Conducted the 4th joint WHO/Europe–ECDC Annual European Influenza Surveillance Meeting in Austria (June 2014).
- Conducted a training on defining disease burden and decision-making for seasonal influenza vaccination for eight countries in Georgia (August 2014).
- Developed the Introduction to Laboratory Quality Management and the Laboratory Quality Stepwise Implementation (LQSI) tool for SEE and NIS, (November 2014/April 2015).
- Conducted a laboratory preparedness training course in the Netherlands (November 2014).
- Conducted a course for NICs on development and validation of PCR assays in the Russian Federation (May 2015).
- Conducted a workshop to estimate disease burden for seasonal influenza for four countries from SEE in Denmark (July 2015).

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ARMENIA



A photo taken during the 2014–2015 National Awareness Campaign in Kotayq marz.

OVERVIEW

In 2006, the State Hygiene and Anti-Epidemic Inspectorate (SHA EI) of the Ministry of Health (MOH) in Armenia began a cooperative agreement with the U.S. Centers for Disease Control and Prevention (CDC) to develop and enhance influenza surveillance and laboratory capacity. Since 2010, Armenia has conducted surveillance for both influenza-like illness (ILI) and severe acute respiratory infection (SARI) in the cities of Yerevan, Kapan (Syunik marz) and Vanadzor (Lori marz) and the sentinel surveillance system now includes a fully functioning PCR laboratory in each city. With a focus on avian and human influenza, Armenia's epidemiological surveillance capacity has been enhanced since the beginning of the partnership with CDC.

SURVEILLANCE

The influenza sentinel system in Armenia is integrated into the general epidemiological surveillance system of infectious diseases. ILI sentinel surveillance includes six polyclinics: two sites in Yerevan, and one site each in Vanadzor, Kapan, ljevan, and Nairi. SARI sentinel surveillance includes 11 hospitals: seven in Yerevan, and one each in Vanadzor, Kapan, ljevan and Nairi. The sentinel sites include one pediatric (Yerevan), one maternity (Yerevan), two

HIGHLIGHTS

- Established new ILI and SARI sentinel sites in the cities of ljevan (Tavush region), near the busiest border crossing area in the country, and in Nairi (Kotayq region), where the main poultry trade centers are located.
- Organized and executed an influenza awareness campaign, including printed and Internet ads, articles, TV and radio public announcements, and national special events throughout the influenza season.
- Submitted influenza samples to the WHO CC in London annually; 40 samples submitted from the 2013–2014 season.

adult (Yerevan) and seven general (Yerevan, Vanadzor and Kapan) hospitals. Each hospital has doctors in key departments designated as surveillance doctors.

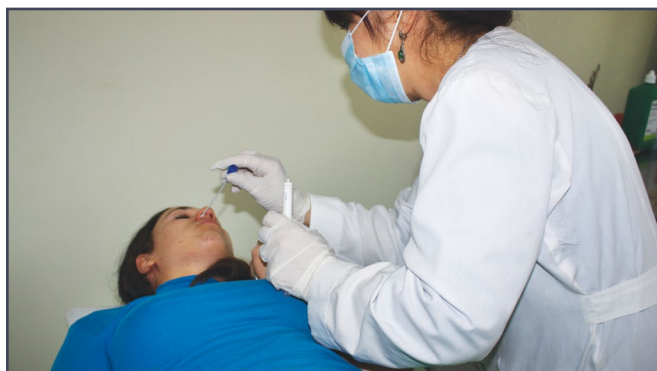
SURVEILLANCE ACTIVITIES

- Conducted supervisory visits at sentinel surveillance sites in Yerevan, Vanadzor (Lori marz), Kapan (Syunik marz), ljevan (Tavush marz) and Nairi (Kotayq marz).
- Established an internet connection for all organizations participating in sentinel surveillance and the sanitary-quarantine border posts (approximately 35 different sites).

LABORATORY

During 2014 and 2015, the National Reference Virology Laboratory at CDC/Yerevan underwent significant renovations, with the virology laboratory relocated to a different part of the building and refurbished with a new design and equipment. Renovations are expected to be complete in 2016. The laboratory is continuing preparatory work to introduce influenza virus isolation and typing using current World Health Organization (WHO) reagents and techniques. After implementing virus isolation, the laboratory aims to begin the process of formal recognition as a National Influenza Laboratory in Armenia.

GEORGIA



A clinician taking a sample at an ILI sentinel site in Georgia.

OVERVIEW

The partnership between the National Center for Disease Control and Public Health of Georgia (NCDC) and the U.S. Centers for Disease Control and Prevention (CDC) began in 2006. Fiscal year 2015 is the fourth year of NCDC's second cooperative agreement with CDC, with an implementation period from 2011–2016. The purpose of the agreement is to improve laboratory, epidemiological and preparedness capacity for surveillance and response to avian and pandemic influenza.

SURVEILLANCE

Sentinel surveillance of severe acute respiratory influenza (SARI) was first established in Georgia in 2007, with an influenza-like illness (ILI) sentinel site established in Tbilisi in 2009. During fiscal years 2014 and 2015, NCDC continued to make improvements and enhancements to the influenza sentinel surveillance system in the country. NCDC specialists developed a template for regional and district public health centers for reporting and monitoring the weekly trends of ILI incidence and SARI admission rates in their respective regions. In addition, new modules for ILI and SARI data collection were added to the Electronic Integrated Disease Surveillance System (EIDSS), the system for collecting and reporting data on notifiable diseases and especially dangerous pathogens in Georgia.

Georgia continued to submit influenza surveillance data to the World Health Organization (WHO) on a weekly basis and in the 2014–2015 season began submitting to the European Surveillance System (TESSy) that replaced EuroFlu.

HIGHLIGHTS

- Established an influenza sentinel surveillance system throughout the country.
- Developed and implemented quality assurance measures in the laboratory and at surveillance sites.
- Enhanced the influenza surveillance system by conducting annual monitoring visits and trainings of epidemiologists and clinicians in influenza epidemiology and surveillance.

SURVEILLANCE ACTIVITIES

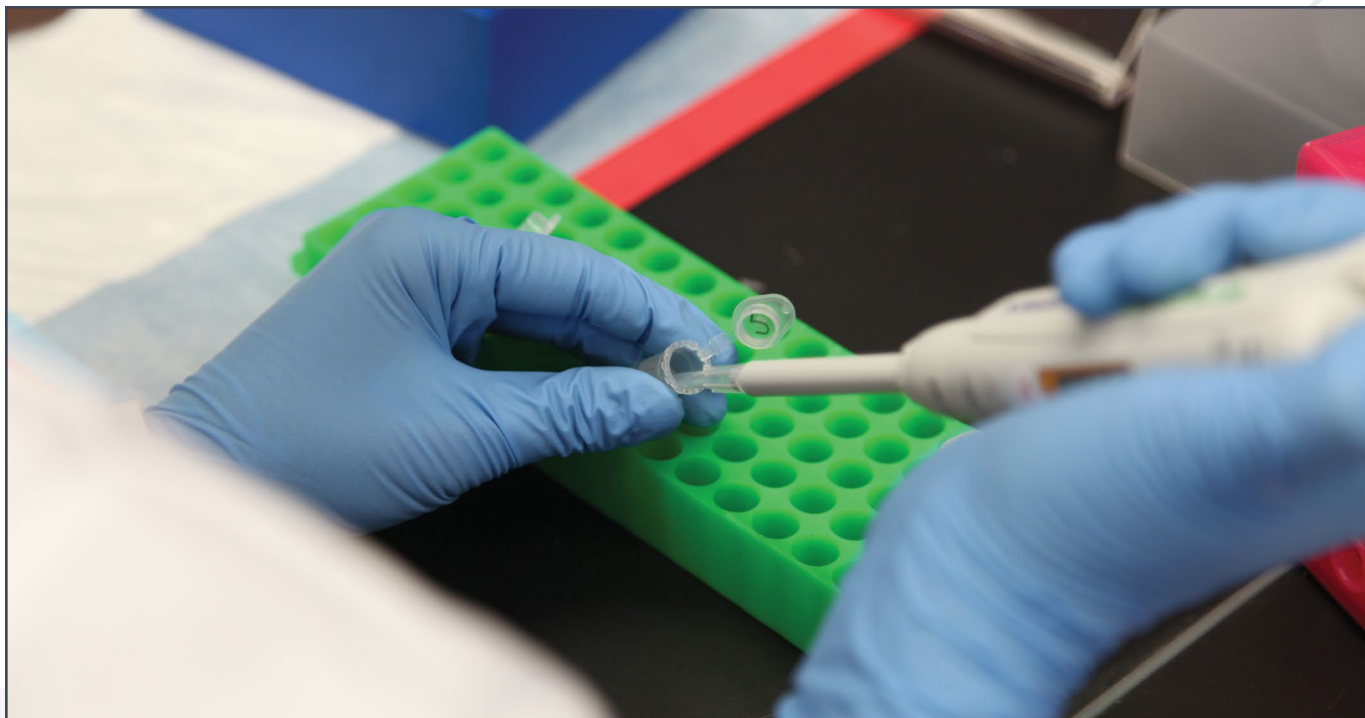
- Conducted a review of the influenza sentinel surveillance system in December 2014 in collaboration with CDC and the Council of State and Territorial Epidemiologists (CSTE).

LABORATORY

The National Influenza Laboratory (NIL) was established at NCDC in 2006 and was recognized as a National Influenza Center (NIC) by WHO in 2007. In 2013, the entire NCDC laboratory was relocated to the NCDC/Richard Lugar Center for Public Health Research, a brand new facility built with funds from the U.S. Defense Threat Reduction Agency (DTRA). In 2014, the NIL was re-designated as a NIC by WHO at the new location at the Lugar Center. During the past nine years of collaboration with CDC, laboratory capacity has been strengthened through staff training on RT-PCR testing, virus isolation, hemagglutination inhibition, and the procurement of essential equipment and supplies.

LABORATORY ACTIVITIES

- Conducted an assessment of the NIC laboratory in collaboration with the Association of Public Health Laboratories (APHL) and CDC using the International Influenza Laboratory Capacity Review Tool.
- Procured necessary reagents and supplies during the 2013–2014 and 2014–2015 seasons.
- Participated in WHO's External Quality Assessment Project (EQAP) in 2014 and 2015 with high marks.
- Confirmed and reported nine fatal infections due to influenza A (H1N1)pdm09 virus infection and



A laboratory technician processing a sample at the Lugar Center.

one due to influenza B during the 2014–2015 season. The age of fatal cases ranged from one to 64 years; eight cases (80%) were in the 30–64 year age group.

- Tested 1,114 specimens for influenza viruses during the 2014–2015 influenza season; 32 were positive for influenza A (H1N1)pdm09 virus, six for influenza A (H3N2) and 185 for influenza B.
- Submitted 20 samples from the 2014–2015 influenza season to the WHO Collaborating Center (CC) in London for virus isolation, sequencing and resistance screening.

PREPAREDNESS

A draft of a national preparedness plan was developed in 2006, and approved by the Ministry of Health (MOH) in 2009. This plan was activated during the 2009 influenza pandemic with great success.

INFLUENZA VACCINE ACTIVITIES

As a result of the national preparedness plan, for the first time in Georgia, high-risk groups were identified and vaccinated with seasonal influenza vaccine, and immunization awareness campaigns were organized for the general population and regional public health center specialists. Eight thousand doses of vaccine were purchased with government funds and administered to high-risk groups, with 500 doses of vaccine used for vaccinating NIC personnel, sentinel site staff, and epidemiologists involved in the ILI and SARI surveillance systems. Additionally, 2,000 doses of vaccine were purchased by the Global Fund project for vaccinating HIV-infected individuals.

KYRGYSTAN



Nurses at the National Clinical Infectious Disease Hospital in Bishkek demonstrating the influenza specimen collection process during a site visit by national staff and CDC.

OVERVIEW

Beginning in 2008, Kyrgyzstan began conducting sentinel surveillance for influenza-like illness (ILI) and severe acute respiratory infection (SARI) in the cities of Bishkek and Osh. The cooperative agreement with the U.S. Centers for Disease Control and Prevention (CDC), which began in 2013, has strengthened the sentinel surveillance system in Kyrgyzstan and continues to help build capacity and improve the country's preparedness to respond to a pandemic.

SURVEILLANCE

SARI sentinel surveillance was first established in Kyrgyzstan in 2008 and currently there are four SARI sentinel sites, with two hospitals in Bishkek and two hospitals in Osh. ILI surveillance was established in 2009, with three ILI sentinel sites in outpatient clinics, one in Bishkek and two in Osh. During the 2014–2015 season, an additional ILI site was established in Tokmok.

SURVEILLANCE ACTIVITIES

- Connected 39 SSES centers to the internet for reporting.
- Developed epidemic threshold for seven provinces and two cities to help assess and

HIGHLIGHTS

- Trained 115 doctors, epidemiologists, and directors of the state sanitary and epidemiological surveillance (SSES) centers on influenza monitoring, assessment, analysis, and recognition of outbreaks of influenza.
- Expanded sentinel surveillance with the addition of an ILI site at the Family Medicine Center Number One in Tokmok.
- Provided the national and regional virology laboratories with reagents and supplies.

predict the epidemiological influenza situation and detect outbreaks of influenza.

- Conducted an evaluation and comparison of the routine and sentinel surveillance systems for influenza (analysis of the timeliness, accuracy, and sensitivity of the different surveillance systems).
- Conducted supervisory visits to sentinel sites in Osh, Tokmak, and Bishkek.
- Conducted training for virologists from the National Virological Center in the virology laboratories in the Kara-Suu and Issyk-Ata districts.
- Established new reporting forms for receiving annual reports from sentinel sites.
- Participated in a review of the influenza sentinel surveillance system in June 2014 in collaboration with CDC in order to identify strengths and opportunities for improving the system.

LABORATORY

The National Influenza Laboratory in Bishkek was established in 2002, and is situated within the Centre of Molecular-Genetic and Microbiological Investigations. The laboratory was designated by the World Health Organization (WHO) as a National Influenza Center (NIC) in 2007. Four laboratories in the Republic are involved in the influenza surveillance network: (1) National Virology Laboratory, Center of Microbiological and Molecular Genetic Studies, Ministry of Health, (2) the Virology Laboratory at the Center of State Sanitary and Epidemiological Supervision of Bishkek; (3) the PCR laboratory at the Issyk-Ata Republican Center of Psychological Health

and State Epidemiological Surveillance; and (4) the Virology Laboratory at the Kara-Suu Republican Center of Psychological Health and State Epidemiological Surveillance.

LABORATORY ACTIVITIES

- Participated in WHO's External Quality Assessment Project (EQAP) and received a score of 100% on the last panel.
- Tested 613 samples, of which 97 (15.8%) were positive for an influenza virus: 38 were influenza A (H3N2) virus, 12 were influenza A (H1N1)pdm09, and 47 were influenza B.
- Participated in a laboratory assessment in collaboration with CDC in order to identify strengths and opportunities in the laboratory.
- Trained laboratory assistants at the regional laboratories on RT-PCR and influenza virus isolation methods.

PREPAREDNESS

- Support from CDC has significantly advanced the level of influenza pandemic preparedness and planning. The Department of Disease Prevention and Sanitary Inspection, in conjunction with the Ministry of Health, has begun to develop an operational plan for the health sector in the event of an outbreak of influenza.

PREPAREDNESS ACTIVITIES

- Organized a round table for leaders of SSES centers to build capacity and help strengthen influenza surveillance at the local level.
- Designed and printed pamphlets, checklists for parents, posters, and informational sheets on the main symptoms and tips on prevention to help raise awareness and educate the population of Kyrgyzstan about influenza (24,000 pcs).
- Planned exercises to enhance pandemic preparedness with the concerned departments and ministries.
- Purchased 343 suits with N-95 masks and glasses which were issued to nine regional centers of the Department of Disease Prevention and Sanitary Inspection.

TRAINING

- Provided a workshop for 21 health care workers and laboratory staff on biosafety, storage, and transport of samples.
- Provided training for nine laboratory experts on the laboratory diagnosis of influenza viruses in Bishkek, Osh, and Chui regions.
- Provided training for doctors and epidemiologists at the regional and municipality levels on monitoring, analyzing, and identifying influenza outbreaks.

INFLUENZA VACCINE ACTIVITIES

A training was organized to prepare doctors and epidemiologists to formulate the number of at-risk groups (i.e. children and patients with heart disease, lung disorders, diabetes, obesity, health workers) in supervised areas.

In the event of an influenza outbreak, it is important to understand the number of people at risk that need vaccination. In the near future, a study of the economic impact of influenza will be carried out, with results of the study to be taken into account during the planning and administration phases of future vaccination campaigns against influenza.

REPUBLIC OF MOLDOVA



Room for influenza virus isolation on cell cultures (Room No. 8).

OVERVIEW

Since 2009, the U.S. Centers of Disease Control and Prevention (CDC) has worked with the Ministry of Health (MoH), National Center of Public Health of the Republic of Moldova (NCPH) to build capacity for pandemic preparedness, communication, surveillance, monitoring, early response, and infection control. Fiscal year 2015 is the second year of CDC's sustainability cooperative agreement with NCPH. The purpose of the award is to improve laboratory, epidemiological, and preparedness capacity for surveillance and response to pandemic influenza.

SURVEILLANCE

During the reporting period, nine sentinel sites collected samples and sent them to the National Influenza Laboratory (NIL), with approximately 40–60 samples sent weekly. Weekly influenza surveillance data are collected and submitted electronically to the World Health Organization (WHO), and in the 2014–2015 season Moldova began submitting data through the newly established system, The European Surveillance System (TESSy), which replaced EuroFlu. The NCPH website (www.cnspl.md) is also updated on a regular basis throughout the year.

Software allowing for electronic transmission of influenza surveillance data from the sentinel sites to NCPH continued to be used and enhanced and all new medical staff at sentinel sites were trained on how to use the software. A working group updated the national definitions and main indicators for each new influenza

HIGHLIGHTS

- Improved the influenza sentinel surveillance system by strengthening hospital, polyclinic, and laboratory surveillance for ILI, ARI, and SARI.
- Developed and implemented quality assurance measures—including External Quality Assurance Programs—at the NIC and at the nine surveillance sites.
- Improved the influenza surveillance system by conducting workshops and trainings on influenza epidemiology, surveillance, and laboratory diagnosis.

season and input the data into the EuroFlu website (through the 2013–2014 season) and TESSy website (starting in the 2014–2015 season).

SURVEILLANCE ACTIVITIES

- Continued to monitor sentinel sites regularly and provide all necessary assistance and supplies for transportation of collected specimens.
- Prepared and disseminated surveillance reports on a weekly basis among healthcare professionals and stakeholders.
- Developed a new MoH order to incorporate sentinel surveillance (ILI, ARI, and SARI) into the Electronic Integrated Disease Surveillance System (EIDSS) that was approved.
- Strengthened surveillance capacity by training 60 people on influenza surveillance, outbreak investigation and response, and disease control activities.

LABORATORY

The NIL was recognized as a National Influenza Center (NIC) by WHO in 2013. All specimens collected from the nine sentinel sites are tested weekly at the NIC. A well-functioning system with a well-maintained cold chain is in place to transport specimens to the NIC in a timely manner. Specimens are all collected at the beginning of the week to ensure they arrive at the NIC by Thursday for testing and are not refrigerated for more than three days. The NIC provides RT-PCR testing for influenza viruses including detection, typing

and subtyping. The NIC sent influenza samples for confirmation to the WHO Collaborating Centre (CC) in London, UK in 2014 and 2015.

LABORATORY ACTIVITIES

- Confirmed 21 deaths due to an influenza virus: one child and 20 adults, including two pregnant women during the 2014–2015 season.
- Tested 685 specimens for influenza viruses from October 2014 to September 2015: 108 were positive for influenza A (H1N1)pdm09 virus, 10 for influenza A (H3N2), and 110 for influenza B.
- Submitted 129 samples during the 2014–2015 season to the WHO CC in London for virus isolation, sequencing, and resistance screening.
- Participated in External Quality Assessment Project (EQAP) by the WHO CC London, WHO CC Hong Kong, and WHO CC Atlanta.
- Designated specialists to attend training with the WHO CC in London (October 2013) and the WHO CC in Atlanta (March 2015).
- Participated in a laboratory assessment using the International Influenza Laboratory Capacity Review Tool, in collaboration with APHL and CDC.

PREPAREDNESS

The European Centre for Disease Prevention and Control (ECDC) and WHO missions conducted in 2014 assessed the national core capabilities for communicable diseases, including pandemic influenza preparedness and response. Recommendations included the following: ensure that the decision-making structure incorporates information from a multisectoral group; work towards standard operational procedures for decision making; prioritize the funding allocated to the plan for the highest priority issues; and work towards sustainable funding. Due to new and reemerging global health threats, a more strategic and more coherent approach to global health preparedness is needed. The Republic of Moldova is in the process of revising the National Pandemic Plan in accordance with the International Health Regulation (2005).

PREPAREDNESS ACTIVITIES

- Assessed preparedness for public health emergencies at the national and territorial levels.
- Continued discussions with stakeholders regarding the improvement of the National Pandemic Plan.

TRAINING

- Identified two specialists to attend training on techniques and research on isolation, growth, and characterization of influenza viruses at the National Institute for Medical Research in London, UK (October 2013).
- Identified two specialists to attend the CSTE/CDC Influenza Data Management and Epidemiological Analysis Course in Athens, Greece (April 2014).
- Identified one specialist to attend the CDC/APHL International Advanced Influenza Real-time RT-PCR Workshop in Atlanta, Georgia (March 2015).

INFLUENZA VACCINE ACTIVITIES

As a part of the National Preparedness Plan, high-risk groups were identified and vaccinated with seasonal influenza vaccines. Immunization awareness campaigns aimed at the general population and regional public health center specialists were organized. With government funds, 150,000 doses of vaccines were purchased and administered to high-risk groups, NIC personnel, sentinel site staff, and epidemiologists involved in the ILI, ARI and SARI surveillance system.

RUSSIAN FEDERATION



Anastasiya Vasileva, scientist participating in development of immune reagents for identification of potentially pandemic viruses.

OVERVIEW

The sustainability cooperative agreement between the Centers for Disease Control and Prevention (CDC) and the Russian Federation began in 2011. The Research Institute of Influenza (RII) in St. Petersburg and the D.I. Ivanovsky Research Institute of Virology (IIV) in Moscow are recognized by the World Health Organization (WHO) as National Influenza Centers (NIC).

SURVEILLANCE

During fiscal years 2013 and 2014, RII enhanced and improved both routine and sentinel influenza surveillance systems that collect, analyze and report epidemiologic and laboratory data from 59 Regional Based Laboratories (RBL), collaborating with the two NICs. Both NICs, in Moscow and St. Petersburg, increased the number of influenza viruses isolated during the 2013–2014 and 2014–2015 influenza seasons. Antigenic, genetic, and phylogenetic analysis of influenza viruses circulating in Russia was expanded, including determination of their susceptibility to antivirals. Sentinel surveillance for severe acute respiratory infection (SARI) and influenza-like illness/acute respiratory illness (ILI/ARI) was improved, allowing for identification of the main risk groups, and the most commonly circulating influenza or other respiratory viruses. Data were presented on a weekly basis to the Ministry of Healthcare of Russia (MoH), Rospotrebnadzor, as well as the RBLs through weekly

HIGHLIGHTS

- Developed new software for the electronic submission, storage, and analysis of influenza surveillance data.
- Expanded PCR diagnosis to detect seven other respiratory viruses, in addition to influenza viruses.
- Transported virus isolates to WHO CCs (Atlanta and London) in a timely manner for 2012–2013 and 2014–2015 seasons.
- Increased capacity to recognize avian influenza viruses A(H9N2), A(H7N9), and A(H2N2) through monoclonal antibody testing and rRT-PCR testing.

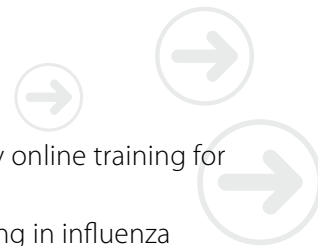
surveillance reports and website summaries. Data on influenza activity in Russia was also reported on a regular basis to GISRS, WHO EURO's new electronic system, The European Surveillance System (TESSy), and WHO Collaborating Centers (CC).

SURVEILLANCE ACTIVITIES

- Enhanced the epidemiologic capacity and infrastructure for disease surveillance, including the development of quantitative criteria to determine the epidemic start and geographic spread of influenza for separate cities, federal districts, and the country.
- Developed a written sustainability plan and included a draft in the Order of Ministry of Healthcare and Rospotrebnadzor.
- Obtained results from the first national disease burden estimates.

LABORATORY

The laboratory surveillance network in Russia currently includes 55 RBLs. Influenza virus isolation is conducted in 31 laboratories. Antigenic and genetic analysis of viruses circulating in Russia is conducted on a regular basis, including determination of susceptibility to antivirals. The etiology of SARI and ILI/ARI cases reported from sentinel sites varies depending on the geography of the site and seasonal patterns. Influenza viruses were detected more often among SARI patients and other respiratory viruses more often in ILI/ARI patients.



LABORATORY ACTIVITIES

- Deposited 348 viruses in the “Collections of Viruses” located at both NICs.
- Published the article, “Influenza surveillance in Russia based on epidemiological and laboratory data, 2005–2012” in the American Journal of Infectious Diseases.

PREPAREDNESS

The draft Pandemic Preparedness Plan for Russia (PR) was refined and updated, with the completed version set to be submitted to the MoH in September 2015. The capacity to identify novel influenza A viruses of H2, H5, H7, and H9 subtypes as potential pandemic agents was increased by preparing rRT-PCR reagent kits and developing immunological methods for identification of potential novel pandemic influenza A viruses (PPIV).

A local rapid-response and containment team (LRT) was assembled to monitor outbreaks and clusters of severe respiratory illness that could indicate the emergence of a new pandemic virus.

PREPAREDNESS ACTIVITIES

- Developed new laboratory tests including rRT-PCR and immunological methods to be used for investigation of clinical samples from SARI patients and autopsy materials.
- Generated hybridomas producing monoclonal antibodies for influenza H2, H5, H7, and H9 virus subtypes.
- Inactivated influenza H2, H5, H7, and H9 virus subtypes for inclusion in an EQC panel designated as PCR control in RBLs participating in sentinel surveillance.

TRAINING

The following activities were completed:

- Presented six reports (two included data on pandemic preparedness) at the workshop of “Rospotrebnadzor”.
- Conducted consultations with both NICs and RBLs virologists.

The following activities and trainings were carried out in collaboration with WHO EURO:

- Developed guidance on data input in GISRS through TESSy in Russian for NICs in East European countries.

- Conducted a two-day TESSy online training for NIC specialists.
- Conducted a five-day training in influenza virology at RII with virologists from NICs in East European countries.
- Selected six NIC specialists to attend training courses in Netherlands, Greece, Turkey, and Denmark.

INFLUENZA VACCINE ACTIVITIES

The main groups at risk for influenza-associated SARI, including pregnant women and patients with chronic lung and cardiovascular disease, were identified through the sentinel surveillance system. Recommendations to introduce seasonal influenza vaccination to the identified target groups will be completed.

Ascertainment of vaccination status among influenza patients was also added to the sentinel surveillance system. The percent of patients vaccinated among hospitalized SARI patient with an influenza virus was lower than among SARI patients with a non-influenza etiology.

Low vaccination coverage was identified in hospitalized SARI patients with RT-PCR-confirmed influenza virus, with much higher vaccination rates among ILI/ARI patients with a confirmed influenza virus infection, indirectly suggesting that there may be a protective role of vaccination in preventing the development of severe influenza. Preliminary data on the economic burden of influenza were also obtained.



Nadezhda Konovalova, PhD, a leading scientist in influenza virus isolation and antigenic characterization, training students from Eastern European countries on influenza virology.



Workshop on ILI Surveillance in Bosnia and Herzegovina.

OVERVIEW

The South East European Center for Infectious Diseases Surveillance and Control (SECID) was established in 2013 at the Institute of Public Health in Tirana, Albania to support Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Montenegro, Romania, Serbia, and Kosovo,* in the field of surveillance and control of infectious diseases, including influenza and International Health Regulations (IHR) implementation. Within this network Albania, Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo* have been identified as priority countries. With the exception of Albania, the priority countries do not yet have National Influenza Centers (NIC).

SURVEILLANCE

The influenza surveillance review guidance for sentinel influenza surveillance from the WHO Regional Office for Europe and CDC's international influenza assessment tool were used to assess the influenza surveillance systems in all SEE countries. Influenza workshops were organized in each country and surveillance assessments were organized in priority countries to decide about sentinel sites and population to be covered for ILI/ARI and SARI surveillance. Activities carried out in each of the priority countries included preparing influenza sentinel surveillance guidelines, identifying ILI and SARI sentinel sites, conducting workshops with

HIGHLIGHTS

- Improved identification and diagnosis of influenza cases in Albania, Bulgaria, Croatia, Bosnia and Herzegovina, Macedonia, Montenegro, Serbia and Kosovo.*
- Completed influenza surveillance assessments in all SEE countries.
- Prepared influenza surveillance guidelines and training packages for all SEE countries.
- Established SARI sentinel surveillance in Montenegro, Macedonia, Bosnia and Herzegovina, and Kosovo* and also strengthened SARI surveillance in Albania, Croatia, and Serbia.
- Established ILI sentinel surveillance in Montenegro, Macedonia, Bosnia and Herzegovina and Kosovo* and improved ILI surveillance in Albania, Bulgaria, Croatia, and Serbia.
- Purchased equipment and began training for influenza virus isolation in laboratories in Macedonia, Montenegro, Bosnia and Herzegovina, and Kosovo.*
- Revised pandemic preparedness plan in Romania and Croatia.
- Established joint protocols and activities for human and animal influenza surveillance in Bulgaria and Croatia.
- Prepared and piloted a web-based platform for reporting ILI/ARI and SARI Surveillance data in Albania, Macedonia and Croatia.

sentinel sites, testing guidelines with sentinel sites, establishing influenza surveillance coordinators in each sentinel site, as well as training on sample collection. SECID's information technology (IT) team also developed a template and a web-based system for ILI and SARI reporting.

SURVEILLANCE ACTIVITIES

- Translated the WHO/Europe guidance for sentinel influenza surveillance and CDC's international influenza assessment tool into each country language to be used for the assessments.
- Organized influenza assessment workshops in every country.

- Prepared influenza surveillance guidelines for each country.
- Prepared SARI surveillance protocols for Bosnia and Herzegovina, Bulgaria, Macedonia, Montenegro, and Kosovo.*
- Prepared ILI surveillance protocols for Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*
- Updated ILI and SARI surveillance protocols in Albania, Croatia, Serbia, and Romania.
- Developed training packages for ILI and SARI surveillance in Albania, Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*
- Conducted field assessments of influenza surveillance in Albania, Bosnia and Herzegovina, Macedonia, Montenegro and Kosovo.*
- Identified ILI and SARI sentinel sites and trained staff in Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*
- Identified and revised ILI and SARI sentinel sites in Albania and Croatia.
- Provided sentinel sites with all necessary sample collection and transportation materials.
- Albania, Croatia, Bulgaria, Romania, and Serbia submitted virological and epidemiological data electronically to The European Surveillance System (TESSy) on weekly basis.
- Prepared and disseminated surveillance reports to healthcare professionals at sentinel sites in Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Montenegro, Romania, Serbia, and Kosovo.*
- Monitored sentinel sites in each country.
- Organized visits for influenza surveillance coordinators between the following countries: Serbia and Macedonia visited Romania; Kosovo* visited Slovenia; and Montenegro and Bosnia and Herzegovina visited Serbia.
- Prepared template in SEEFflu, a web-based influenza information system.

LABORATORY

Albania, Bulgaria, Croatia, Romania, and Serbia all have NICs, while Bosnia and Herzegovina, Macedonia, Montenegro and Kosovo* have national influenza laboratories, but do not have NICs. All activities are aimed to strengthen the capacities of influenza diagnosis (RT-PCR) in influenza laboratories

across the region and to start establishing capacities for influenza virus isolation in Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*

Essential kits and some equipment on RT-PCR testing were procured for all countries and training on RT-PCR testing was provided in all countries. A self-assessment influenza laboratory diagnosis and quality assurance tool developed by WHO was translated and used by all countries and the results were provided to SECID, WHO, and CDC. Laboratory SOPs for influenza diagnosis by RT-PCR were prepared in all countries and, based on that and NIC requirements, country plans were developed and essential equipment for virus isolation was procured for Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*

LABORATORY ACTIVITIES

- Translated and used WHO's Influenza laboratory self-assessment tool in all countries.
- Developed and implemented laboratory SOPs for RT-PCR in all countries.
- Developed plans for obtaining NIC recognition in Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*
- Developed sample collection and transportation SOPs in Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*
- Translated WHO Biosafety guidelines for use in Albania, Macedonia, Montenegro, Bosnia and Herzegovina, Serbia, Kosovo,* and Bulgaria.
- Improved influenza diagnostics in all countries, with a 35% improvement in Albania.
- Organized training visits for influenza laboratory specialists from Serbia and Macedonia to visit Romania; and Kosovo* to visit Slovenia.
- Influenza laboratory specialists from Macedonia and Kosovo* participated in a training at CDC.
- Procured and distributed RT-PCR essential kits according to the needs of all the countries.
- Procured essential equipment for virus isolation for Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*

PREPAREDNESS

Pandemic preparedness plans are in place in all SEE countries and they were used during the 2009 influenza pandemic. All countries have also adopted legislation to allow for implementation of pandemic plans and have performed training and established

structures to coordinate pandemic preparedness and response. Discussion around revising and updating preparedness plans was started in all countries during influenza assessment workshops. Romania and Croatia started the process of evaluating the existing framework for preparedness and terms of reference and began revision of pandemic preparedness plans. Joint human and animal workshops were also organized to discuss integrated surveillance and pandemic preparedness.

PREPAREDNESS ACTIVITIES

- Organized an influenza pandemic preparedness planning workshop in Croatia and Romania.
- Organized animal and human surveillance workshops in Albania, Bulgaria, Croatia, Macedonia, Montenegro, Romania, Serbia, and Kosovo.*
- Established joint protocols and activities for and human and animal influenza surveillance in Bulgaria and Croatia.

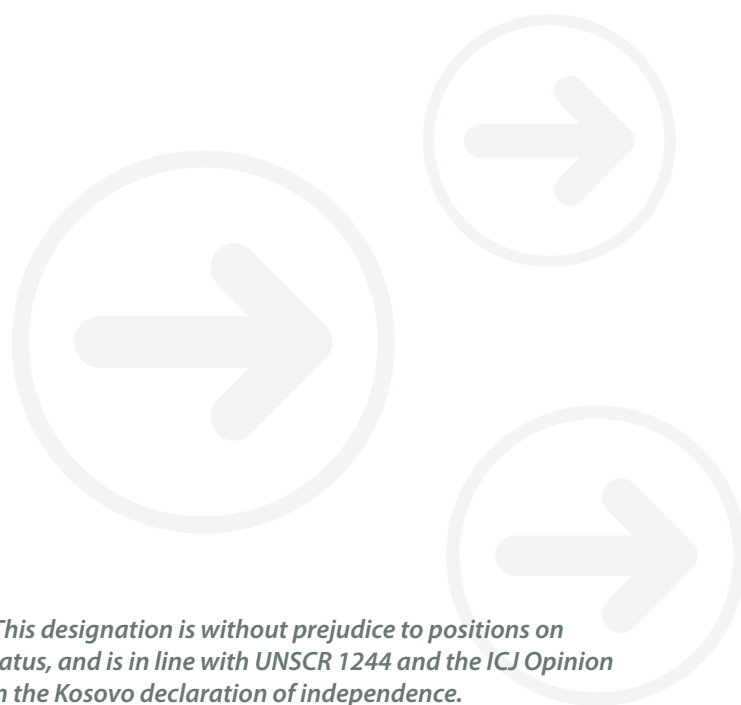
TRAINING

- Trained approximately 400 health care workers from ILI and SARI sites.
- Trained and retrained all ILI site health care workers in Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*
- Trained and retrained all SARI site health care workers in Bosnia and Herzegovina, Macedonia, Montenegro, and Kosovo.*
- Retrained all SARI and ILI sentinel sites in Albania, Bulgaria, Croatia, Romania and Serbia.

INFLUENZA VACCINE ACTIVITIES

Influenza vaccination is not mandatory for any group of people in SEE countries, although a certain number of people from high risk groups are covered by health insurance and vaccinated free of charge. At this time there are no data to evaluate the impact of vaccination policies or burden of disease.

However, Albania participated in a workshop organized by WHO EURO to evaluate the burden of disease and impact of vaccination policies. Albania also introduced for the first time a national program and guidelines to vaccinate health workers where a national coverage of 70% was achieved.



**This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.*

UKRAINE

OVERVIEW

Fiscal year 2015 is the fifth year of the U.S. Centers for Disease Control and Prevention's (CDC) sustainability cooperative agreement with L.V. Gromashevsky Institute of Epidemiology and Infectious Diseases National Academy of Medical Science of Ukraine. This cooperative agreement is the continuation of the previous five-year agreement between CDC and PATH to strengthen influenza and pandemic preparedness in Ukraine.

SURVEILLANCE

During the 2014–2015 influenza season, 271 influenza viruses were isolated with 50 isolates submitted to CDC and 50 to the WHO Collaborating Center (CC) in London. The percentage of influenza positive samples obtained from the ILI and SARI surveillance sites in the four sentinel centers varied from 7% to 58%.

SURVEILLANCE ACTIVITIES

- Developed a new logistics plan for transporting samples between sentinel sites and the National Influenza Center (NIC) on dry ice.
- Performed supervisory visits to influenza sentinel sites in Odessa and Khmelnytsky.
- Organized training for all participants of sentinel surveillance.
- Carried out quality SARI surveillance and established that there was a high correlation between the number of SARI cases and the percent of influenza-positive samples.
- Prepared an additional draft order aimed at improving surveillance. This order is under consideration in the Ministry of Health.

LABORATORY

Funding from CDC continued to support the NIC in Kyiv and four regional virology laboratories in the sentinel sites with equipment, reagents, consumables and other items to maintain optimal functionality of the laboratories. These laboratories can perform RT-PCR and virus isolation on cell culture. Samples from Ukraine are routinely submitted to the WHO CC Atlanta and the WHO CC London.

HIGHLIGHTS

- Submitted isolates twice each season to a WHO CC to support the Vaccine Strain Selection Meeting for the Northern Hemisphere.
- Published a weekly influenza bulletin in both English and Ukrainian on the site www.ukrinfluenza.com.ua.
- Trained two laboratorians on laboratory methods at the WHO CC in London.
- Organized trainings for clinicians and sanitary-epidemiological service personnel.

LABORATORY ACTIVITIES

- Trained sentinel site virologists in influenza virus isolation and identification, and RT-PCR assay.
- Tested 1,225 samples from ILI and SARI patients by PCR, with 25.5 % positive for an influenza virus.
- Supported the NIC in Kyiv and four regional virology laboratories with consumables.
- Continued participation in WHO GISRS, including submitting 110 positive samples from the 2013–2014 and 2014–2015 seasons to the WHO CC in Atlanta.
- Conducted three supervisory site visits to three sentinel sites.
- Improved the material and technical equipment of virology laboratories (equipment and test-systems) and trained personnel to strengthen pandemic preparedness.

PREPAREDNESS

- Developed new recommendations for the national healthcare system in the event of accidental importation of avian influenza A (H5N1) and (H7N9) viruses from endemic regions.
- Made several improvements to the National Guidelines for Health Services of Ukraine which include planning and organizing measures to combat pandemic influenza.

TRAINING

The NIC continued to provide technical assistance and training to ensure continued operation and improvements of the sentinel surveillance system, quality of the surveillance data, timely data analysis, and integration of preparedness and response activities.

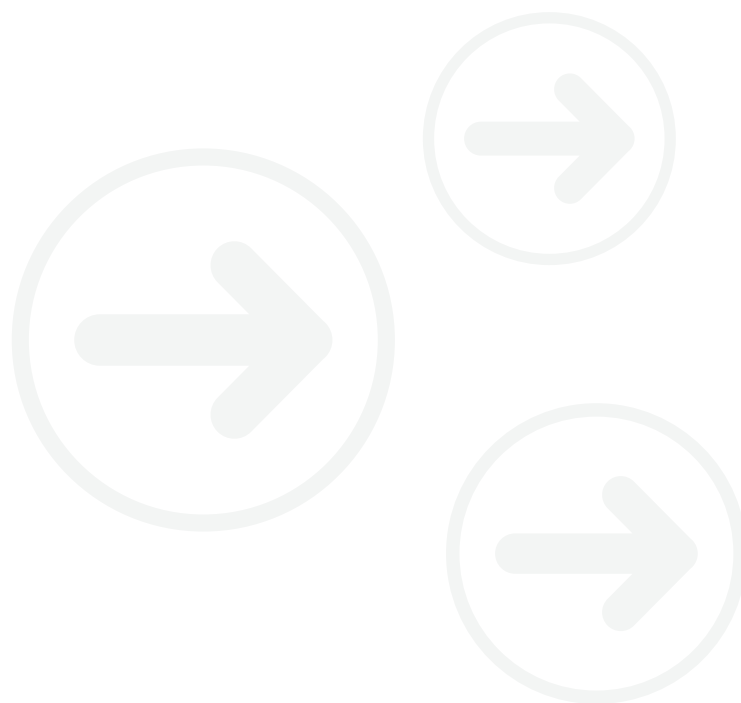
From 2013–2015 the following trainings were organized in Ukraine:

- **Sentinel Surveillance**—Trained 50 health care workers from clinics involved in surveillance.
- **Virus Isolation/Cell Culture**—Trained virologists from Odessa, Kharkiv, Dnipropetrovsk, Khmelnytsky, Ternopil, and Zhitomyr.

A researcher from the Gromashevsky Institute, attended the Advanced Influenza Real Time RT-PCR Workshop in March 2015 at CDC Atlanta.

INFLUENZA VACCINE ACTIVITIES

Every year the Institute develops an influenza forecast and recommendations for the next influenza epidemic season. Recommendations include a brief description of registered influenza vaccines available in Ukraine and high risk groups that should be vaccinated first. The forecast and recommendations, are sent from the MOH to all regions of the country.





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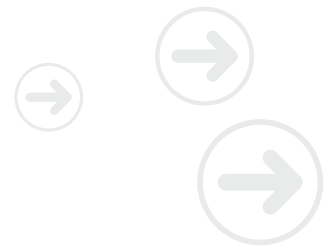
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Region of the Americas [AMR]



WHO Region of the Americas [AMR]

As of fiscal year 2014, there are four bilateral influenza cooperative agreements in the WHO Region of the Americas. These agreements with ministries of health (MOH) or institutions designated by the MOHs work with the Pan American Health Organization (PAHO)/the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC) to build capacity to routinely identify and respond to seasonal and novel influenza strains across the Americas.

Direct country support through non-research cooperative agreements is established in the following four countries:

- Brazil
- Mexico
- Paraguay
- Peru

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

The core activities of the 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 the International Health Regulations 2005 (IHR).
- To make routine contributions of surveillance and virology data to WHO's Global Influenza Surveillance and Response System (GISRS).
- To increase the geographic reach of WHO GISRS.
- To provide earlier access to critical virus isolates from humans and birds for WHO GISRS.
- To increase the numbers of shipments and influenza isolates provided by local influenza laboratories for analysis by WHO Collaborating Centers (CC).
- To develop sustainable epidemiologic and virologic surveillance systems for severe influenza in order to gain an understanding of the disease and economic burden caused by influenza and other respiratory viruses.
- To develop and sustain interagency national preparedness plans.
- To develop and train local rapid response and containment teams.
- 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 addition to our bilateral work, we also partner with the U.S. 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]



HIGHLIGHTS

- Launched SARI-net (<http://www.sarinet.org/>), the regional influenza network, in May 2014.
- Conducted the second annual SARI-net Meeting in April 2015.
- Established regional estimates of influenza disease burden, in depth analyses of seasonality, and improved data sharing and dissemination through SARI-net collaborations.
- Conducted SARI-net technical webinars and disseminated quarterly newsletters.
- Continued to implement the PAHO SARI Surveillance Protocol in more than 90 hospitals in 20 countries.
- Developed an information system, PAHOFlu that generates automated outputs of case-based, integrated laboratory and epidemiologic data. Two Member States are using PAHOFlu and several others are using their own systems.
- Conducted site visits to improve surveillance capacity in Colombia and Nicaragua. Future visits are planned for Chile, Costa Rica, Ecuador, Honduras, Paraguay, and Suriname.
- Provided technical assistance on strengthening laboratory diagnostic capacity in Colombia, Ecuador, and Nicaragua.
- Purchased laboratory equipment, reagents and supplies for many countries in the region.

U.S. CDC DIRECT SUPPORT

The current five-year cooperative agreement, Surveillance and Response to Seasonal and Pandemic Influenza by Regional Offices of the World Health Organization (WHO), began in September 2011 and is now in its fourth year. The Pan American Health Organization (PAHO) is the WHO Regional Office for the Americas and is located in Washington, DC, USA. The Office serves 35 Member States, four Associate Members, and three Participating States.

In 2014–2015, technical cooperation activities centered on influenza and pandemic influenza preparedness through strengthening three pillars; epidemiology, laboratory, and analyses to estimate influenza disease burden.

In 2015–2016, PAHO will focus on supporting epidemiologic and laboratory capacity in the countries and developing influenza burden of disease estimates. Technical cooperation in strengthening epidemiologic capacity will include training in severe acute respiratory infections (SARI) surveillance and developing data-sharing bridges.

Laboratory activities will include support for immunofluorescence and real-time RT-PCR, including the detection of other respiratory viruses and building the laboratory networks, including the National Influenza Center (NIC) network and participation in WHO External Quality Assessment Project (EQAP) and CDC proficiency panel.

SURVEILLANCE

During the 2009 influenza pandemic, surveillance for severe respiratory disease became increasingly important. This was because cases in a hospital setting are easier to capture, are smaller in number than the milder ambulatory cases, and during a pandemic, information about severe cases is of paramount importance for making decisions about response. SARI-net, a network of PAHO/AMR Member States that conduct SARI surveillance, was created in 2014. Since then, countries in the Americas have been eager to improve their SARI surveillance, and today 15 (43%) countries in PAHO are reporting data through WHO's Fluid platform.

SURVEILLANCE ACTIVITIES

- Shared weekly epidemiologic and laboratory data through SARI-net (20 countries).

- Conducted an updated training course on event surveillance for unusual respiratory illness and developed surveillance guidance for influenza-like illness (ILI).
- Trained more than 20 healthcare workers (HCW) in Colombia and Nicaragua, with plans to train HCWs in Costa Rica, Honduras, Paraguay and Suriname.
- Published an analysis of influenza-associated mortality in the region in a peer-reviewed journal.

LABORATORY

Considering the challenges faced during the pandemic, technical cooperation was directed to increase the capacity in the laboratory to process specimens for real-time RT-PCR, through the purchase of automated extractors and vacuum extractors. 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 WHO's EQAP. Through these activities, PAHO continued to strengthen the regional laboratory network, which now consists of 27 NICs in Latin America and the Caribbean.

LABORATORY ACTIVITIES

- Worked with regional laboratories to strengthen the diagnostic capabilities for influenza and other respiratory viruses, through the provision of supplies, equipment purchases, and training.
- Submitted over 700 samples from Latin America and the Caribbean to the WHO CC in Atlanta for characterization.
- Participated in the 2014 WHO EQAP (32 NICs and laboratories from the Region).
- Shared virologic data for influenza and other respiratory viruses with PAHO (20 countries).
- Conducted laboratory evaluations using the CDC/APHL laboratory tool.

PREPAREDNESS

During the response to the Ebola virus disease (EVD) outbreak in West Africa, PAHO activated the emergency operation center (EOC) in Washington D.C. to coordinate preparedness activities in the region and provide support in the deployment of rapid response teams (RRT) to West Africa. The EOC serves

as the point of contact for communication between technical areas and MOHs. PAHO continues to support all countries in creating situation rooms and EOCs to centralize data and coordinate preparedness activities. In the context of the EVD response, PAHO had the opportunity to evaluate preparedness for the spread of Emerging Infectious Diseases (EIDs) and the status of Member States' core capacities under the International Health Regulations (IHR).

PREPAREDNESS ACTIVITIES

- Visited 25 countries for EVD preparedness assessments (November 2014 to January 2015). Country missions helped to detect gaps and provided an opportunity to prioritize essential public health functions.
- Enhanced a regional stockpile of personal protective equipment (PPE) for potential use in emergencies in the region at the PAHO warehouse in Panama.

TRAINING

- Conducted national, sub regional, and regional trainings on risk communication, clinical management and laboratory biosafety in the context of the EVD preparedness activities.

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OVERVIEW

Since 2011, the Ministry of Health (MoH) has been developing activities to strengthen influenza surveillance in order to understand the epidemiology of circulating viruses. Brazil, a large country with different climatic regions, experiences variation in influenza seasonality and outbreaks both temporally and geographically. In each of the 27 states of the Brazilian Federation there is an epidemiological team and a Central Laboratory from the State Secretariat of Health. The national influenza surveillance network has 146 Sentinel Units for influenza-like illness (ILI) surveillance, and 132 Intensive Care Units for severe acute respiratory infection (SARI). The number of sentinel units varies by state. Data collected are included in national databases: Sivep-Gripe for ILI and SINAN for sentinel surveillance and SARI surveillance. The laboratories process the clinical material and test for respiratory viruses by immunofluorescence (IFAT) assays using a commercial kit (RSV, adenoviruses, parainfluenza virus 1-3, influenza A and B viruses). Central laboratories in 16 states also perform influenza virus detection by real-time RT-PCR using CDC primers and probes. The results are added to databases and analyzed by the state epidemiological teams and the MoH.

HIGHLIGHTS

- Published the treatment protocol for suspected cases of influenza.
- Conducted an annual influenza vaccination campaign and included new priority groups for influenza vaccination.
- Conducted an influenza vaccine effectiveness study in Brazil.
- Conducted online courses for clinical treatment and surveillance of influenza.

SURVEILLANCE

Influenza surveillance in Brazil consists of both sentinel surveillance for ILI and SARI in intensive care unit inpatients and universal surveillance for SARI.

Sentinel surveillance is based on a network of health units distributed in all geographic regions of the country and the principal objective is to identify the circulating respiratory viruses in order to provide data to support the seasonal influenza vaccine composition recommendations. In addition, the surveillance system allows tracking of health system needs due to these respiratory viruses.

Currently the country has 76 municipalities with sentinel sites for influenza (ILI and SARI), and 278 SARI sites. The universal SARI surveillance monitors the hospitalizations and deaths due to influenza and helps with understanding the epidemiology of influenza in the country and guides decision-making in the Ministry of Health and the States and Municipal Health Secretariats. Data are collected through standardized forms and entered in the electronic health surveillance systems: Sivep-Gripe and SINAN Influenza Web for timely analysis.

SURVEILLANCE ACTIVITIES

- Conducted a workshop to update the treatment protocol for suspected cases of influenza.
- Developed surveillance guidelines and contingency plans for influenza.
- Conducted regional meetings and supervisory visits.
- Provides weekly technical reports.

LABORATORY

The network of the National Influenza Center (NIC) laboratories in Brazil, has three central laboratories: Evandro Chagas Institute (IEC) in Belém/Pará State; Adolfo Lutz Institute (IAL), in Sao Paulo and the Oswaldo Cruz Foundation (FIOCRUZ), in Rio de Janeiro which is also a National Reference laboratory for the MoH. In addition the NICs have 27 laboratories, in federal units and each NIC directs a number of laboratories for monitoring and supervision. The samples (nasopharyngeal aspirates or combined swabs) are collected at sentinel units and hospitals and a nationally standardized form is used to assess clinical and epidemiological information.

Data are included in National Databases—Sivep-Gripe and SINAN for sentinel surveillance and universal surveillance, respectively. The laboratories process the clinical material and test for respiratory viruses in IFAT assays using commercial kits. Central Laboratories in 16 states also perform influenza detection by real Time RT-PCR using CDC primers and probes.

LABORATORY ACTIVITIES

- Tested 36,134 samples in 2013 and 18,488 in 2014 in the SARI universal surveillance system.
- Conducted a training course on Influenza Virus Phylogenetic Studies.
- Conducted training for the analysis of antiviral resistance testing (FIOCRUZ).
- Tested 16,856 samples in 2013 and 20,638 in 2014, in the sentinel surveillance system.
- Expanded and modernized laboratories and enhanced capacity.

PREPAREDNESS

The MOH of Brazil has a Contingency Plan for Influenza which was developed after the 2009 influenza pandemic. The plan is updated as needed and WHO information on the circulation of animal influenza around the world is included. All recommendations of the plan follow the guidelines of the U.S. CDC and WHO. Currently this plan is being updated and will be available on Brazil's website.

PREPAREDNESS ACTIVITIES

- Conducted training for leaders of Federal Units of Brazil on the Contingency Plan Matrix.
- Conducted regional training seminars for the development of the Influenza Contingency Plan and plans for other diseases.
- Conducted meetings with the Ministry of Agriculture for discussion and actions regarding avian influenza.
- Developed an inter-ministerial technical group for pandemic preparedness planning.
- Worked with the Ministry of Agriculture to develop a plan to monitor influenza viruses in migratory birds.

TRAINING

- Conducted training for ILI and SARI (ICU) sentinel surveillance and universal surveillance for SARI.
- Conducted trainings and a meeting on the burden of disease for influenza.
- Training for Contingency Plan Development for Influenza.
- Conducted training for Sivep-Gripe and SINAN web sites.
- Conducted training on influenza data analysis.

INFLUENZA VACCINE ACTIVITIES

In Brazil between 1999 and 2010, vaccination with seasonal influenza was available only for the elderly and some high risk groups. The evaluation of coverage was available only for the elderly group. The evaluation of coverage highlights that in 1999 the vaccination only included those 65 years of age and older.

In the elderly, over the period from 1999 to 2014, the vaccination coverage was high, between 64.78% (2000) to 87.9% (2013). The number of doses administered rose from 7.5 million (1999) to 18 million doses (2014) because of the growth of the elderly population.

Beginning in 2011, influenza vaccine coverage expanded to new groups with a significant increase in the amount of administered doses. In 2013, more than 35 million doses of seasonal influenza have been administered to the eligible groups. As with the vaccination of the elderly, vaccination coverage in these eligible groups remained above the set target



of 80% coverage, except for pregnant women and indigenous peoples where coverage remains less than optimal.

RESEARCH

In partnership with the Brazilian Ministry of Health and state health departments, CDC provides technical assistance to generate data for the design of influenza prevention and control strategies in the country. Ongoing projects evaluate the impact of influenza vaccination, burden of influenza disease, pandemic preparedness, and influenza vaccine effectiveness.

Primary activities include:

- Assessing the impact of seasonal influenza vaccination among persons 60 years and older on rates of influenza-associated mortality and hospitalization from 1994 to 2009, in São Paulo State, Brazil.
- Documenting the reemergence of influenza A (H1N1pdm09) virus in 2013, São Paulo, Brazil.

Additionally, Brazil is part of a multi-country evaluation of seasonal influenza vaccine effectiveness among high risk groups targeted for vaccination, a PAHO-sponsored initiative through REVELAC-i (Network for Evaluation of Influenza Vaccine Effectiveness).

CENTRAL AMERICA & PANAMA (CDC-CAP)



Guatemala MOH and COMISCA epidemiologists evaluate influenza surveillance performance in the San Juan de Dios Hospital in Guatemala City, 2014.

OVERVIEW

Influenza program activities of the U.S. Centers for Disease Control and Prevention's (CDC) Regional Office for Central America provide support to eight countries: Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama and the Dominican Republic. The focus is to strengthen capacity to respond to pandemic influenza and to prevent and control seasonal influenza. This includes improving influenza surveillance and laboratory capabilities, promoting the development of local pandemic plans, supporting targeted research projects, and building the evidence base for decisions on influenza vaccine program expansion.

SURVEILLANCE

Based on results of an exhaustive evaluation of influenza sentinel surveillance, some countries in the region have been updating their national guidelines to implement the new influenza surveillance standards developed by the World Health Organization (WHO). The main strategy to optimize the surveillance system is focused first on reducing the number of sentinel sites. This reduction in sites will focus resources, allowing for increasing the number and percentage of respiratory samples from severe acute respiratory infection (SARI) cases, and decreasing bias.

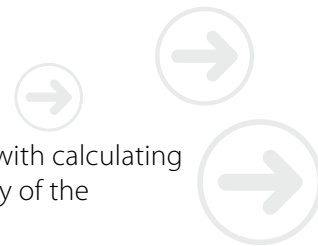
HIGHLIGHTS

- Strengthened surveillance for influenza and other respiratory viruses, laboratory capabilities, and pandemic influenza preparedness in Central American countries.
- Improved the abilities of the MOH surveillance laboratories to identify and characterize circulating influenza viruses and other respiratory viruses.
- Conducted an inventory of core capabilities to respond to an influenza pandemic in all eight Central American countries.
- Achieved significant changes to influenza vaccine policy in countries that receive technical support from CDC.

Surveillance activities will be further strengthened by continuous training, updating standardized procedures, and implementing an essential indicators-based monitoring plan. All activities are being coordinated with PAHO and Ministries of Health.

SURVEILLANCE ACTIVITIES

- Conducted standardized evaluations of influenza surveillance systems in each country by the Council of Ministers of Health of Central America (COMISCA) and PAHO experts.
- Developed a tool to assist the Ministry of Health (MOH) in right-sizing influenza surveillance systems.
- Provided technical assistance to local experts and epidemiologists in order to update national guidelines for influenza surveillance according to new WHO influenza surveillance standards.
- Revised and updated standardized operating procedures (SOP) for surveillance in some countries.
- Provided support for the national dissemination of updated guidelines in Honduras by assisting with preparation of content and printing posters.



LABORATORY

Public health institutions in Central America have continued to improve laboratory-based surveillance for respiratory viruses. These gains have involved establishing numerous laboratories and sentinel sites to process clinical specimens. Currently, there are six National Influenza Centers (NIC), two National Influenza Reference Laboratories and sixteen decentralized influenza laboratories in the region. These efforts have resulted in expanded diagnostic capabilities and improved data quality.

These laboratories now process approximately 20,000 respiratory samples per year. Personnel at the NICs have also updated algorithms, standard operating procedures and biosafety guidelines. Some countries in the region have developed or updated laboratory contingency plans. The support provided by CDC's Central America Regional Office (CDC-CAR) has improved the abilities of the MOH surveillance laboratories to identify and characterize the viruses that cause influenza and other acute respiratory infections. Seven laboratories are registered with CDC's Influenza Reagent Resource (IRR) and receive reagents and control materials for molecular methods and also cell lines.

LABORATORY ACTIVITIES

- Provided assistance to laboratories in the region to switch from serology-based surveillance to molecular methods.
- Conducted standardized evaluations of influenza laboratory capabilities in each country by TEPHINET and PAHO experts with the CDC/APHL review tool.
- Provided technical assistance to the NIC and decentralized influenza laboratories to update algorithms, SOPs, biosafety guidelines, and contingency plans.
- Strengthened electronic laboratory information systems.
- Participated in WHO's External Quality Assessment Project (EQAP)—six NICs and two National Influenza Reference Laboratories.
- Processed approximately 20,000 respiratory samples yearly (all influenza laboratories combined).

- Assisted the Honduras NIC with calculating the sensitivity and specificity of the immunofluorescence assay.
- Participated in ongoing discussions on the possibility of creating a regional reference laboratory and establishing an external quality control program on the immunofluorescence assay in the region.
- Provided technical assistance to improve quality of cell culture, influenza virus isolation, and selection of isolates and specimens.

PREPAREDNESS

All countries in the Central American region already have received recommendations to strengthen their Pandemic Influenza Preparedness (PIP) plans based on the results from a core capacity assessment for influenza pandemic preparedness and response conducted in 2014. These recommendations have been useful to help the countries prioritize their activities and identify the necessary resources for implementation.

Additionally, COMISCA has developed an informatics platform that will provide updated information to the rapid response teams to better contain infectious diseases of pandemic potential. This tool will allow a more efficient use of training resources and available time of the trainees. Several activities have been coordinated with PAHO to help update the national pandemic preparedness plans in the region.

PREPAREDNESS ACTIVITIES

- Conducted the core capabilities inventory to respond to influenza pandemic in all eight Central American countries.
- Provided support for the development of an electronic platform to provide updated information to the rapid response teams to better contain infectious diseases of pandemic potential.

TRAINING

- Conducted a regional training workshop to address new WHO influenza surveillance standards and unusual respiratory events surveillance system.
- Conducted several hands-on trainings at the NICs and decentralized laboratories.



The Gorgas Memorial Institute and CDC Influenza Division started the INFLUMI project in Panama and El Salvador in 2014. The INFLUMI's team in El Salvador and CDC-CAR Influenza Program key officers are shown, 2015.

INFLUENZA VACCINE ACTIVITIES

CDC-CAR Influenza Program has been supporting influenza vaccination research and decision-making in order to optimize influenza prevention in the Central American region and Dominican Republic. In 2013, we collaborated with PAHO to update the description of influenza seasonality in CAR and create a network for influenza vaccine evaluations in Latin America and the Caribbean called REVELAC-i for its acronym in Spanish (Red para la Evaluación de Vacunas En Latino América y el Caribe–influenza).

Additionally, studies were conducted on influenza disease burden and the economic burden of influenza. The Influenza Program assisted Honduras and Costa Rica with a change in the timing and/or formulation of influenza vaccines used. We have been supporting countries' efforts to use findings to inform Central American immunization programs and the Strategic Advisory Group of Experts about the potential value of vaccinating pregnant women and young children aged >6 months.

RESEARCH

Influenza Division works closely with GDD and other CDC programs in Guatemala; Universidad del Valle; The Gorgas Institute; COMISCA; PAHO; and Ministries of Health in Belize, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, and Colombia to explore the timing of influenza in the American tropics, optimal times to vaccinate, the influenza-associated disease and economic burden, the effectiveness of influenza vaccination programs, and illnesses averted through vaccination, especially among SAGE target groups.

Ongoing research activities include studies to explore the following:

- Associations between seasonal influenza and meteorological parameters in Costa Rica, Honduras and Nicaragua.
- Prevalence of influenza A virus in swine and duck populations in rural backyards within tropical wetlands in Guatemala, 2013.
- Demographics and clinical characteristics of influenza A(H1N1)pdm09 virus-associated deaths in Central America and Dominican Republic 2009–2010.
- Influenza illness among case-patients hospitalized for suspected dengue, El Salvador, 2012.
- Incidence of influenza-associated severe acute respiratory infection among pregnant women in El Salvador.
- Medical and economic burden of influenza-like illnesses and influenza-associated medically-attended illness.
- Burden of influenza and influenza-associated pneumonia in the first year of life in a prospective cohort in Managua, Nicaragua.
- Influenza-associated hospitalizations and deaths in Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua.
- Direct and indirect costs associated with laboratory-confirmed hospitalized influenza illness in Honduras, Panama, and Guatemala.
- Impact of maternal acute respiratory infection and laboratory-confirmed influenza illness on neonates.
- Pilot to evaluate the feasibility of measuring seasonal influenza vaccine effectiveness using surveillance platforms in Central America, 2012.
- Public health policies and practices of the use of influenza vaccine, oseltamivir and palivizumab in Costa Rica, El Salvador, Guatemala and Panama.
- Knowledge, attitudes and practices for influenza vaccination in Costa Rica, El Salvador, Honduras and Panama.

MEXICO



InDRE's Virology Department where influenza diagnostics occur.

OVERVIEW

The Mexican National Laboratory Network consists of the Institute for Epidemiologic Diagnosis and Reference “Manuel Martínez Baéz” (InDRE) that coordinates training, quality control and reporting for 31 state laboratories. The cooperative agreement has assisted Mexico’s Secretariat of Health (SOH) by increasing influenza laboratory capacity in Mexican states and improving diagnostic protocols. This grant helped Mexico to maintain seasonal influenza surveillance and develop response actions in the event of an influenza pandemic.

SURVEILLANCE

Mexico’s National Epidemic Surveillance System (SiNaVE) detects when influenza virus activity starts and when the season can be considered as active. In México, epidemic surveillance and laboratory-based surveillance are the two pillars of influenza surveillance used to detect virus activity and new influenza virus strains.

In 2014, the Influenza Epidemiological Surveillance Manual was updated and published. This manual describes the characteristics, activities and

HIGHLIGHTS

- Inaugurated the new campus of the Directorate General of Epidemiology including the new facilities of the National Influenza Center.
- Updated and published the Influenza Epidemiological Surveillance Manual.
- Collaborated with Mexico, USA and Canada (all involved in the North American Plan for Animal and Pandemic Influenza [NAPAPI]), to revise the 2014–2015 Work Plan.

responsibilities of the Influenza Sentinel Sites (USMI). A new case definition has also been introduced for “death due to influenza”, defined as a positive laboratory result for an influenza virus and a death certificate where the basic cause of death is specified as influenza. This definition has been implemented as a new variable on the platform of Epidemiological Surveillance System of Influenza (SISVEFLU).

SURVEILLANCE ACTIVITIES

- Posted epidemiological surveillance information to the website.
- Developed a weekly newsletter that is distributed to the national epidemiological network and shared with partners.
- Updated and published the Influenza Epidemiological Surveillance Manual in which the characteristics of USMI and its activities and responsibilities are described.

LABORATORY

As part of the Directorate General of Epidemiology (DGE), the diagnostic capacities and capabilities of the National Influenza Center (NIC) in México, increased as a result of the first cooperative agreement. The same increases occurred in all laboratories of the national public health laboratory network.

With the resources of the recent agreement, DGE was able to recruit more staff. In April 2014, the President of Mexico, Enrique Peña Nieto, inaugurated the new Directorate General of Epidemiology Campus; including the new facilities of the NIC and InDRE.

LABORATORY ACTIVITIES

2013

- Collected, registered, and tested 18,118 samples from patients with severe acute respiratory infection (SARI); 2,001 (11.0%) were positive for an influenza virus.

2014

- Collected, registered, and tested 19,294 samples from patients with SARI; 4,861 (25.2%) were positive for an influenza virus.

PREPAREDNESS

Through a series of meetings with representatives of the three countries (Mexico, USA and Canada) involved in the North American Plan for Animal and Pandemic Influenza (NAPAPI), the Work Plan for 2014–2015 has been revised. Among the activities to be undertaken are maintaining communication through the National Focal Points of the three countries (Mexico, USA and Canada) and updating emergency protocols in case of an influenza epidemic for immediate response.

Potential areas of collaboration are being considered in case of an emergency event. The activities also include investigating outbreaks, sharing laboratory samples and medical countermeasures, and sharing information in a trilateral way. In May 2014, Mexico made the official transfer of the NAPAPI Secretariat to the Assistant Secretary for Preparedness and Response (ASPR) to the Department of Health and Human Services of the United States.

PREPAREDNESS ACTIVITIES

- Continued exchange of information and maintained communication regarding possible pandemic influenza emergencies between NAPAPI country members.
- Upgraded NAPAPI Board Members.

TRAINING

- Conducted a simulation exercise between NAPAPI member countries on pandemic preparedness in order to assess coordination and response.



A site visit outside of Mexico City with the Epidemiology Team.

PARAGUAY



Agueda Cabello, Director of SVS, Cynthia Vasconez, of the NIC (Laboratorio Central de Salud Publica—LCSP), Duc Vugia, Sara Mirza and Marta von Horoch at the Direccion General Vigilancia de la Salud (DGVS) offices.

OVERVIEW

Since August 2009, CDC has provided funds to the Paraguay General Directorate of Health Surveillance through a cooperative agreement to help the Paraguay Ministry of Health (MOH) strengthen influenza surveillance. In 2013, Paraguay entered into a sustainability cooperative agreement having completed the capacity building phase of the first cooperative agreement.

The country has strong sentinel surveillance for severe acute respiratory infections (SARI) and data reporting has been regular and maintained throughout the year. Current data are comparable with data from the region and are regularly incorporated and disseminated through a national epidemiological bulletin and the weekly PAHO influenza report. The country also is member of the network of the vaccine effectiveness study of Latin America and the regional SARI surveillance network.

SURVEILLANCE

In response to lessons learned during the 2009 influenza pandemic, a sentinel surveillance system for SARI was created. It is a hospital-based, systematic surveillance that covers all ages, and is supported by the cooperative agreement with CDC; the focus is on building capacity. There are ten hospitals that perform SARI surveillance and five sites that monitor for influenza-like illness (ILI). The country now has data on circulating respiratory viruses from patients of all age groups, and follow-up procedures are in place to monitor risk factor and severity of the disease.

HIGHLIGHTS

- Developed a sustainability plan for SARI and ILI national surveillance.
- Established ten SARI sentinel hospitals and five ILI sentinel sites that complete our early warning system.
- Implemented epidemiological units in every regional hospital.
- Analyzed 2,993 respiratory samples by RT-PCR assay and 2,715 by immunofluorescence (IFI) assay.

SURVEILLANCE ACTIVITIES

- Developed weekly summaries and weekly reports on SARI and ILI cases.
- Established better interaction between epidemiology and laboratory teams at the national level.
- Improved the computer system and integrated laboratory data.
- Conducted an evaluation of the surveillance system in April 2014.

LABORATORY

The National Influenza Center (NIC) capacity was strengthened in response to year round demand for testing, and this was supported in large part by the cooperative agreement. The implementation of RT-PCR as an exclusive assay performed in the reference laboratory was the next step for the detection of all respiratory viruses under surveillance.

The diagnostic capacity to perform the immunofluorescence (IFI) assay in local laboratories at the sentinel sites and the ability to send samples for RT-PCR to the national reference laboratory was increased. Now one of the sentinel sites is considering introduction of RT-PCR in their local laboratory. Surveillance of other respiratory viruses that may cause SARI (e.g., rhinoviruses, human metapneumovirus) is also needed to better understand the epidemiology and etiology of SARI, and it is important to incorporate techniques to detect these additional viruses. During 2014, some information about metapneumovirus was collected.

LABORATORY ACTIVITIES

- Completed a self-evaluation of the NIC and two sentinel laboratories in collaboration with CDC.
- Participated in CDC's Influenza Molecular Diagnostic Performance Evaluation Panel.
- Submitted 20 influenza virus isolates to CDC for further characterization.
- Implemented RSV and adenovirus detection by real-time RT-PCR in all samples negative for an influenza virus.
- Conducted training on the use of gauge CO2 for the incubator cell cultures.
- Conducted molecular diagnosis of other respiratory viruses such as bocavirus, coronaviruses, rhinoviruses, and enteroviruses.

PREPAREDNESS

CDC support helped evaluate the ability of the surveillance system and these results were used to update the national pandemic preparedness and response plan. The cooperative agreement strengthened surveillance capabilities, and the country continued the work by committing its own budget, increasing support of the NIC, and incorporating human resources at both the national level and the sentinel sites. It has also expanded and improved the infrastructure of the buildings and equipment. Human resources dedicated to surveillance both centrally and locally have been trained.

PREPAREDNESS ACTIVITIES

- Conducted a desktop simulation exercise with stakeholders to review procedures set forth in the plan for a particular scenario.
- Determined corrective measures based on the outcome of the simulation exercise to adapt evidence-based findings from the 2009 influenza pandemic into the plan.
- Included a protocol for detection of unusual SARI events in the plan with actions to be taken by the rapid response teams.

TRAINING

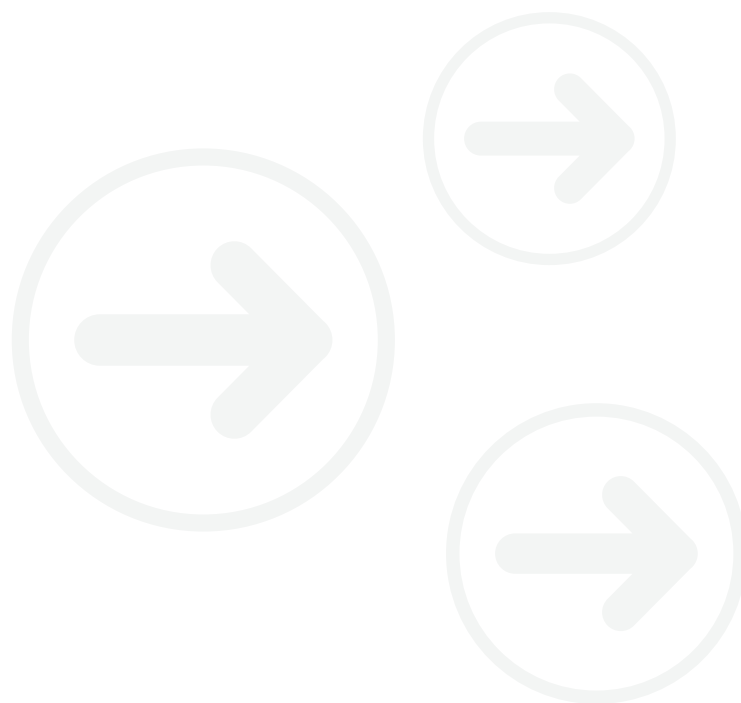
PAHO and CDC continued to provide training to ensure proper functioning of the sentinel surveillance system, high quality of surveillance data, prompt data analysis, and integration of information between the epidemiology and laboratory teams.

- Conducted training on surveillance procedures in hospitals at sentinel sites.
- Conducted in-service training at two sentinel sites on the SARI and ILI surveillance protocol.
- Conducted training for virologists on influenza virus isolation and identification.
- Conducted training on infection control at all national hospitals emphasizing the proper use of personal protective equipment.
- Conducted computer training at two sentinel sites.

INFLUENZA VACCINE ACTIVITIES

The country introduced influenza vaccine in 2006, targeted to populations at higher risk of severe illness or death. In this context, it is time to assess the impact and effectiveness of the vaccine.

To achieve this the country joined the Network of evaluating the effectiveness of the vaccine in Latin America and the Caribbean (REVELAC-i) and provided surveillance data.



PERU



OVERVIEW

Peru began to develop preparedness and response plans against avian influenza in 2005. The Ministry of Health initiated advocacy to increase the awareness of health and non-health authorities, and to encourage working together to prepare to face a potential influenza pandemic threat. This work was the first line of response against the 2009 influenza pandemic. In 2010, Peru's Ministry of Health and the Directorate General of Epidemiology entered into an agreement to strengthen surveillance and detection for avian and human influenza in the country. Peru's influenza surveillance system uses sentinel sites to identify influenza-like illness (ILI) and severe acute respiratory infection (SARI) case patients throughout the country. Laboratory testing for influenza viruses takes place in the 15 regional laboratories, as well as the National Influenza Center (NIC) located in the National Institute of Health (INS) in Lima.

SURVEILLANCE

Peru has 21 surveillance sites that perform ILI and SARI surveillance throughout the country. Since 2006, the MoH sub-committee for influenza surveillance has collaborated with the Virology Department of the U.S. Naval Medical Research Unit No. 6 (NAMRU-6) based in Peru.

SURVEILLANCE ACTIVITIES

- Updated the guidelines for investigation and control of outbreaks of influenza and SARI.
- Developed a 'professional supervision' tool to support surveillance sites.
- Conducted a PAHO review of the Expanded Program for Immunization that also included a review of surveillance for influenza.
- Conducted meetings to analyze the surveillance system and identify methods for improvement.

LABORATORY

Peru has a National Influenza Center, located in the laboratories of the National Health Institute in Lima that has for many years achieved 100% agreement in quality control testing, and routinely provides data to networks of the Pan American Health Organization

HIGHLIGHTS

- Continued epidemiological surveillance of influenza and produced analysis and reports on influenza activity in the country.
- Strengthened epidemiological surveillance (notification and immediate investigation of probable and confirmed cases) of influenza A (H1N1)pdm09 virus, including cases of ILI, SARI and SARI deaths.
- Used virological data and knowledge from the surveillance system to help guide vaccination policies.

(e.g. SARInet and REVELAC-i). The laboratory also sends strains to the World Health Organization Collaborating Centre to inform decisions on the formulation of the influenza vaccine. The country has 15 regional laboratories all of which receive respiratory samples from influenza sentinel sites. Samples at the regional sites are tested using immunofluorescent assays (IFA), and those that are positive are then sent to the country's NIC for testing by RT-PCR. Testing at the NIC is done the same day samples are received and results are generally returned within 72 hours. The influenza positive samples are cultured in MDCK cells. Positive isolates are shared with CDC at least three times per year.

LABORATORY ACTIVITIES

- Learned that influenza A (H1N1)pmd09 virus is circulating in different parts of the country; however, the type of influenza virus that presents most frequently is influenza B.

PREPAREDNESS

In 2014, Peru revised their National Plan of Preparedness and Response to a potential pandemic of influenza and other emerging respiratory viruses.

INFLUENZA VACCINE ACTIVITIES

In 2014, Peru distributed vaccines against influenza in all departments. As of April 2014, there was only 6.5% coverage in children under one year and 8.12% in persons over 65 years.

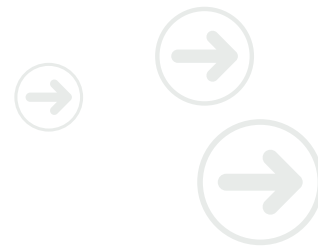
RESEARCH

The Influenza Division has partnered with the Ministry of Health, PAHO, and NAMRU-6 to explore the timing of influenza in different macro-regions of Peru, the optimal time of influenza vaccination, the disease and economic burden associated with disease, and the vaccine effectiveness among potential target groups.

Research activities include:

- Describing the timing of influenza epidemics and optimal time to vaccinate using seven years of National Influenza Centre and WHO Collaborating Centre data.
- Estimating the incidence and burden of influenza in four ecologically distinct regions in Peru through a household-based community cohort study.
- Estimating the economic burden of influenza in Peru, 2009–2010.
- Exploring vaccine effectiveness of the trivalent inactivated influenza vaccine among health care workers in Lima, Peru.





Research Activities

ARGENTINA

During the past 5 years, CDC's Influenza Division has worked closely with the Ministry of Health, academic partners, and the Pan American Health Organization to explore the disease and economic burden of influenza illness as well as the effectiveness of influenza vaccination among children and older adults.

This latter effort is anticipated to help Argentina assess how many illnesses and the costs that could be averted through its vaccination program.

Research activities include:

- A study to quantify the incidence of viral respiratory infections among outpatient and hospitalized children aged ≤ 5 years and its associated cost in Buenos Aires, Argentina
- A cohort study to quantify rates of laboratory-confirmed influenza among pregnant women.
- A study to describe the timing of respiratory virus epidemics in subregions of Argentina during 30 years.
- Participation in a program evaluation to estimate the influenza vaccine effectiveness among young children and older adults during 2012–2015 through the PAHO led REVELAC-I network.

AMERICAS

CDC's Influenza Division and PAHO are collaborating to strengthen surveillance systems in the region and leverage the data generated from these activities to answer questions of public health importance.

Activities have focused on estimating the burden and cost of medically-attended influenza disease, estimating influenza vaccine effectiveness, and determining the seasonality of influenza circulation to optimize vaccine timing. Ongoing research findings include:

- Influenza peak-activity in the American tropics as reported to SARINet (www.sarinet.org/) appears to occur during May through September, and countries in this region should consider timing influenza vaccine accordingly.

- Efforts to estimate the burden of influenza-associated hospitalizations throughout the region are ongoing.
- Most (88%) countries in the Americas have seasonal influenza vaccination policies.
- On average, annually, ~85,000 people appear to die from influenza in the Americas.
- Regional efforts are ongoing to estimate influenza-associated mortality among pregnant women, a priority group recommended to receive influenza vaccine by WHO.
- Preliminary results suggest that the 2013 trivalent influenza vaccine-effectiveness to prevent hospitalization in nine Latin American countries was 49% (95% confidence interval: 32–61%) in children less than 5 years of age and 48% (95% confidence interval: 33–59%) in adults 60 years and older.

ECUADOR

CDC is working through SARINet, the Pan American Health Organization regional surveillance network, to help the National Influenza Centre explore the timing of influenza epidemics in different provinces within Ecuador. In addition, CDC is exploring a collaboration between the National Influenza Centre, the Universidad Catolica, and the University of Liverpool to estimate the influenza burden of acute respiratory illness among very young children in Ecuador.

The Ministry of Health in Ecuador may also participate in the Pan American Health Organization led REVELAC-i network to estimate influenza vaccine effectiveness among SAGE target groups.

Research activities include:

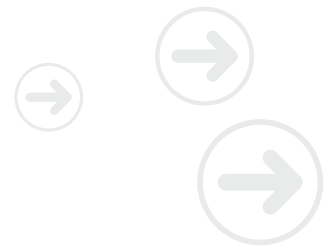
- An analysis to determine the timing of historical influenza seasons in different provinces within Ecuador and the optimal time for influenza vaccination.
- A cohort study to quantify rates of laboratory-confirmed influenza acute respiratory illness among very young children in the highlands of Ecuador.

NICARAGUA

CDC's Influenza Division is collaborating with the Ministry of Health, PAHO, and the University of Michigan to explore the timing of influenza season in Nicaragua, verify the optimal timing of influenza vaccination, and quantify the burden of influenza illness among SAGE target groups. CDC is also partnering with the Ministry of Health, PAHO and the Partnership for Influenza Vaccine Introduction to explore vaccine effectiveness and the value of maternal immunization to prevent illness among pregnant women and their infants. Research activities include:

- Describing the timing of influenza epidemics and optimal time to vaccinate using seven years of National Influenza Centre and WHO Collaborating Centre data.
- Quantifying the burden of influenza and influenza-associated pneumonia in the first year of life in a prospective cohort study in Managua, Nicaragua.
- Estimating influenza-associated hospitalizations and deaths in Central America (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua) among various key age groups.
- Estimating, through REVELAC-i, the efficacy of inactivated influenza vaccine to prevent influenza among children and older adults in the region.
- Assessing the effect of seasonal vaccination in pregnant women on birth outcomes.





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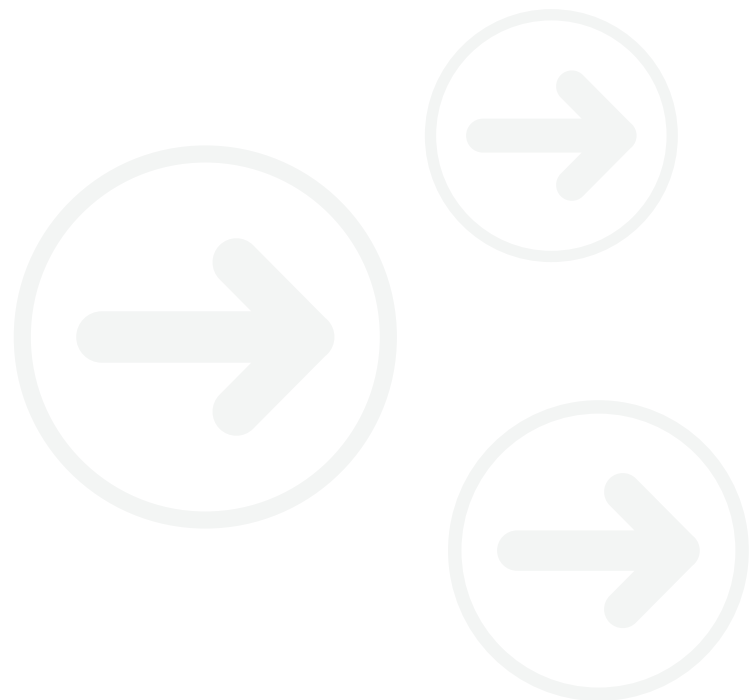
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WHO South-East Asia Region (SEAR)





WHO South-East Asia Region [SEAR]

In fiscal year 2014, the U.S. Centers for Disease Control and Prevention (CDC) funded nine non-research bilateral influenza cooperative agreements in the South-East Asia Region (SEAR). Cooperative agreements with ministries of health (MOH) or institutions designated by the MOH to build capacity to routinely identify, diagnose and respond to seasonal, avian and pandemic influenza.

Direct country support through cooperative agreements is established in the following eight countries:

- Bangladesh
- Bhutan
- India (until Sept 2014)
- Indonesia
- Maldives
- Nepal
- Sri Lanka
- Thailand (until Sept 2014)

In addition, CDC supports the World Health Organization (WHO) Regional Office for South-East Asia (SEARO) Headquarters in New Delhi through a cooperative agreement.

In 2014, three countries (India, Indonesia and Thailand) entered the final year of the five-year cooperative agreement designed to transition to local sustainability. Bangladesh entered the fourth year of their sustainability agreement while Nepal and Sri Lanka entered the second year.

Maldives and Bhutan entered the second year of the capacity building grant cycle.

Countries are expected to develop and maintain a surveillance system that rapidly detects, identifies and responds to seasonal, novel and pandemic influenza, participate in WHO's Global Influenza Surveillance and Response System (GISRS) and create and implement a sustainability plan that phases out U.S. government funding. All but two countries have a laboratory designated as a WHO National Influenza Centers (NIC), and the two that do not are working

toward designation for their national public health laboratories.

Core activities include improving laboratory and epidemiologic capacity and infrastructure for influenza virologic and disease surveillance; developing hospital-based sentinel surveillance for influenza-like illness (ILI) and severe acute respiratory infections (SARI); integrating laboratory and epidemiologic influenza surveillance; developing and maintaining surveillance for cases and clusters of respiratory illnesses; and training local rapid response and containment teams.

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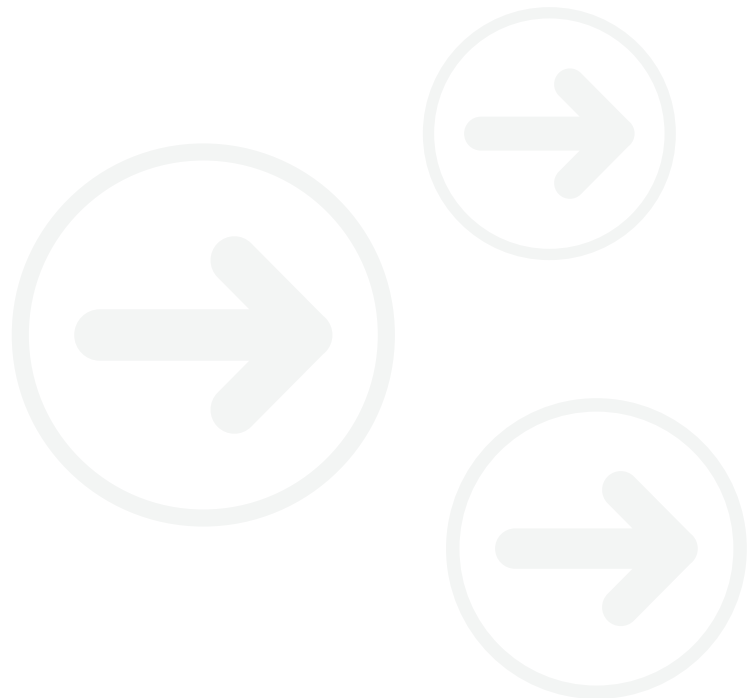
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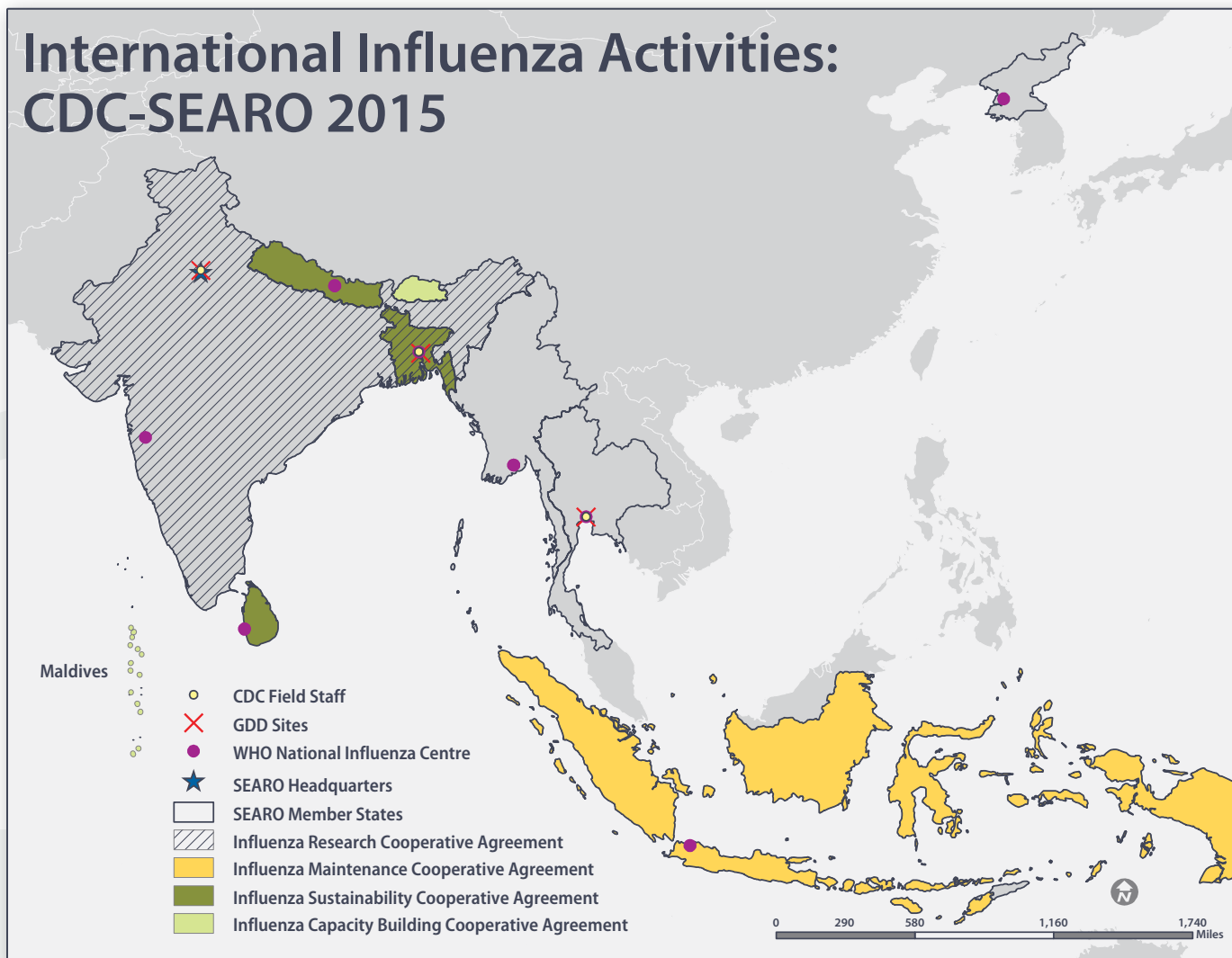
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WHO Regional Office For South-East Asia [SEARO]



HIGHLIGHTS

- Organized the 8th Bi-Regional Influenza Surveillance and NIC Meeting in Jakarta, Indonesia.
- Developed a methodology to assess the cost-effectiveness of seasonal influenza vaccination in Nepal.
- Conducted a systematic analysis of influenza disease and economic burden and cost-effectiveness of influenza vaccines in the South-East Asia region.
- Established the capacity of clinicians to manage patients with avian influenza and other severe respiratory infections.

U.S. CDC DIRECT SUPPORT

Since 2006, WHO's Regional Office for South-East Asia (SEARO) has received funding from a CDC cooperative agreement to support enhancing the capacity of member states to build and maintain an influenza surveillance system which is used for the routine identification, investigation, and containment of novel influenza viruses, some of which may have pandemic potential.

WHO SEARO is located in New Delhi, India. The office serves the following 11 member countries: Bangladesh, Bhutan, DPR Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste. Eight of the 11 countries received cooperative agreement funds from CDC's Influenza Division in fiscal year 2014.

In 2013–2014, WHO SEARO staff provided training, support and technical assistance to member countries to strengthen preparedness and response, surveillance and laboratory capacity. Working together, staff working on the International Health Regulations (IHR), Immunization and Vaccine Development (IVD) and Health Laboratory Systems (HLS) together implemented the activities related to the CDC grant.

In the coming year, WHO SEARO will focus on further strengthening capacity development in disease surveillance, preparedness for and response to seasonal and pandemic influenza, and scaling-up laboratory capacity in influenza diagnostics.

SURVEILLANCE

SEARO has utilized both CDC and WHO pandemic influenza preparedness (PIP) funds to conduct trainings and laboratory activities to improve influenza surveillance in the region.

SURVEILLANCE ACTIVITIES

- Facilitated collating and synthesizing available regional and country-level data on economic and disease burden of influenza.
- Facilitated a discussion with Sri Lanka and Bhutan to improve reporting of influenza surveillance data to WHO FluID.
- Supported member countries by planning and implementing a number of activities to improve surveillance at the country level.

LABORATORY

The financial support provided to SEARO through the cooperative agreement was used to enhance the capacity of the influenza laboratories in the region by conducting a regional laboratory workshop on diagnosis of influenza and novel respiratory viruses. This training was held at the National Institute of Virology in Pune, India from May 26–30, 2014. The main objective of the workshop was to provide hands-on training on using diagnostic tools including RT-PCR for influenza and novel respiratory viruses. In addition, the cooperative agreement supported the participation of laboratory focal points from the NICs and public health laboratories in the 7th and 8th NIC meetings in 2013–2014.

LABORATORY ACTIVITIES

WHO SEARO

- Conducted a regional laboratory workshop on diagnosis of influenza and novel respiratory viruses.
- Assessed two influenza public health laboratories and provided on-site trainings to strengthen laboratory capacity including molecular diagnosis.

Bhutan

- Assigned a consultant to review the standard operating procedures for influenza RT-PCR and influenza RT-PCR quality systems; developed biosafety guidelines; and trained the influenza laboratory staff on influenza RT-PCR procedures.

Timor-Leste

- Trained staff in molecular diagnostics and line probe assay testing for avian influenza A (H7N9) virus; developed new and updated existing standard operating procedures; developed molecular diagnostic modules and modules on material safety datasheets for all influenza-specific reagents used in PCR; trained staff using these modules and orientated staff on specimen repository, management and shipping.

PREPAREDNESS

SEARO identified the need to review existing member countries' pandemic influenza preparedness and response plans, including pandemic vaccine deployment plans to better prepare for and respond to a future pandemic. SEARO recognized the need for familiarizing member countries with the global guidelines on pandemic influenza preparedness and pandemic vaccine deployment.

To facilitate implementation of the above objectives, SEARO held a regional meeting with participation of all member states.

PREPAREDNESS ACTIVITIES

- Organized a regional workshop to build the capacity of non-vaccine producing countries. Discussions included how to register and evaluate commercially-available seasonal and pandemic influenza vaccine.
- Conducted regional training for influenza vaccine manufacturing countries in SEAR that focused on designing, conducting and reviewing studies in support of initial vaccine approval, annual strain change, process modification and prequalification.
- Focused attention on strengthening the regional clinical network, enhancing the clinical management capacity of influenza and other respiratory pathogens of outbreak potential, and facilitating linkages between curative health care and public health services.
- Worked jointly with WHO Country Offices and key stakeholders in six countries to review tabletop exercises—key components of the International Health Regulations (2005)—related to responding to a pandemic or an emerging infectious disease.

TRAINING

- Conducted a training workshop on clinical management of avian influenza and other causes of severe acute respiratory infections (SARI) in Jakarta, Indonesia.
- Conducted a regional workshop on planning for influenza pandemic preparedness in Kathmandu, Nepal.
- Conducted a workshop on sensitizing the influenza vaccine manufacturers in the South-East Asia Region to the Pandemic Influenza Preparedness (PIP) framework.
- Conducted a regional laboratory workshop on influenza and novel respiratory viruses in Pune, India.
- Conducted on-site trainings for laboratory staff at the public health laboratories in Bhutan and Timor-Leste.

INFLUENZA VACCINE ACTIVITIES

- Supported countries in developing a road map to plan for influenza vaccination using recommendations of the SEAR Immunization Technical Advisory Group (ITAG).
- Focused on strengthening the national regulatory authorities in both influenza vaccine manufacturing and non-manufacturing countries in SEAR to enable timely and rapid deployment of influenza vaccines.

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BANGLADESH



Medical technologist getting ready to collect a blood sample from a pregnant woman study participant in Kishoreganj District, Bangladesh.

OVERVIEW

The Institute of Epidemiology, Disease Control, and Research (IEDCR) of the Ministry of Health and Family Welfare has been a recipient of the Centers for Disease Control and Prevention's (CDC) cooperative agreements since 2006. IEDCR is the national focal point for conducting disease surveillance and outbreak investigations. The CDC-funded influenza project concentrates on strengthening sustainable disease surveillance, enhancing laboratory capacity and responding rapidly to pandemic threats. IEDCR works closely with the International Centre for Diarrheal Disease Research, Bangladesh (icddr,b), which also receives CDC funding to conduct influenza research and surveillance. The two institutions collaborate on surveillance, training and research. Bangladesh has made substantial progress in the field of respiratory illness since the start of the cooperative agreement.

SURVEILLANCE

CDC funding enabled IEDCR and icddr,b to establish Bangladesh's first sentinel surveillance for influenza. Together they have been conducting hospital-based influenza surveillance since 2007, in 12 tertiary hospitals across the country. In fiscal year 2013, the surveillance platform was enhanced by defining the catchment area of the participating hospitals and performing health utilization surveys in these areas. Also during 2014, surveillance activities were expanded to five additional sites: two sites through collaboration

HIGHLIGHTS

- Leveraged and enhanced the national influenza surveillance platforms to detect potential circulation of novel avian influenza A (H7N9) virus among poultry and suspected human cases or MERS-CoV.
- Enhanced the national hospital-based influenza surveillance platform.
- Participated in joint avian influenza outbreak investigations following a One Health approach with stakeholders.

between icddr,b and IEDCR and three sites by IEDCR to increase the chance of detecting avian influenza A (H7N9) virus and MERS-CoV.

The addition of these sites allows Bangladesh to better understand its influenza disease and estimate economic burden. The current national influenza surveillance system identifies cases of severe acute respiratory infection (SARI), influenza-like illness (ILI), and severe pneumonia in 24 sentinel sites. 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 avian influenza A (H5N1) virus and for the novel avian influenza A (H7N9) virus as needed.



Two technicians collecting a post-mortem biopsy sample.

Bangladesh continues to experience outbreaks of highly pathogenic avian influenza A (H5N1) virus. In collaboration with IEDCR and the Department of Livestock Services (DLS), icddr,b currently conducts surveillance for avian influenza in domestic poultry and poultry workers in live bird markets within Bangladesh.

SURVEILLANCE ACTIVITIES

- Monitored and investigated suspected influenza outbreaks on a consistent basis.
- Continued to send detailed surveillance reports to CDC and the World Health Organization (WHO) FluNet on a weekly basis during the influenza season.
- Collected and tested specimens for influenza virus from 24 sentinel surveillance sites across the country.
- Tested nearly 30,000 specimens from surveillance activities (May 2007 to April 2015).

LABORATORY

Since 2007, CDC has provided diagnostic support, resources, training and technical support to laboratories at IEDCR and icddr,b, resulting in strengthened capacity and improved diagnosis of influenza and other respiratory viruses. Influenza viruses (100–200 per year) are routinely sent to CDC for further molecular and antigenic characterization and for use in vaccine strain selection.

In 2007, IEDCR was nominated as a National Influenza Center (NIC) by WHO and has routinely contributed specimens to GISRS. 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 RT-PCR to identify seasonal, pandemic and avian influenza viruses (e.g., H1N1pdm09, H7N9, H9N2, and H5N1).

In fiscal year 2013, a sequencer was procured and training of NIC staff began. Plans are currently underway to increase the virus isolation and serologic testing capacity of the NIC.

Icddr,b houses a modern molecular virology BSL-2 laboratory, tissue culture capacity, animal virology laboratory as well as a certified BSL-3 laboratory where virus isolation and culture for highly pathogenic influenza strains can be performed.

LABORATORY ACTIVITIES

- Obtained and tested over 40,000 specimens, from both the human and zoonotic sector, through surveillance and research activities (May 2007 to April 2015).
- Integrated new sequencing capacity within several surveillance and research projects.
- Enhanced diagnostic capacity of partner laboratories for the detection of the novel avian influenza A (H7N9) virus.
- Participated in the field testing of novel rapid serological assays for influenza-specific antibodies (icddr,b laboratory).

PREPAREDNESS

IEDCR, together with key partners, has periodically updated their pandemic response and avian influenza plan with lessons learned from the 2009 influenza pandemic. IEDCR has led several recent trainings for public health officials and health professionals on pandemic preparedness.

An emergency operations center (EOC) was built and equipped to help centralize a government response during major outbreaks and pandemics.

PREPAREDNESS ACTIVITIES

- Responded to outbreaks and unusual health events or diseases reported directly or indirectly to the Director.
- Updated the national pandemic preparedness plan in collaboration with stakeholders which will now include all emerging infectious diseases.

TRAINING

IEDCR continuously conducts trainings on emerging and re-emerging diseases to strengthen Bangladesh's capacity to detect, survey, prevent, and control influenza, including novel pandemic threats (Ebola virus disease (EVD) and MERS-CoV):

- Trained the National rapid response team (RRT), District RRT, Upazilla RRT, clinicians, and health personnel at ports of entry on EVD (Fall 2014).
- Conducted training on web-based disease surveillance (July 2013–current).
- Conducted training on development of standard operating procedures (SOP) on laboratory biosafety and infection control of emerging infectious diseases (Fall 2013).

- Conducted hands-on training on SOPs for diagnosis of emerging infectious diseases (Fall 2013).
- Conducted a workshop on establishing laboratory network among public health laboratories with policy makers (Fall 2013).
- Conducted training for preparedness, capacity building, surveillance, laboratory support and response for zoonotic Diseases (July 2013–current).
- Conducted disease surveillance training for Upazilla health officers and medical officers (March 2013–current).
- Conducted workshop on National Influenza Surveillance, Bangladesh (June 2013).

INFLUENZA VACCINE ACTIVITIES

DGHS/MOH is planning to introduce seasonal influenza vaccines among high-risk groups. The government already identified high-risk groups. An estimated 15.87 million or 10% of total population are at high risk. Ministry of Health organized several consultations to explore the funding and to develop a vaccine development plan. Currently, the expanded program on immunization (EPI) is working on providing influenza vaccination among pregnant women.

RESEARCH

Influenza Division works closely with icddr,b, IEDCR, and DLS to explore the risk of avian influenza among persons who work closely with poultry, potential interventions to interrupt zoonotic influenza transmission, seasonal influenza disease and economic burden among SAGE target groups, and the potential value of vaccination programs to avert medically attended illness and its associated cost.

Ongoing research activities include studies to explore:

- Avian influenza in domestic waterfowl in live bird markets in Bangladesh, 2007–2012.
- Risk factors for highly pathogenic avian influenza A (H5N1) virus outbreaks in backyard poultry flocks, Bangladesh, 2009–2012.
- Understanding the failure of an intensive behavior change intervention to reduce the risk of avian influenza transmission from flocks to backyard poultry raisers in rural Bangladesh.
- Developing and piloting safe home slaughtering practices in a Bangladeshi rural community to reduce human exposure to avian influenza viruses.



A family working in one of the poultry markets in the city.

- Where backyard poultry raisers seek care for sick poultry: implications for avian influenza prevention in Bangladesh.
- Risk of avian influenza transmission among poultry in Dhaka live bird markets and possible impact of routine disinfection.
- Mild respiratory illness in young children caused by highly pathogenic avian influenza A (H5N1) virus infection in Dhaka, Bangladesh, 2011.
- Household-level risk factors for secondary influenza-like illness in a rural area of Bangladesh.
- Factors driving customers' health care seeking behaviors for acute respiratory illness at pharmacies, drug sellers' treatment recommendations and outcomes, in Dhaka City, Bangladesh, in 2012.
- Etiology and incidence rates of hospital-acquired viral respiratory illness in tertiary care hospitals in Bangladesh, 2008–2011.
- Viral etiology of pneumonia and outcomes in severely malnourished children in an urban hospital.
- Incidence of viral respiratory infections among hospitalized children aged <5 years, 2010–2013.
- Assessing laboratory-confirmed influenza virus infection among family caregivers in district hospitals in Bangladesh.
- Piloting hand-hygiene interventions in hospital wards to improve hand hygiene behavior in resource-poor health care facilities in Bangladesh.
- Incidence of influenza-associated mortality in Bangladesh, 2010–2012.

BHUTAN



Training of health workers on the web-based reporting system.

OVERVIEW

The Public Health Laboratory (PHL) under the Department of Public Health, Ministry of Health, Bhutan, is in the second year of a five-year capacity building cooperative agreement with the Centers for Disease Control and Prevention (CDC). The key objectives of the agreement are to strengthen the existing influenza surveillance system established in 2009-2010 following the 2009 influenza pandemic and achieve National Influenza Center (NIC) status from the World Health Organization (WHO).

With CDC's financial and technical support and recommendations, several positive changes have been made to the system. These include improved sample transportation, laboratory testing capacity, influenza-like illness (ILI) case reporting, and establishing surveillance for severe acute respiratory infections (SARI). Access to reagents through CDC's Influenza Reagent Resource (IRR) has helped maintain continuous testing. Currently, Bhutan is in the process of enhancing the level of preparedness and response to influenza pandemic threats.

SURVEILLANCE

The Public Health Laboratory (PHL) conducts and coordinates influenza surveillance for Bhutan. Currently, there are 11 influenza sentinel sites. All sites conduct SARI surveillance and seven of the 11 sites also conduct ILI surveillance. As per the Bhutan influenza surveillance guideline, each site reports the

HIGHLIGHTS

- Established SARI surveillance system.
- Developed a web-based ILI and SARI surveillance reporting system.
- Established the capacity of relevant health professionals to conduct influenza surveillance and laboratory testing.
- Established event-based surveillance and outbreak investigation and response system.
- Published manuscript "Epidemiological and Virological Characteristics of Influenza B: Results of the Global Influenza B Study" in IORV Journal.

number of ILI and SARI patients meeting the case definition every week through a web-based reporting system. Sites collect six to eight ILI samples per week. The sites are responsible for shipping samples to PHL.

SURVEILLANCE ACTIVITIES

- Reviewed the existing influenza surveillance system with experts from CDC and submitted the summary report to the Ministry of Health.
- Revised and printed an ILI and SARI influenza surveillance guideline. The small size, easy-to-use booklet that includes flow charts has been distributed to all sentinel sites.
- Procured IT equipment for web-based reporting, and redesigned the ILI and SARI web-based reporting system.
- Developed a surveillance information system user manual and made it accessible on PHL's website.
- Provided each sentinel site with detailed laboratory results so health providers were aware of which patients were influenza -positive.
- Produced weekly PHL reports on ILI and SARI cases on Bhutan's web-based reporting system, Flu View. Reports are available in aggregate and detailed by sentinel site.
- Submitted manuscript "Temporal Pattern of Influenza A and B in the Tropics and Temperature Countries: What are the Lessons for Influenza Ratiocination" for publication in the WHO bulletin.



LABORATORY

PHL worked closely with the Armed Forces Research Institute of Medical Sciences (AFRIMS) in Bangkok to establish the RT-PCR assay and testing prior to the CDC cooperative agreement award. This has enabled PHL to contribute influenza virological surveillance data to GISRS since 2011.

Laboratory testing and surveillance have improved with updated equipment and training from both AFRIMS Thailand and CDC. Providing access to IRR has helped mitigate shortages of reagents. During the last two years, sample quality has improved due to training and an improved shipment mechanism.

By the end of 2015, PHL will move into a new, modern, spacious laboratory. It will house additional equipment, facilitate RT-PCR testing and have space for setting up virus culture. Staff are looking forward to having the capacity to culture virus, a step needed to become a WHO NIC.

LABORATORY ACTIVITIES

- Procured ABI PCR system and other needed equipment for the influenza laboratory.
- Trained two laboratory personnel on molecular techniques.
- Trained laboratory staff from sentinel sites on sample collection techniques, storage and shipment.
- Procured and distributed refrigerators for sample storage at sentinel sites.
- Received and tested approximately 25–30 samples every week.
- Collected 168 SARI specimens and 2,279 ILI specimens between 2013 and May 2015.
- Participated in CDC's performance panel and WHO's (Hong Kong) External Quality Assessment Project (EQAP).

PREPAREDNESS

The Avian Influenza (AI) program, under the Department of Public Health, Ministry of Health, is responsible for coordinating avian influenza preparedness and response and is required to liaise with all national stakeholders in controlling and preventing avian influenza outbreaks.

The AI program is revising the National Influenza Pandemic Preparedness Plan (NIPPP) with assistance

from a WHO consultant. Per the country's Disaster Management Act of Bhutan, 2013, the Ministry of Health has developed a Health Emergency Contingency Plan (HECP). NIPPP and the disease outbreak investigation and control manual will be aligned with the HECP.

PREPAREDNESS ACTIVITIES

- Trained school health coordinators on influenza case detection and the reporting of influenza illness.
- Trained clinicians on influenza case management and sensitized the general public to influenza transmission and prevention through print, radio, and TV media.
- Developed and printed an event-based surveillance guideline.
- Developed outbreak investigation and control manual.

TRAINING

- Conducted training for hospital surveillance focal points on the newly designed ILI and SARI web-based reporting system.
- Conducted training on the revised influenza surveillance guideline for clinicians and other health workers involved in influenza surveillance.
- Conducted training for hospital laboratory persons on sample collection techniques, storage and shipment.
- Trained five clinicians, two laboratory persons and one nurse at AFRIMS, Bangkok on operational aspects of an influenza surveillance system.
- Trained three persons from PHL on basic field epidemiology at the FETP Training Centre, Ministry of Public Health, Thailand. Staff who participated held a training on basic field epidemiology for health workers in Bhutan.
- Trained two laboratory personnel on molecular techniques at AFRIMS, Bangkok.
- Trained school coordinators on influenza case detection and reporting.
- Trained approximately 120 village health workers on event-based disease surveillance.
- Trained health workers on Avian and Pandemic Influenza Management Guidelines.

INFLUENZA VACCINE ACTIVITIES

Influenza vaccination has not been introduced and influenza vaccine is not available in the country. An influenza burden study is planned during the third and fourth years of the cooperative agreement. Findings from the burden study will be presented to the Ministry with policy discussion points related to introducing influenza vaccine in Bhutan.



INDIA



OVERVIEW

The U.S. Centers for Disease Control and Prevention (CDC), in coordination with other U.S. government agencies supports response measures against seasonal, avian and pandemic influenza in India. In 2004, CDC in collaboration with the Indian Council of Medical Research (ICMR) initiated influenza surveillance in India. This CDC cooperative agreement ended in 2014. The CDC-ICMR cooperative agreement supported the development of a network of ten influenza surveillance sites which contributed epidemiological and virological surveillance data for timely characterization (genetic and antigenic) of influenza isolates for inclusion in global vaccine selection. Since 2014, the Indian Ministry of Health and Family Welfare (MoHFW) has contributed some funds for ongoing influenza surveillance and during 2015, ICMR continued to contribute surveillance data to WHO FluNet which demonstrated a large outbreak of influenza A (H1N1)pdm09 virus in 2014–2015.

SURVEILLANCE

The National Institute of Virology (NIV), Pune-led, ICMR network throughout India continued influenza surveillance contributing crucial surveillance data to WHO's FluNet site. Surveillance efforts have demonstrated that influenza seasonality varies across India with peak influenza activity occurring during January–March in the northern most tip of the country (temperate climate) and during the rainy monsoon season (August–October) in the rest of the country. Previously, India was only using Northern Hemisphere influenza vaccine, but these findings have led to importation of Southern Hemisphere vaccine for pre-monsoon vaccination.

SURVEILLANCE ACTIVITIES

- Processed over 5,000 samples in the first six months of 2015.
- Gathered virological data which showed that an outbreak occurred during the winter of 2015 due to influenza A (H1N1)pdm09 virus.

HIGHLIGHTS

- Performed genetic characterization of influenza A (H3N2), A (H1N1) pdm09 and B viruses at the National Institute of Virology (NIV) Pune.
- Based on evidence generated by CDC-supported studies, the Indian Academy of Pediatrics (IAP) recommended a change in vaccination timing to May–June prior to the monsoons and Drugs Controller General of India (DCGI) allowed use of Southern Hemisphere vaccine formulation.
- Conducted extensive analysis of five years of seasonal influenza data which has shown that seasonality varies according to latitudinal location of the site:
 - » Areas lying north of 30°N latitude demonstrate peak activity in winter and limited activity during rainy monsoon season.
 - » Areas between 10°N and 30°N demonstrate highest activity during monsoon and limited activity in winter.

LABORATORY

ICMR network members have trained extensively with CDC-Atlanta scientists on influenza virus typing, sub-typing, RT-PCR, real-time RT-PCR, and reverse genetics techniques. ICMR's network now has ten sites equipped with RT-PCR to detect seasonal influenza A and B viruses. Four of these laboratories are also equipped to detect and handle avian influenza viruses. Genetic characterization of viruses is carried out at NIV, Pune.

LABORATORY ACTIVITIES

- Submitted virological and epidemiological data from the ICMR network to WHO FluNet which includes aggregated data from ten regional sentinel influenza sites in India.
- Completed the genetic characterization of the 2014–2015 circulating strain of influenza A (H1N1)pdm09 virus which revealed minimal changes and matched the recommended vaccine strains for that year.

PREPAREDNESS

HHS/CDC activities have focused on supporting pandemic influenza preparedness programs and helping advance the field of influenza research (seasonal, pandemic and avian) in India. Prior to 2009, preparedness activities to minimize the risk of spread of human infections and disease, including that due to influenza, were carried out by the MoHFW (National Centre for Disease Control and ICMR) and WHO partners and funded partially through CDC support. These efforts contributed to India's ability to respond to the 2009 influenza pandemic. Even after the sustainability period for the cooperative agreement ended in 2014, CDC has continued to provide technical and laboratory support for ongoing surveillance activities. Current activities are focused on continued CDC technical support of the ICMR influenza network in contributing epidemiological and laboratory surveillance data and response trainings.

PREPAREDNESS ACTIVITIES

Current efforts have had policy effects in at least three major areas:

- Licensure: Evidence-based surveillance data on influenza seasonality has led to licensure to import Southern Hemisphere vaccine prior to influenza peak.
- Vaccine: The Federation of Obstetricians and Gynecologists of India recommended influenza vaccination for pregnant women.
- HHS/WHO supported Serum Institute of India (SII) in the production of the influenza A (H1N1) pdm09 monovalent live-attenuated influenza vaccine (LAIV). SII is currently in the process of producing trivalent LAIV.

RESEARCH

CDC collaborates with Indian partner organizations, including the National Institute of Virology, the All India Institute of Medical Science, and multiple academic institutions, on research studies that provide data to inform national strategies for influenza prevention and control. Research studies have focused on estimating influenza burden, identifying groups at risk of severe influenza, evaluating the effectiveness of influenza vaccines, and identifying optimal timing for influenza vaccination in India.

RESEARCH ACTIVITIES

- Estimated the burden of influenza resulting in hospitalizations and outpatient visits in two rural communities in India during 2009–2013.
- Estimated the burden of acute lower respiratory tract infections associated with various viral and bacterial infections among children aged <5 years and adults aged >60 years.
- Estimated the cost of acute lower respiratory tract infection among children aged <5 years and adults aged >60 years in two regions of India.
- Evaluated the use of vital records data from two Indian national death reporting systems in conjunction with influenza surveillance data to estimate influenza-associated mortality in India.



INDONESIA

OVERVIEW

The overall goal of the influenza program in Indonesia is to establish a sustainable, comprehensive surveillance system that can identify and respond to seasonal, avian and pandemic influenza. The Centers for Disease Control and Prevention (CDC) funding has supported routine influenza surveillance, the National Influenza Center laboratory, and pandemic preparedness. In 2011, the Indonesia Ministry of Health (MoH), in collaboration with CDC and USAID, began piloting an enhanced surveillance project to better understand the burden of seasonal and avian influenza in the East Jakarta District. In addition to the ongoing influenza-like illness (ILI) surveillance, a national severe acute respiratory infection (SARI) surveillance system was established with CDC and Government of Indonesia (GOI) funding in 2013. Together these systems help identify circulating influenza viruses, and monitor severity and trends in several provinces in the country.

SURVEILLANCE

SIBI (Surveillance ISPA Berat Indonesia) surveillance was established in 2013, in six sentinel sites in six provinces. The system collects epidemiological data on SARI cases, including the proportion of cases with severe illness, pneumonia and death. Nasal and throat swabs are collected and tested for influenza viruses at the National Influenza Center (NIC) at the National Institute of Health Research and Development (NIHRD). In addition, the East Jakarta Project has provided information about the epidemiology and virology of influenza viruses circulating in an urban area of DKI Jakarta province.

SURVEILLANCE ACTIVITIES

SIBI Surveillance

- Conducted mid-year and annual meetings to review site performance, present surveillance findings, and develop a work plan.
- Conducted a two-day logistics management workshop for laboratory staff from the six sentinel sites in June 2014.
- Conducted two monitoring missions per year to each of the sentinel sites for technical supervision, troubleshooting, and coordination.

HIGHLIGHTS

- Continued SIBI—the national severe acute respiratory infection (SARI) surveillance system—in collaboration with the GOI in six hospitals in six different provinces.
- Used SARI surveillance data from three of the six hospitals to calculate influenza disease burden.
- Continued national influenza-like illness (ILI) surveillance in 26 healthcare centers in 25 provinces.

East Jakarta Project

- Coordinated a dissemination meeting to present surveillance findings from three years of data, lessons learned, and a sustainability work plan in December 2014.
- Developed and shared the final report with conclusions and findings from the three-year surveillance project.

ILI Surveillance

- Reported ILI surveillance data routinely to the Global Influenza Surveillance Response System (GISRS) and uploaded it to the NIHRD website.
- Conducted two annual meetings to review surveillance performance, present surveillance findings, and develop a work plan.
- Updated the ILI surveillance guideline with the new WHO case definition and directions for collecting denominator data.

LABORATORY

CDC provides support for the NIC in several ways including providing the NIC with an External Quality Assessment (EQA) panel for real-time RT-PCR testing and technical assistance in the form of trainings and troubleshooting to improve provincial and regional laboratory capacity. Since 2008, approximately one year after the first avian influenza (AI) human case was detected, an AI laboratory network with 44 laboratories was established. Recently, the MOH decided to broaden the Network to encompass additional infectious diseases. This new Emerging Infectious Diseases (EID) laboratory network has 23 laboratories. An assessment of the laboratories is taking place to better understand the capacity of each.

LABORATORY ACTIVITIES

SIBI Surveillance

- Identified and tested 1,147 SARI cases, of which 13% were positive for an influenza virus.

East Jakarta Project

- Detected and tested 6,346 ILI cases, of which 30% were positive for an influenza virus.
- Detected and tested 3,989 SARI cases, of which 14% were positive for an influenza virus.

ILI Surveillance

- Detected 2,485 ILI cases, of which 489 (20%) were positive for an influenza virus. Of the influenza-positives, 305 (12.3 %) were influenza A and 184 (7.4%) were influenza B (October 2013–September 2014).
- Commenced testing of SARI specimens at the regional laboratory in October 2013 and continued to participate in quality control and assurance activities.
- Certified biosafety cabinets at seven ILI regional laboratories.
- Developed an EID laboratory network.

PREPAREDNESS

CDC support has considerably advanced pandemic influenza preparedness and planning in Indonesia. The pandemic plan that was initially developed by MoH was adopted by the National Committee on Zoonotic Diseases and has become intersectoral.

PREPAREDNESS ACTIVITIES

- Conducted trainings and exercises on the pandemic influenza contingency plan in certain provinces and districts.
- Developed an adaptation of the influenza pandemic response plan for MERS-CoV and Ebola virus.
- Conducted pandemic influenza planning exercises with the port health authorities, intersectoral entities, the army, and commercial companies.

TRAINING

SIBI Surveillance

- Conducted refresher training on case detection for all sentinel sites during monitoring activities in April 2015.
- Conducted data management training.
- Conducted specimens collection training.
- Conducted logistics management training.

East Jakarta Project

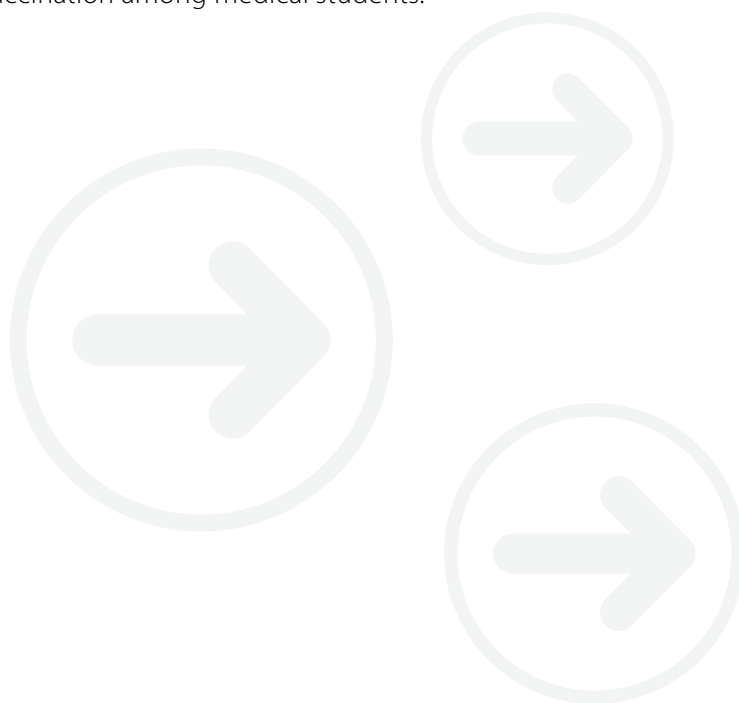
- Conducted refresher training for regional laboratory staff on diagnostic protocols in October 2013.
- CDC facilitated a biosafety and biosecurity workshop conducted in the Balai Teknik Kesehatan Lingkungan (BTKL) by the US Biosecurity Engagement Program.
- Conducted refresher trainings for national ILI surveillance sentinel site staff (clinicians, nurses, regional laboratory staff, and medical records) to improve surveillance data quality.

ILI Surveillance

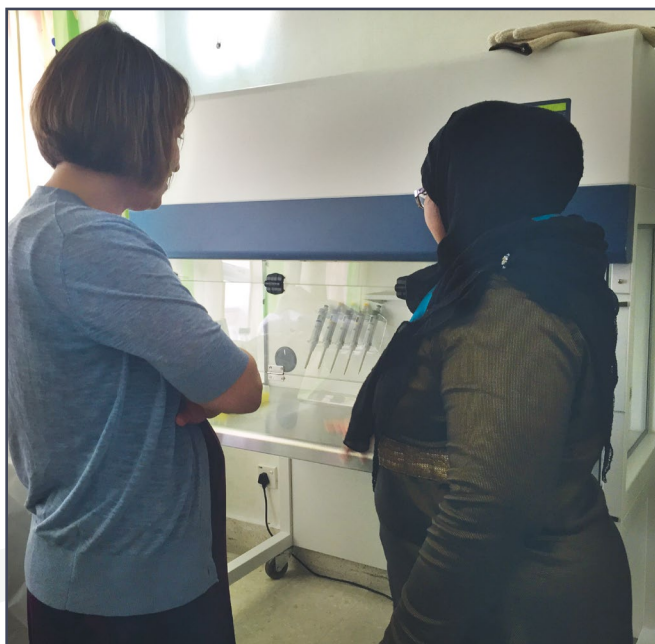
- Conducted refresher training for all sentinel sites in April 2015.

INFLUENZA VACCINE ACTIVITIES

CDC provided technical support for a study conducted by a private medical school in Jakarta on knowledge, attitudes, and practices of influenza vaccination among medical students.



MALDIVES



Reviewing laboratory improvements at Indira Gandhi Memorial Hospital in Malé, Maldives.

OVERVIEW

The Health Protection Agency (HPA) is an independent professional public health institution under the Ministry of Health. HPA was awarded a Centers for Disease Control and Prevention (CDC) five-year capacity building cooperative agreement in September 2013. The agreement aims to build and strengthen the national laboratory and influenza surveillance capacity including establishing protocols for pandemic preparedness and response and sharing information with the World Health Organization (WHO) Global Influenza Surveillance and Response System (GISRS) for global pandemic preparedness.

SURVEILLANCE

Until recently, Maldives conducted acute respiratory infection (ARI) surveillance based on a passive syndromic system which collected data from all hospitals. The system was sensitive to the rise in ARI, but not specific to influenza, as the WHO case definition was not used, and testing for influenza viruses was not available. With the CDC award, three influenza surveillance sites were selected in Malé, and one each on two of the larger, more populated atolls. Both severe acute respiratory infection (SARI)

HIGHLIGHTS

- Initiated SARI and ILI surveillance at IGMH.
- Initiated PCR testing at IGMH's laboratory with up-to-date protocols/procedures and sample handling.
- Updated the National Pandemic Preparedness Plan.
- Conducted Hospital Emergency Preparedness & Response training for all major hospitals up to the atoll level.
- Developed and disseminated an Event-based Surveillance Guideline for central level and SOPs for the atoll level.

and influenza-like illness (ILI) surveillance have been initiated at Indira Gandhi Memorial Hospital (IGMH). All samples will be sent to the national laboratory in Malé. Previously, communicable disease surveillance was mainly by an indicator-based surveillance using disease data from health facility notifications. To improve and formalize early warning and event-based surveillance, a guideline and standard operating procedures (SOP) for Event-Based Surveillance were prepared and disseminated.

SURVEILLANCE ACTIVITIES

- Commenced ILI surveillance at ADK Hospital, a private hospital and a health center.
- Developed standardized data collection forms for ILI and SARI which were pretested with doctors.
- Reviewed and used the standard WHO case definitions.
- Finalized a flow chart and protocols on collecting, packaging, storing and transporting specimens.
- Compiled and disseminated weekly reports.
- Identified data sources for hospitalizations and morbidity of SARI patients which can be used in the future for estimating disease burden.

LABORATORY

The IGMH public health laboratory tested for influenza viruses briefly during the 2009 influenza pandemic. In January 2015, trained staff began to test specimens for influenza by RT-PCR again. Staff are trained through

programs in Thailand, India and CDC Atlanta. A total of 30 samples have been tested; two were positive for an influenza virus.

LABORATORY ACTIVITIES

- Designated laboratory staff at IGMH to attend a RT-PCR refresher training course hosted by CDC.
- Ordered necessary laboratory reagents from CDC's Influenza Reagent Resource (IRR).
- Purchased new equipment and supplies.
- Developed laboratory protocols for sample collection, storage, and transportation.

PREPAREDNESS

The National Pandemic Preparedness Plan was prepared during the 2009 influenza pandemic. In December 2014, with outbreaks of avian influenza A (H7N9) virus and MERS-CoV circulating in some countries, the national plan was revised according to WHO guidelines. A multi-sectoral Pandemic Preparedness Committee, including the national IHR committee and other stakeholders, was established during the Ebola outbreak. The committee is formalized in the revised National Pandemic Preparedness Plan.

PREPAREDNESS ACTIVITIES

- Established a national working group led by the Emergency Preparedness program of the HPA to develop an Atoll Hospital Emergency Response Plan (HERP).
- Trained focal points from all atoll hospitals to draft atoll-specific HERPs.
- Assigned a consultant from Thailand to prepare an event-based surveillance guideline which includes SOPs for early detection and management of outbreaks for health personnel and authorities at national, regional, and local levels.
- Developed a SOP for event-based surveillance for atoll public health units.



Scenery in the capital city of Malé, Maldives.

TRAINING

- Trained staff at ADK Hospital on identifying, reporting and collecting samples from SARI and ILI patients (May 2015).
- Conducted a three-day workshop on influenza surveillance and trained medical and administrative staff from all health facilities in the Male' Region (March 2015).
- Trained medical staff at IGMH on identifying, reporting, and collecting samples from SARI and ILI patients (November 2014).
- Conducted a seven-day workshop on Hospital Emergency Preparedness and Response to train staff in atoll hospitals to develop hospital emergency response plans.

INFLUENZA VACCINE ACTIVITIES

We offer influenza vaccination for all persons traveling for Hajj and Umra pilgrimages.

In the future, Maldives plans to use data generated by the surveillance system to estimate influenza disease burden. This will be used to advocate for providing influenza vaccines to high-risk groups.

NEPAL

OVERVIEW

Nepal's Patan Academy of Health Sciences (PAHS), a public health science university at Patan Hospital, was awarded Nepal's first influenza cooperative agreement in September 2009. The cooperative agreement has strengthened influenza surveillance in Nepal and has supported building capacity in the National Public Health Laboratory (NPHL) which is the National Influenza center (NIC), the Patan laboratory and the sentinel hospital sites. Routine influenza-like illness (ILI) and severe acute respiratory infection (SARI) surveillance at Patan Hospital provides consistently reliable and detailed epidemiologic and virologic influenza data. In September 2014, PAHS began a five-year sustainability grant.

SURVEILLANCE

Under the leadership of the NIC/NPHL, a network of partners including Walter Reed Research Unit Nepal (WARUN) and PAHS oversee influenza sentinel sites that cover key geographic areas around the country. PAHS oversees three hospital sites each with a peripheral health facility that monitors for ILI. WARUN oversees two sites and NPHL, with the assistance of the MOPH Epidemiology and Disease Control Division's (EDCD), five sites. There is a strong collaborative relationship between the three surveillance partners who regularly share data, organize trainings together and support each other through technical assistance and other resources when needed. The larger Network, Nepal National Influenza Surveillance Network (NISN), includes animal health and meets quarterly and on an as-needed basis.

SURVEILLANCE ACTIVITIES

- Collected key data including the total number of out-patients and in-patients and the number of patients meeting the ILI and SARI case definitions at Patan Hospital.
- Maintained a database and analyzed data by week, age, gender, percent of overall cases, clinical presentation, and influenza virus type and subtype.
- Revised protocol for collecting ILI and SARI specimens and data.

HIGHLIGHTS

- Conducted routine SARI surveillance in three hospitals, one in Kathmandu, and one each in East and West Nepal.
- Maintained continuity of SARI surveillance in Patan Hospital including daily sample collection, transport, storage, and reporting.
- Established a molecular diagnostic laboratory at Patan Hospital and testing for influenza viruses.
- Participated in several outbreak responses in coordination with the EDCD.

LABORATORY

The NIC and PAHS operate as a unit sharing the influenza testing workload. NPHL, designated a NIC in April 2010, has molecular and virology laboratories with four staff responsible for specimen extraction, real time RT-PCR detection for influenza viruses, cell culture and virus isolation.

In addition they have capacity to sequence and characterize by serological and real time assays. A recently established molecular laboratory at PAHS Patan Hospital uses real-time RT-PCR to test for influenza viruses in SARI and ILI patient samples.

LABORATORY ACTIVITIES

- Collected and tested 376 SARI samples from September 2014 to April 2015.
- Collected and tested approximately 3,000 ILI samples from April 2011 through April 2015.
- Established that among hospitalized influenza cases, 26% were in persons >65 years of age and 48% <5 years of age.
- Submitted 38 isolates and 50 clinical samples to the WHO Collaborating Center (CC) at NIID, Japan (January 2014–April 2015).
- Established a BSL-3 laboratory at the NIC in July 2014 with financial support from World Bank.

PREPAREDNESS

Rapid response teams (RRT) are in place at the central level under the MOH EDCCD and in all 75 districts under the District Health/Public offices. In the last few years, the Influenza Project has participated in several EDCCD trainings and meetings and the EDCCD response team during several outbreaks, including during outbreaks in the 2015 influenza season.

PREPAREDNESS ACTIVITIES

- Supported EDCCD and the Animal Health Division in responding to avian influenza (AI) poultry outbreaks; no human cases of AI were found.
- Established a joint rapid response team at the national level for immediate mobilization during outbreaks.
- Provided support to Nepal Police Hospital for infection control as part of Ebola preparedness.
- Prepared the NIC to test for suspect avian influenza A (H7N9) virus and MERS-CoV infections.
- Reviewed the National Pandemic Preparedness Plan with the support of WHO. It will be revised to include all emerging and reemerging infectious diseases.

TRAINING

- Conducted surveillance training for staff at all sentinel sites.
- Designated Influenza Pandemic Preparedness and Response Project (IPPRP) staff to participate in a workshop on inclusion of zoonosis in the medical curriculum.
- Conducted infection control training for all sentinel site hospital staff.
- Organized an infection control train-the-trainers meeting for staff from Mechi Zonal Hospital and Nepalgunj Medical College.

INFLUENZA VACCINE ACTIVITIES

WHO SEARO, in collaboration with Nepal, is conducting a cost-effectiveness analysis on the burden of influenza. The findings will be used to demonstrate the value of establishing an influenza vaccination program for high-risk populations.



SRI LANKA



Signage inside Ragama General Hospital in Colombo, Sri Lanka.

OVERVIEW

Sri Lanka is in the second year of a five-year award. Prior to support from the Centers for Disease Control and Prevention (CDC), pandemic influenza preparedness and response activities began with guidance and support from both the World Health Organization (WHO) and the World Organization for Animal Health (OIE). The Epidemiology Unit and Medical Research Institute's (MRI), National Influenza Centre (NIC) of the Ministry of Health (MoH), are responsible for the influenza-related activities in the CDC grant. Key partners include the Health Education Bureau (HEB) of the MoH and the Department of Animal Production and Health (DAPH) of the Ministry of Livestock Development and Agriculture.

Since CDC funding commenced, progress has been made in a few key areas. Sri Lanka now collects consistent, reliable, detailed epidemiologic data on severe acute respiratory infection (SARI) and maintains a web-based system able to generate and routinely share relevant data and analysis.

SURVEILLANCE

Influenza surveillance in humans and animals is conducted as part of the Avian/Pandemic Influenza Preparedness Programme. Influenza surveillance in animals is carried out by DAPH and human influenza surveillance is conducted in selected sentinel hospitals by the Epidemiology Unit. Human influenza surveillance includes both influenza-like illness (ILI)

HIGHLIGHTS

- Collected and provided epidemiological data and specimens from four SARI sites and 19 ILI sites.
- Produced quarterly and annual influenza surveillance reports in addition to the weekly and monthly influenza reports; all are available on the Epidemiology Unit website.
- Collected ILI and SARI epidemiologic data, including the number of patients reporting ILI and SARI symptoms and the number of outpatient visits and in-patient admissions.

surveillance and SARI surveillance. ILI surveillance is carried out in 19 sentinel hospitals and SARI surveillance in four of the 19 sentinel sites.

In 2014, ILI surveillance identified 63,524 (1.4%) ILI patients from a total of 4,541,297 out-patient department visits in 18 hospitals. That same year, SARI surveillance identified 4,246 (3.9%) SARI patients from a total of 107,760 in-patients in four hospitals.

SURVEILLANCE ACTIVITIES

- Posted one surveillance officer at each of the four SARI sites.
- Developed standard operating procedures to streamline sentinel surveillance activities.
- Conducted sentinel site visits to review influenza surveillance activities and provide technical assistance to hospital surveillance staff.
- Developed a web-based system that links data between the Unit, MRI, and the sentinel sites which facilitates data analysis.
- Printed and distributed weekly, quarterly, and annual influenza surveillance reports/bulletins to stakeholders; also published on the health website www.epid.gov.lk.

LABORATORY

MRI was designated a WHO NIC in 1968. The NIC functions as the main national diagnostic laboratory for the Ministry of Health. It has capacity to conduct real-time RT-PCR and viral isolation and to receive and test large numbers of specimens as needed.

LABORATORY ACTIVITIES

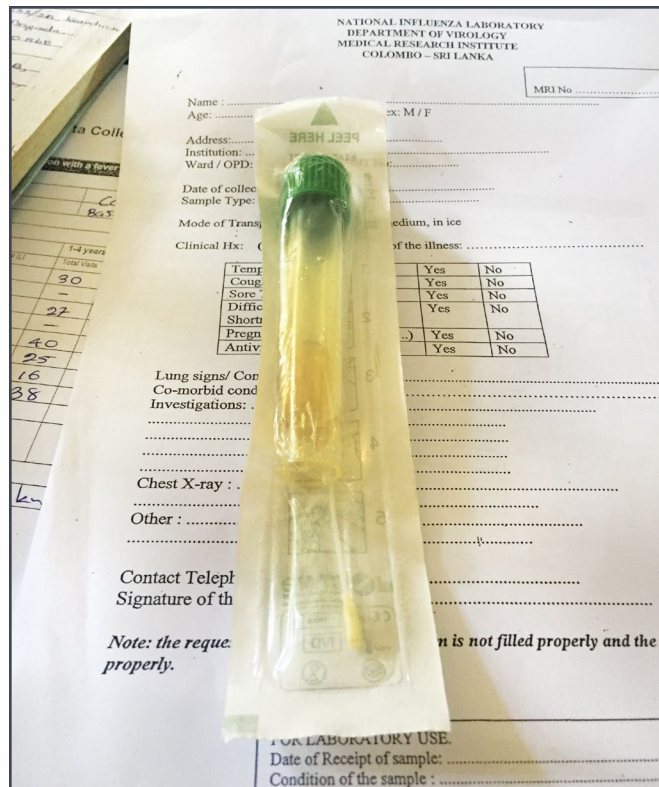
- Characterized seasonal/circulating influenza viruses by type and subtype.
- Tested 1,005 ILI samples; 13.6% (137) were influenza A positive and 1.8% (18) were influenza B (2014).
- Tested 317 SARI samples; 10.7% (34) were influenza A virus positive and 0.63% (2) were influenza B.
- Submitted virologic data through FluNet.
- Submitted seasonal influenza viruses to a WHO Collaborating Centre (CC) twice a year.

PREPAREDNESS

A sustainability plan was developed under the guidance of Ministry of Health Sri Lanka and with stakeholders from the National Technical Committee on Avian/Pandemic Preparedness. The plan includes sustaining ILI and SARI surveillance, sample collection and epidemiologic data reporting. It also includes standard operating procedures (SOP) for each institution.

PREPAREDNESS ACTIVITIES

- Designated the National Technical Committee on Avian/Pandemic Influenza Preparedness and Response to conduct monthly meetings and streamline the country's response to pandemics.
- Distributed awareness materials to all districts and regional epidemiologists who were trained on rapid response.
- Discussed preparedness for MERS-CoV, avian influenza A (H7N9) virus, Ebola virus, and seasonal influenza epidemics at the avian influenza (AI) monthly meetings.
- Provided comprehensive guidelines on MERS-CoV and Ebola to relevant stakeholders.
- Provided revised guidelines on seasonal influenza epidemics to all relevant stakeholders.
- Conducted advocacy meetings and awareness programmes for relevant officials at ports of entry.
- Started an awareness program at the airport by having a 24-hour health desk for MERS-CoV.
- Upgraded the NIC's capacity to test samples from suspected cases of MERS-CoV.



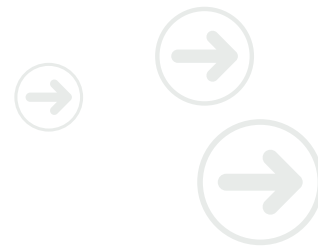
Respiratory collection kit and case report form at the Medical Research Institute in Colombo, Sri Lanka.

TRAINING

- Conducted a training program on influenza surveillance for Medical Administrators and Infection Control Nursing Officers who are responsible for ILI and SARI surveillance in sentinel hospitals.
- Conducted a training program on the web-based influenza surveillance system for Infection Control Nursing Officers who are responsible for ILI and SARI surveillance in sentinel hospitals.
- Conducted a special awareness program for Directors, Medical Officers, and Infection Control Nursing Officers at sentinel hospitals to strengthen surveillance activities.

INFLUENZA VACCINE ACTIVITIES

Influenza vaccination was discussed at the National Immunization Summit held in January 2015 and at the Advisory Committee on Communicable Diseases in June 2015. A decision on influenza vaccination has not been made yet.



THAILAND

OVERVIEW

In August 2014, the U.S. Centers for Disease Control and Prevention (CDC) funding for Thailand in support of routine influenza surveillance ended. Between September 2014 and September 2015, funding for influenza surveillance was provided by a collaboration between the Department of Medical Sciences (DMSc), Thai National Institute of Health (NIH) and the Bureau of Epidemiology. CDC continues to provide technical support to Thailand and the Thai Department of Disease Control (DDC) in the area of influenza with a shift in emphasis towards evaluation of vaccine effectiveness in high-risk groups.

SURVEILLANCE

Thailand has a long-standing sentinel surveillance system for influenza (since 2004). The system routinely collects clinical specimens from sentinel sites around the country and routinely performs influenza virus testing, drug resistance monitoring, and submits viral isolates and unsubtypeable isolates to WHO Collaborating Centers (CC). With Thai Ministry of Public Health (MOPH) funds, the Thai NIC, DMSc has continued to maintain surveillance in six sentinel hospitals situated throughout Thailand's four regions. Data from the systems are shared weekly with partners and sites in a report posted on a public website. Using the strength of the existing influenza surveillance system, the Thai NIC and Thai DDC have collaborated closely with WHO and CDC to expand the system to detect MERS-CoV and avian influenza A (H7N9) virus in SARI specimens.

In addition, educational messages/fact sheets were updated using data from unusual outbreaks in-country and globally and distributed to executives at the MOPH.

SURVEILLANCE ACTIVITIES

- Transitioned support for routine influenza surveillance to the MOPH by reducing the number of sentinel sites yet maintaining all the SARI sentinel hospitals.
- Received notification that one of the Thai viral isolates (B/Phuket/3073/2013-like) would be incorporated into the 2015 Southern Hemisphere influenza vaccine formulation.

HIGHLIGHTS

- Purchased approximately 3.5 million doses of influenza vaccine for use in the public sector.
 - Recommended seven high-risk groups for annual vaccination: health care personnel, persons with chronic disease, persons >65 years, pregnant women, obese persons, persons who are mentally disabled, children aged 6 months to 2 years.
 - Evaluated vaccine effectiveness in high-risk groups in collaboration with CDC.
- Completed a report on resistance of influenza isolates to antiviral treatment.

LABORATORY

Between September 15, 2013 and June 30, 2015, the Thai NIC tested 3,601 specimens from patients with ILI and 1,244 from patients with SARI. Among the specimens from ILI patients, 933 (25.9%) were influenza positive.

These included 251 influenza A (H1N1)pdm09, 316 influenza A (H3N2) and 366 influenza B viruses. Among the specimens from SARI patients, 158 (12.7%) were positive for an influenza virus. These included 41 influenza A (H1N1)pdm09, 75 influenza A (H3N2) and 42 influenza B viruses.

LABORATORY ACTIVITIES

- Attended the annual scientific meeting conducted by the Virology Association of Thailand (November 2014).
- Continued participation in WHO's External Quality Assurance Program (EQAP) twice yearly.
- Enhanced the proficiency testing (PT) program by including influenza A (H7N9) virus positive samples for the first PT panel of fiscal year 2015.
- Circulated a weekly situational report and posted publically-available data at <http://www.thainihnic.org/>.

PREPAREDNESS

In May 2015, the Thai MOPH co-organized the GHSA Meeting "Step towards Regional Strategic Collaboration in Asia-Pacific on Workforce

Development, National Laboratory System Strengthening & Antimicrobial Resistance Prevention to Respond Global Challenges” in collaboration with WHO, CDC, and APSED in Bangkok, Thailand. One of the outputs from the National Laboratory System Strengthening is to strengthen the regional diagnostic capacity of five priority diseases, including influenza. The Thai NIC will play a major role in supporting the training and diagnostic services for influenza for countries without this capability.

PREPAREDNESS ACTIVITIES

- Provided training and information to all responsible staff in DMS Centers.
- Organized the first and second workshops on the EID Laboratory Network (June 2014 and July 2015).
- Published an EID laboratory network manual which provides information of EID testing methods and guidelines on the specimen referral system.
- Organized the first and second workshops on Biosecurity and Biorisk Management (February 2014 and June 2015).

TRAINING

This past year saw the emergence of two new viral respiratory pathogens, avian influenza A (H7N9) virus and MERS-CoV.

To address these new concerns and educate the medical workforce, Thailand’s Influenza Foundation partnered with the MOPH for several trainings. In addition, the Thai NIC trained laboratory scientists in the diagnostics.

- Designated two MOPH staff to participate in the 8th Bi-regional SEARO/WPRO NIC Meeting in Jakarta (August 2014).
- Designated two staff to participate in a regional workshop on Virological Technique in Influenza and Other Emerging Viruses at the National Institute of Virology, in Pune, India (May 2015).
- Trained staff in the 14 regional medical science centers on new PCR diagnostics for avian influenza A (H7N9) virus and MERS-CoV.
- Conducted a two-day workshop to review the proficiency test program (June 2015).

INFLUENZA VACCINE ACTIVITIES

The Thai MOPH piloted a program to increase vaccine coverage among persons aged 65 years and older in Nakhon Phanom Province and increased coverage from 12% in 2014 to 35% in 2015.

RESEARCH

Thailand provides free influenza vaccination to high-risk groups but coverage is low. The CDC collaborates with the Thai Ministry of Public Health (MOPH) on research that can inform policy and program activities to improve vaccine coverage, through development of the evidence base for burden, cost-effectiveness and impact. Areas of research focus include knowledge, attitudes and practices that relate to influenza vaccination, burden of disease, vaccine effectiveness, surveillance methods and economic evaluations.

Research Activities:

- Followed 500 healthy and 500 chronically ill children aged 0 to 36 months at baseline for two years to compare the incidence of mild and severe influenza virus infection in the two groups.
- Determined the effectiveness of the southern hemisphere influenza vaccine to reduce influenza-associated acute respiratory infection in children using a test-negative design.
- Measured the knowledge, attitudes and practices of pregnant women and their providers towards the influenza vaccine.
- Evaluated the increase in influenza vaccine coverage and determinants of vaccination in persons aged 65 years and older.
- Determined the acceptability, feasibility and validity of self-swabbing for detection of influenza infection in a population of elderly.
- Established a cohort of pregnant women to measure the burden of influenza in pregnancy and the effect of maternal influenza vaccination on their offspring during their first six months of life.
- Established a cohort of persons aged 65 years and older to measure the effectiveness of the influenza vaccine to reduce the burden of influenza-associated acute respiratory infection.



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WHO Western Pacific Region (WPR)



WHO Western Pacific Region [WPR]

In fiscal year 2015, the U.S. Centers for Disease Control and Prevention (CDC) funded six bilateral influenza cooperative agreements in the Western Pacific Region of Asia. These agreements are with ministries of health or institutions designated by the Ministry of Health to work with the Centers for Disease Control and Prevention (CDC) to build capacity to routinely identify, diagnose, and respond to seasonal and pandemic influenza.

Direct country support through non-research cooperative agreements is established in the following six countries/entities:

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

In addition, CDC supports the World Health Organization (WHO) Regional Office for the Western Pacific through a cooperative agreement; this agreement provides assistance to three additional countries:

- Fiji
- Lao People's Democratic Republic
- Papua New Guinea (PNG)

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

- To build sustainable national capacity for surveillance for seasonal influenza, pandemic influenza and other emerging diseases and preparedness for implementation of the International Health Regulations 2005 (IHR).
- To make routine contributions of surveillance data to the WHO Global Influenza Surveillance and Response System (GISRS).
- To increase the geographic reach of WHO's GISRS.
- To provide quicker access to critical virus isolates from humans and birds for WHO GISRS.

- To increase the numbers of shipments and influenza isolates provided by WHO WPR influenza laboratories to WHO Collaborating Centers (CC) for analysis.
- To develop sustainable epidemiologic and virologic surveillance systems for severe influenza in order to gain an understanding of the burden of disease in the WHO WPR.

In fiscal year 2013, CDC expanded its cooperative agreement portfolio to include a Vaccine Policy component. Country support was established in Vietnam and China to introduce or expand the use of seasonal influenza vaccines.

The core activities include: conducting a needs assessment to identify barriers, developing a three-year action plan to introduce vaccines, implementing the plan and introducing or expanding vaccine use to the target population through a national policy.

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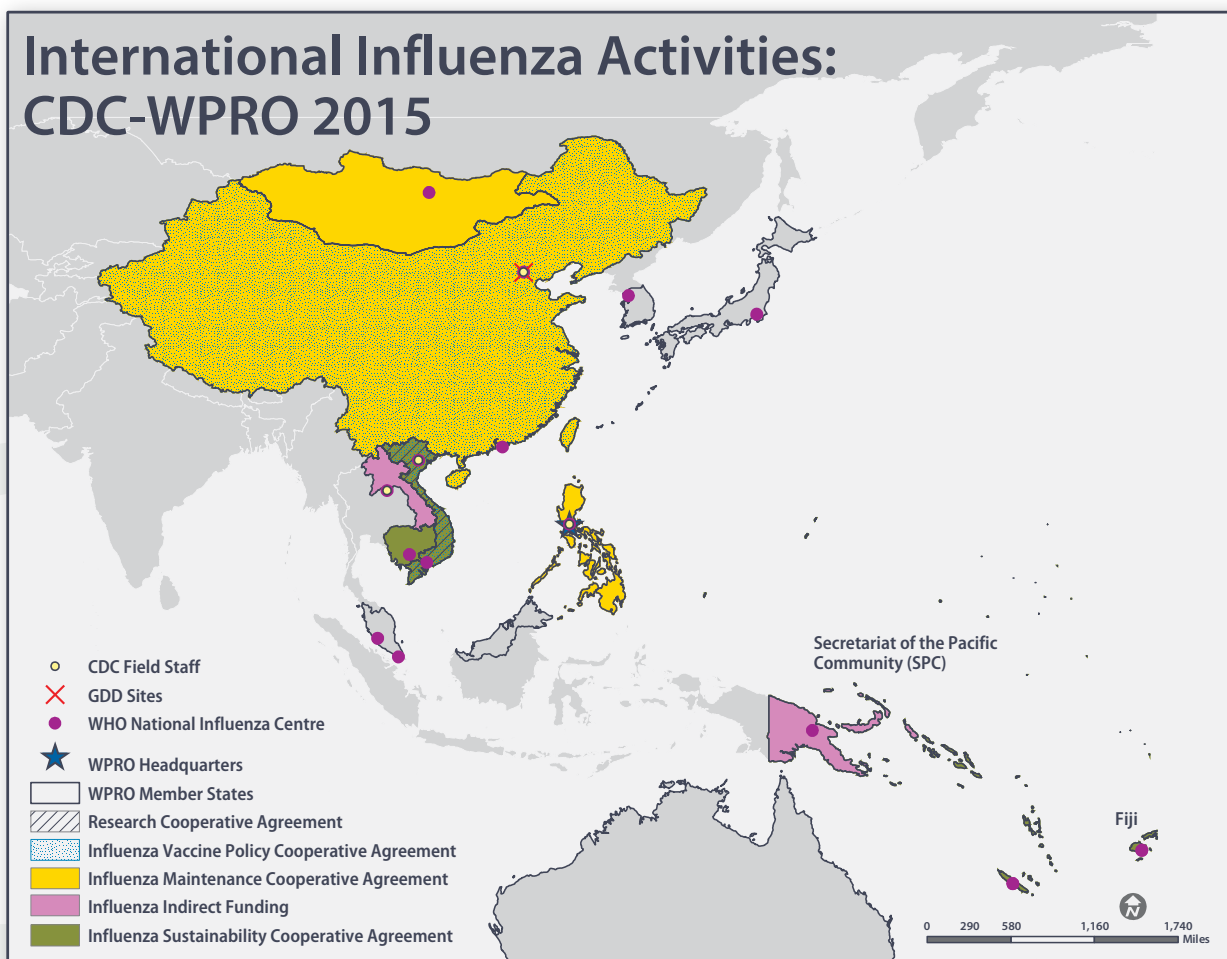
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WHO Regional Office for the Western Pacific [WPRO]



HIGHLIGHTS

- Assisted with the response to the second (2013–2014) and third (2014–2015) waves of human infection with avian influenza A(H7H9) in China, through routine risk assessments and three-level (Country Office, Regional Office, Headquarters) and tripartite (FAO, OIE, WHO) teleconferences.
- Maintained hotlines for event-based surveillance (EBS) in Lao PDR and Cambodia.
- Initiated severe acute respiratory infection (SARI) surveillance in intensive care units (ICU) in Fiji.
- Implemented an Early Warning and Response System to monitor potential communicable disease outbreaks following Cyclone Pam in Vanuatu.
- Integrated animal surveillance into EBS in Lao PDR and coordinated joint human/animal avian influenza coordination meetings.
- Integrated influenza surveillance into the Ministry of Health national plan in Fiji.
- Worked with WHO Collaborating Centers (CC), and other laboratory experts to improve testing proficiency for emerging infectious diseases (EID) in the Region.



Posters put up after H5N1 outbreak in Kratie, Cambodia (May 2015).

U.S. CDC DIRECT SUPPORT

The five-year cooperative agreement between CDC and WHO WPRO began on September 30, 2011. It supported the implementation of the Asia Pacific Strategy for Emerging Diseases (APSED 2010), which provides a common framework to strengthen national and regional capacities to manage emerging diseases and public health threats, improve pandemic influenza preparedness and comply with the core capacity requirements of the International Health Regulations (2005). The strategy includes components (such as surveillance and laboratory strengthening) that support the Global Influenza Surveillance and Response System (GISRS), which, in this region, currently consists of 21 National Influenza Centres (NICs) in 15 countries, three WHO Collaborating Centres (CCs) for Reference and Research on Influenza in Australia, China, and Japan, two Essential Regulatory Laboratories in Australia and Japan and an H5 Reference Laboratory in Hong Kong, China. The cooperative agreement also includes funds directed to countries through WHO country offices in Cambodia, China, Pacific Island Countries, Lao People's Democratic Republic (Lao PDR), and Papua New Guinea (PNG).

SURVEILLANCE

Event-and indicator-based surveillance was supported in Lao PDR and Cambodia. These systems supported the successful deployment of Rapid Response Teams for several outbreak investigations. An Early Warning and Response System was established in Vanuatu after Cyclone Pam to monitor potential communicable disease outbreaks. Improved reporting and information sharing was also supported.

Cambodia began publishing monthly respiratory disease bulletins based on influenza-like illness (ILI) and severe acute respiratory infection (SARI) data.

Lao PDR produces a weekly laboratory report based on ILI and SARI sentinel site surveillance in 13 provincial hospitals. The Pacific Island Countries released their first influenza bulletin integrating syndromic and virologic data from ILI and laboratory surveillance sites.

Annual meetings of the National Influenza Centres (NIC) and influenza surveillance sites were held in Beijing, China in November 2013 and in Jakarta, Indonesia in August 2014. These meetings brought together representatives of NICs and influenza surveillance staff from WHO's Western Pacific and South-East Asia regions as well as representatives from the WHO CC's in the USA, Australia, Japan, China and Hong Kong (China).

The 2013 meeting was attended by 119 participants from 22 countries and focused on lessons learned from avian influenza A(H7N9) as well as experiences for severe respiratory infection detection. The 2014 meeting focused on ways to further strengthen influenza surveillance systems, data reporting, response and the role of GISRS to provide data for vaccine policy development.

Support was also provided to Papua New Guinea to create a position dedicated to collecting respiratory samples from ill persons and improving surveillance efficiency, and to send PNG NIC staff for training at the WHO CC at the Victorian Infectious Diseases Reference Laboratory (VIDRL) in Melbourne. Support was also provided to the WHO Country Office for the ESR Team Lead.



SURVEILLANCE ACTIVITIES

2014

- Facilitated daily event-based surveillance conducted by Field Epidemiology Trainee Program participants from six Member States; participants reported over 500 cases of animal and human avian influenza A virus infections including subtypes H5N1, H5N2, H5N3, H5N6, H5N8, H6N1, H7N2, H7N9, H9N2, and H10N8.
- Facilitated event information site reports for 318 human cases of avian influenza A (H7N9) virus infection, three human cases of avian influenza A (H10N8) and two human cases of avian influenza A(H9N2).
- Participated in the Cambodia-Viet Nam Bilateral Meeting on influenza A (H5N1) virus in March 2014, the “Expert Advisory Group for Burden of Influenza,” in Geneva, December 2013, and the “FAO/WHO sub-regional technical consultation to review preparedness, surveillance and response for Avian Influenza A(H7N9) in Lao PDR, Myanmar, and Vietnam,” in Yangon, Myanmar, April 2014.

2015

- Developed an action plan for improved reporting and utilization of influenza surveillance data.
- Developed a prototype for interactive web-based influenza reporting to display both epidemiological (FluID) and virological (FluNet) data.
- Published biweekly regional situational updates of seasonal influenza, weekly updates of avian influenza, and the online Western Pacific Surveillance and Response Journal (WPSAR).
- Supported the Surveillance Officer, Monitoring and Evaluation Technical Officer, Coordinating Editor of WPSAR, Risk Communications Officer, and administrative assistants.

Cambodia

2014

- Investigated 17 laboratory-confirmed human infections of avian influenza A(H5N1) virus, notified WHO through the IHR mechanism and shared information with partners.
- Supported the Communicable Disease Control (CDC) Department and Provincial Health Department to investigate an influenza outbreak in a prison in Battambang Province.
- Developed and trained on a joint pilot protocol between human and animal health sectors

on outbreak investigations of avian influenza in Kampot and Tekeo provinces.

2015

- Conducted 12 small outbreak investigations in poultry.
- Maintained eight SARI and seven ILI sites.
- Supported a suspected outbreak of influenza in Pursat Province.
- Supported national and provincial teams with biannual quality assurance visits to ILI sentinel surveillance sites.
- Provided refresher trainings for ILI surveillance staff as well as trainings to enhance information sharing among sentinel sites.
- Supported the Cambodia Early Warning and Alert Network (CamEWARN) indicator-based surveillance system.
- Issued Monthly Respiratory Bulletins in collaboration with CDC Department, MoH, AFRIMS, NAMRU and Institut Pasteur du Cambodge and shared it with partners
- Supported the Team Leader, National Professional Officer, and the National Professional Officer for Surveillance as well as the administrative support group in Emerging Disease Surveillance and Response for influenza surveillance, outbreak investigations, and infection control.

Lao People’s Democratic Republic (PDR)

2014

- Introduced new SARI case definitions and forms to hospital directors, deputies, coordinators, and ILI/ SARI sentinel surveillance staff.
- Conducted the Annual Surveillance and Response Workshop in March 2014 to review past activities, outbreaks, and to discuss gaps in surveillance systems.
- Conducted the Annual Lao FET Alumni Conference to share outbreak investigation experiences with new trainees.

2015

- Conducted 18 outbreak investigations, two of which were in persons with ILI.
- Conducted a joint human-animal health meeting on avian influenza surveillance and response with staff and stakeholders.
- Maintained surveillance at eight ILI and five SARI sentinel sites at 13 provincial hospitals.

- Supported the upgrade of the Ministry of Health LaoEWARN surveillance informatics infrastructure.
- Supported ILI and SARI sentinel surveillance in five provinces, with technical assistance for seasonal influenza surveillance, conducting workshops and providing regular site monitoring.
- Distributed weekly laboratory results to all sentinel surveillance sites.
- Carried out joint field supervision in collaboration with NCLE and U.S. CDC.
- Provided support for an Epidemiologist, National Professional Officer for FETP, Laboratory Specialist, and an administrative assistant.

Pacific Island Countries and Territories (PICT)

2014

- Developed site assessment checklists for laboratory and ILI surveillance.
- Revised standard operating procedures (SOP) for ILI surveillance and sample transport outside of Suva.
- Developed national SARI surveillance guidelines.
- Developed posters and promotional material to be used at ILI and laboratory surveillance sites.
- Revised surveillance reporting formats for the Influenza Technical Working Group (TWG), the weekly surveillance report and the monthly Fiji Surveillance Bulletin.
- Registered with FluNet to allow entry of PICT data.
- Initiated SARI surveillance in the intensive care unit of the Commonwealth War Memorial Hospital in Suva, Fiji.
- Provided support to the sub-regional NIC (Fiji CDC-Mataika House).
- Developed proposal for the implementation of event-based surveillance in Pacific settings.

2015

- Integrated influenza surveillance into the Ministry of Health National Plan.
- Produced the first influenza bulletin integrating syndromic and virologic data.
- Supported the Early Warning and Response System (EWARS) to monitor potential communicable disease outbreaks after Cyclone Pam in Vanuatu.
- Provided technical support on surveillance in Papua New Guinea (PNG).
- Supported an outbreak investigation in the

Federal States of Micronesia.

- Coordinated influenza surveillance through the National Influenza Surveillance TWG comprised of WHO and MOH representatives.
- Provided assistance for both laboratory and syndromic (ILI/SARI) surveillance to the ministries of health by supporting influenza surveillance officers for Fiji, Solomon Islands, and Vanuatu.
- Supported a Medical Officer (Team Leader), Surveillance Coordinators (Vanuatu, Fiji, Solomon Islands), and a Laboratory Specialist for the Fiji NIC.

LABORATORY

Support was provided for the procurement of reagents and supplies, specimen transport and testing. Procurement needs were determined based on influenza external quality assessment scores. Technical support was also provided at laboratory sites to ensure proper testing methods, sample handling and biosafety protocols were followed. Technical support was provided to improve virological data reporting through the GISRS FluNet system. Support was also provided to national laboratories to process samples for outbreak investigations as well as routine surveillance activities.

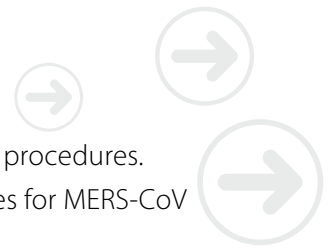
LABORATORY ACTIVITIES

WPRO

- Provided technical guidance and advice to laboratories in member states on the referral of specimens between laboratories.
- Helped select laboratories and NICs obtain equipment, including a -80°C freezer for PNG. Laboratories also received reagents and disposables for ensuring clean and safe laboratory work.
- Worked closely with WHO CCs, NICs, and other relevant laboratories to plan for the 9th meeting of NICs and Influenza Surveillance in Cambodia (August 2015).

Cambodia

- Supported the procurement of reagents and supplies, shipping, and testing of SARI and ILI samples at the National Institute of Public Health (NIPH). In 2015, NIPH tested approximately 300 SARI and 390 ILI samples.



- Supported confirmatory testing by the NIPH on all positive samples and 10% of all negative samples. NIPH tested 66 event-based surveillance specimens from SARI cases for influenza A (H5N1) and 35 SARI specimens for influenza A (H7N9) viruses.
- Supported weekly transportation of specimens from seven provincial sentinel sites to Phnom Penh for testing.

Lao People's Democratic Republic (PDR)

- Procured influenza laboratory supplies for the National Centre for Laboratory and Epidemiology (NCLE) in Vientiane including reagents for detecting avian influenza A (H7N9) and repaired critical laboratory equipment.
- Tested an average of 53 outbreak and surveillance specimens for influenza viruses each week in 2014 and found the influenza positivity proportion to range from 0 to 64%.
- Shared 13 samples from persons suspected of having avian influenza with the National Institute of Infectious Diseases (NIID) in Japan; all samples were negative for influenza viruses.
- Tested approximately 70 specimens from outbreaks and surveillance for influenza viruses each week during the first quarter of 2015.
- Sent 22 influenza isolates and three clinical samples to U.S. CDC, and 20 influenza insulates to NIID in November 2014.
- Sent 21 influenza isolates and three samples to U.S. CDC and 20 isolates to NIID in January 2015.
- Conducted field monitoring and on-the-job training in specimen collection and biosafety at all sentinel and non-sentinel sites in 17 provinces.
- Supported a Laboratory Specialist.

Pacific Island Countries and Territories (PICT)

- Resumed contribution of virological data to FluNet.
- Tested samples from ILI sites and from SARI site at CWM Hospital.
- Worked with WHO CC in Melbourne for sequencing and further testing of influenza positive samples.
- Validated new influenza diagnostic reagents.
- Introduced and validated the influenza A H7 RT-PCR assay at Fiji NIC.

- Revised standard operating procedures.
- Received primers and probes for MERS-CoV testing.

PREPAREDNESS

Capacities of IHR National Focal Points (NFPs) were strengthened and tested through an IHR communication exercise called "Crystal" in December 2013 and 2014. PanStop was carried out in February 2014, to practice, validate, and strengthen procedures for determining if a rapid containment operation is necessary to stop or slow the spread of an outbreak of influenza with pandemic potential.

In 2015, there was a focus on the integration of the animal and human sectors for preparedness activities. Participants from the Western Pacific countries participated in a multi-sectoral workshop which focused on zoonotic influenza viruses. Standard operating procedures were also developed for outbreak and emergency response. Although the PanStop exercise could not be conducted in 2014 due to large scale deployment to support the Ebola outbreak, the experience gained through Ebola response and the lessons learned for effective response will be important for future public health emergencies.

Other support for preparedness included activities for Field Epidemiology Training fellows, procurement of supplies for rapid response teams, and human resources for technical guidance on outbreak response and for health authorities developing, delivering and evaluating training programs.

PREPAREDNESS ACTIVITIES

WPRO

- Conducted the fifth annual IHR exercise (IHR Exercise Crystal) to test the capacity for and adherence to communications requirements outlined in IHR (2005) (December 2013).
- Conducted an additional IHR communication exercise (December 2014).
- Conducted a rapid containment exercise called PanStop in Manila (February 2014).
- Designated the WPRO Influenza Technical Officer to participate in the 3rd WHO Informal Consultation on Improving Influenza Vaccine Virus Selection (April 2014).

- Enabled IHR National Focal Points to test their preparedness and response procedures and highlighted the application of pandemic preparedness plans to strengthen all-hazards public health emergency planning through a Regional Ebola Simulation Exercise.
- Supported participation of Western Pacific countries in the Fifth Asia Pacific Workshop on Multi-Sectoral Collaboration for the Prevention and Control of Zoonosis (November 2014).
- Supported the annual testing of member states' capacity for and adherence to communications requirements outlined in IHR.
- Participated in monthly risk assessments and held monthly three-level (Country Office, Regional Office, Headquarters) and tripartite (FAO, OIE, WHO) teleconferences in response to the second (2013/2014) and third (2014/2015) waves of human infection of avian influenza A(H7H9) virus in China.

Cambodia

- Provided technical support to develop outbreak investigation SOPs that address multi-sectoral coordination, deployment of personnel during an outbreak, procurement, transport, and risk communication.
- Supported World Hand Hygiene Day 2014.
- Supported 2014 Infection Prevention Workshop.
- Provided technical support to revise training materials for clinicians on clinical management for severe acute respiratory infection (SARI).
- Conducted an assessment of the Institut Pasteur du Cambodge (IPC) capacity and isolation units of five hospitals.

Lao People's Democratic Republic (PDR)

- Supported a public health emergency preparedness simulation exercise with approximately 80 national rapid response training (RRT) participants.
- Supported an epidemiologist for influenza preparedness and outbreak response activities.

Pacific Island Countries and Territories (PICT)

- Commenced planning for review of Fiji Pandemic Preparedness and Response Plan.
- Developed an event-based surveillance proposal for implementation in Pacific island countries.

- Commenced planning for Fiji National Influenza Surveillance Meeting.
- Reviewed and updated personal protective equipment (PPE) stockpile.

TRAINING

WPRO

- Adapted WHO manual for estimating burden of influenza disease for application in selected countries of the Western Pacific Region.
- Provided technical support for a two-day Infectious Substances Shipping Training (ISST) in Fiji for 29 participants.

Cambodia

- Supported a National Epidemiology Conference in September 2014.
- Participated in ILI surveillance workshops for information sharing and refresher training conducted by the Ministry of Health (MOH).
- Conducted Applied Epidemiology Training (AET) on influenza surveillance and IHR core capacities.
- Supported an AET introductory course on outbreak investigation and response.
- Supported AET field activities including investigation of ILI clusters and human infections with avian influenza.
- Drafted an infection safety training curriculum for healthcare workers, including an assessment and planning tool for infection, prevention and control in isolation rooms.
- Provided technical support for Rapid Response Team training in investigation of human infection with avian influenza, risk assessment, and specimen collection.
- Organized training workshop for teachers from public and private medical/co-medical universities and colleges on infection, prevention and control.

Lao People's Democratic Republic (PDR)

- Provided technical and financial support to the one-year Lao Field Epidemiology Training (FET). FET Cohort V graduated in February 2014.
- Initiated FET Cohort VI which completed Module III lectures, field work, and data collection in March 2014.
- Conducted training on case management of SARI at one sentinel hospital in April 2014.

- Supported six nurses, from six different hospitals, to attend an infection prevention and control course in Thailand, March–June 2015.

Pacific Island Countries and Territories (PICT)

- Trained on infection, prevention and control for influenza in Vanuatu.
- Developed training material for three-day surveillance and outbreak response workshop for Divisional Response Teams in Fiji.
- Developed and provided materials to surveillance sites including a sample collection video, SOPs, and posters.
- Conducted site visits to laboratory-based surveillance sites, providing on-site refresher training.

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CAMBODIA



Meeting with Cambodian colleagues.

OVERVIEW

Cambodia is currently beginning their tenth year of support through a U.S. Centers for Disease Control and Prevention (CDC) cooperative agreement. This support has enabled Cambodia to build human capacity and infrastructure for influenza surveillance, response, laboratory diagnosis, and pandemic preparedness resulting in the establishment of a molecular laboratory capable of detecting influenza viruses, seasonal and avian, and other respiratory viruses at Cambodia's National Institute of Public Health Laboratory (NIPHL). Currently, sentinel sites in six provinces are being supported for influenza-like illness (ILI) surveillance. NIPHL, Cambodia Centers for Communicable Diseases (CCDC) and CDC are planning a sustainability workshop in late 2015 to establish a plan for continuing the surveillance capacity.

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 the Ministry of Health (MOH) with technical guidance from CDC and WHO. Currently, influenza-like illness (ILI) surveillance involves seven sites (health centers and hospital outpatient departments) located in seven provinces and Phnom Penh. SARI surveillance consists of eight hospitals from Phnom Penh, Siem Reap,

HIGHLIGHTS

- Established influenza virus isolation and characterization at NIPH's virology laboratory in early 2015.
- Enhanced influenza laboratory infrastructure to meet National Influenza Center (NIC) criteria and sustain the current activities of laboratory testing.
- Strengthened and expanded the national influenza surveillance system.

Kandal, Takeo, Kampot, Kampong Cham, and Svay Rieng. Influenza surveillance has clearly demonstrated the existence of annual influenza seasonality in Cambodia.

SURVEILLANCE ACTIVITIES

- Utilized and upgraded the mobile phone short message service (SMS) reporting system for ILI surveillance.
- Performed testing for influenza A and B viruses and subtyping for H1N1pdm09, H3N2, H5N1, H7N9 and H9N2 viruses as part of ILI and SARI surveillance, as well as MERS-CoV.
- Conducted site visits at all ILI and SARI sentinel sites.
- Produced a monthly Respiratory Disease and Influenza Bulletin through the MOH/CCDC.
- Implemented testing for human metapneumovirus, RSV, and parainfluenza viruses as part of SARI surveillance.

LABORATORY

Support from the cooperative agreement has resulted in substantial strengthening of laboratory capacity, including technician skills, 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 types and subtypes, including influenza A (H1N1) pdm09, H3N2, H5N1, H7N9, H9N2 and influenza B/Victoria and B/Yamagata, and also for MERS-CoV, in addition to multiplex PCR testing for other selected respiratory viruses. In early 2015, cell culture and virus isolation including virus characterization were introduced to the NIPH laboratory. NIPH can also perform gram stain, culture and identification

for various clinical specimens and supports the development of microbiology laboratories at national and provincial hospitals.

LABORATORY ACTIVITIES

- Tested 3,011 influenza specimens (979 from ILI sentinel sites; 2,032 from SARI sentinel sites).
- Submitted a total of 60 influenza-positive samples to the WHO CC's in Atlanta and Melbourne.
- Performed internal quality control for media preparation, antimicrobial susceptibility testing, and gram stain.
- Participated in WHO's External Quality Assessment Project (EQAP) and CDC's performance panel.
- Completed development of the BSL-2, BSL-2+, and cell culture rooms and put essential equipment in place.
- Strengthened SARI surveillance by incorporating microbiologic testing of sputum and blood culture samples, resulting in significantly greater laboratory activity.

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 the MOH and WHO have led the development of a health sector response plan. NIPH laboratory staff have performed real-time RT-PCR to detect influenza A and B viruses including influenza A subtypes H3N2, H1N1pdm09, H5N1, H7N9, H9N2, and novel MERS-CoV.

Virus isolation and characterization has been performed in the BSL-2/2+ laboratories. Bacteria cultures have been performed for respiratory pathogens identification and drug sensitivity testing. The CCDC team, together with partners, is well prepared to conduct investigations and respond to any unknown or unusual outbreak. They have conducted field investigations and responses, including clinical case management on a cluster of fever death of unknown etiology and three foodborne outbreaks, and presented findings to the technical working group (TWG).

PREPAREDNESS ACTIVITIES

- Provided recommendations on infection control measures and case management.
- Conducted emergency outbreak investigations and response.
- Developed reports to disseminate findings to stakeholders through press releases.
- Worked through the existing RRT/AET system from community to central level to investigate and respond to emerging and re-emerging diseases following event-based surveillance.
- Supported outbreak investigations and response for human cases of avian influenza A (H5N1) virus in 2013 and early 2014.

TRAINING

- Identified two NIPH technicians to attend the Strengthening of GISRS-International Air Transport Association (IATA) Licensing for NICs workshop.
- Trained five NIPH technicians on influenza virus isolation and characterization (January 2015).
- Trained five NIPH technicians on infection control prevention in a BSL-2/2+ facility (February 2015).
- Identified one staff member to attend the Next Generation Sequencing and Bio-information Data Analysis course in Thailand (March 2015).
- Identified one staff member to attend the Advanced Influenza rRT-PCR Workshop in Atlanta, GA—USA (March 2015).

INFLUENZA VACCINE ACTIVITIES

We do not perform influenza vaccine activities at this time. Our goal is to introduce a seasonal influenza vaccination program in the near future, in particular after conducting an analysis for disease burden from the surveillance data.

CHINA



Inoculation of embryonated eggs with clinical samples at the National Influenza Center of China.

OVERVIEW

The U.S. Centers for Disease Control and Prevention (CDC) and China CDC have a long-term partnership on influenza that spans more than 20 years. Currently, China receives support to expand the use of seasonal influenza vaccine in their public health programs and a smaller amount of funding is provided to maintain the capacity of the national influenza surveillance network for the early detection of novel influenza viruses with pandemic potential. In addition, the U.S. CDC and China CDC work together to improve the rapid response to novel influenza viruses.

SURVEILLANCE

The Chinese government funds the influenza surveillance systems in China, including 408 network laboratories and 554 sentinel hospitals for influenza-like illness (ILI) and virology surveillance, 25 sentinel hospitals for severe acute respiratory infection (SARI) surveillance, and pneumonia of unknown etiology (PUE) surveillance throughout the country.

HIGHLIGHTS

- Collaborated with stakeholders to evaluate the pneumonia of unknown etiology (PUE) surveillance system to inform revision of the national protocol.
- Collaborated with U.S. CDC in scientific activities related to avian influenza A (H7N9) virus prevention and control.
- Collaborated with the U.S. CDC influenza team in Beijing to identify domestic scientific evidence and design and implement innovative pilot interventions that will inform influenza vaccination policy in China.

During October 2013–2015, with support from U.S. CDC, China CDC conducted surveillance quality improvement activities, enhancement to the national influenza surveillance information system, data analyses, and efforts to share surveillance data with the global community. The enhanced influenza surveillance systems facilitated the early identification and response to the avian influenza A (H7N9) virus outbreak, as well as the early detection of human infections with novel influenza viruses H10N8, H9N2 and H5N6.

SURVEILLANCE ACTIVITIES

- Interviewed 487 clinicians in 43 hospitals in Beijing, Hubei, Zhejiang and Guizhou provinces to understand clinician knowledge and practices related to the PUE surveillance system and case reporting.
- Strengthened the analysis and utilization of ILI, SARI and PUE surveillance data for avian influenza A (H7N9) virus outbreak response efforts.
- Expanded antiviral drug resistance surveillance for viruses collected through the ILI surveillance system with 5,569 viruses tested in the past year (compared with 1,041 the prior year).
- Shared 195 representative viruses with other WHO Collaborating Centers (CC) in a timely manner.
- Strengthened the capacity to conduct egg-based virus isolation in more than 60% of all 408 network laboratories.

- Tested more than 1,000 samples from severe acute respiratory infection cases for multiple pathogens.
- Conducted virus transmission capacity analyses on the basis of influenza outbreak incidents.

LABORATORY

In fiscal years 2014 and 2015, the Chinese National Influenza Center (CNIC) and U.S. CDC worked together to enhance ILI surveillance quality and CNIC's capacity to better support their 408 network laboratories. At the national level, thirteen senior staff participated in international meetings and trainings and received training on surveillance data analysis, influenza detection technology, scientific writing and other relevant topics in order to enhance CNIC's capacity to fulfill the requirements and responsibilities as a WHO CC, and to support the antigenic, genetic and drug resistance testing of avian influenza H7N9 virus in a timely manner.

LABORATORY ACTIVITIES

- Initiated and conducted the ISO 15189 laboratory accreditation at CNIC and four network laboratories.
- Established the classical reassortment platform for seasonal influenza candidate vaccine strains.
- Improved the capacity of network laboratories to conduct egg-based virus isolation.
- Participated and presented at international meetings, playing a greater role in global influenza control.
- Supported the monitoring of mutations of avian influenza H7N9 virus in a timely manner.

PREPAREDNESS

The risk of emerging novel influenza viruses with pandemic potential cannot be ignored in China, and the existing pandemic preparedness plan needs improvement. China CDC, with support from U.S. CDC, is developing a new national pandemic preparedness plan. In addition, China CDC is working closely with the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and other partners to promote One Health approaches to influenza-related activities in China.

PREPAREDNESS ACTIVITIES

- Collaborated with U.S. CDC and WHO on the development of the national pandemic preparedness plan.
- Promoted communication on pandemic preparedness topics between China CDC and pandemic preparedness experts at U.S. CDC, Atlanta.
- Participated in the United Nations Theme Group on Health related to diseases at the animal-human interface.

TRAINING

- Supported hands-on training on sequencing and serology testing for 64 laboratory scientists from 32 provincial level network laboratories.
- Supported professional development of 11 CNIC scientists as they participated in training and international conferences in Geneva, London, Riga, Singapore, and Manila.
- Supported training of SARI surveillance staff from 25 provinces engaged in the national SARI surveillance system.

INFLUENZA VACCINE ACTIVITIES

Currently, seasonal influenza vaccine is not included in China's Expanded Program on Immunization. Influenza vaccination coverage among groups recommended for vaccination by WHO, U.S. CDC, and China CDC, including pregnant women, older adults, young children, people with chronic diseases and healthcare workers, is extremely low. China CDC is participating in a multi-country project designed to develop policies to expand seasonal influenza vaccination coverage.

In collaboration with Beijing CDC, Zhejiang CDC, Ningbo CDC and U.S. CDC, China CDC's focus is the expansion of vaccination coverage in two populations: young children living in Beijing, and older adults living in Ningbo. China CDC, the local CDCs and U.S. CDC are working together to gather and analyze scientific evidence on vaccine coverage, knowledge, attitudes, and practices (KAP) related to influenza infection and seasonal influenza vaccination, influenza disease burden and vaccine effectiveness to inform vaccine policy development in China.

In addition, Beijing CDC and Ningbo CDC are implementing innovative interventions to increase public acceptance and availability of seasonal influenza vaccination, while making recommendations for influenza vaccine policies in Beijing and Ningbo. In the future, successful interventions will be scaled up to other cities in China.

RESEARCH

The U.S. CDC is collaborating with China CDC, Fudan University School of Public Health and Suzhou CDC on the following research projects to inform both seasonal and avian influenza prevention and control recommendations and interventions in China in the future.

A study investigating the most recent cases of the avian influenza A (H7N9) virus outbreak in China to identify risk factors associated with human infection,

and to develop recommendations to prevent and control human infections. As of July 2015, there have been 680 human cases and more than 280 deaths of avian influenza A (H7N9) virus infection in China. Collaborations between China CDC and the U.S. CDC during the outbreaks have facilitated virus sharing and information exchange.

A prospective study to define the epidemiological characteristics and economic burden of severe respiratory infection (SARI), and specifically influenza infection, among hospitalized children less than five years of age in Suzhou, China. This study has established the disease burden of influenza-associated hospitalization among children aged less than 5 years old in Suzhou, and has provided local scientific evidence for influenza vaccine policy development in China.



China's national influenza meeting organized by the National Influenza Center of China in October 2014 in Guiyang, Guizhou Province. Opening remarks were made by Dr. Shu Yuelong, Director of the National Influenza Center of China, Dr. Wang Dingming, the Guizhou Provincial CDC Director, and Dr. Carolyn Greene, Director of the U.S. CDC influenza program in China.

LAO PEOPLE'S DEMOCRATIC REPUBLIC




Influenza Vaccination Campaign.

OVERVIEW

Since 2005, Lao People's Democratic Republic (Lao PDR) has received support through the Western Pacific Regional Office (WPRO) for avian, pandemic, and seasonal influenza preparedness to strengthen laboratories, surveillance, outbreak response, capacity building initiatives, infection control guidelines and best practices, clinical case management, and pandemic planning. In 2010, the National Center for Laboratory and Epidemiology (NCLE) was designated as a National Influenza Center (NIC) by the World Health Organization (WHO). Over the past 10 years, Lao PDR has continued to develop and improve their capacity building beyond influenza in support of the International Health Regulations. Beginning in fiscal year 2016, NCLE will be graduating to the maintenance phase of the program.

SURVEILLANCE

Lao PDR continued surveillance for influenza-like illness (ILI) at eight hospital sites in five provinces and for severe acute respiratory infection (SARI) at five sites in five provinces; the sites are geographically distributed throughout Lao PDR. Five hundred and eighty-seven and 777 SARI patients were screened for influenza in 2013 and 2014, respectively. SARI

HIGHLIGHTS

- Incorporated seasonal influenza vaccine into the National EPI Strategy.
- Deployed influenza vaccine reaching over 700,000 people through the Partnership for Influenza Vaccine Introduction (PIVI) contributions, highlighting the value of public-private vaccine partnerships (May–June 2014).
- Conducted first multi-hospital assessment in the region evaluating the association between influenza vaccine use in pregnant women with birth outcomes.

site coverage expanded to 13 additional hospitals throughout Lao PDR with special congressional funding for avian influenza A (H7N9). Animal health surveys were periodically conducted in three provinces, and recently expanded to two additional sites, with a focus on wet markets and farms. In collaboration with Wellcome Trust, non-malaria fever surveillance was expanded to a third province. Lao PDR established dengue surveillance using the ILI/SARI Surveillance Platform.

SURVEILLANCE ACTIVITIES

- Recognized shifting patterns of influenza seasonality, first observed in 2014 and again in 2015.
- Identified two distinct influenza A (H5N6) virus outbreaks in poultry populations in March and July 2014.
- Completed full genomic sequencing using newly established capabilities on influenza A (H5N1) viruses from outbreak clusters, using a shared "One Health" platform.
- Recognized the relative importance of influenza viruses as a causative etiology in febrile illness, as high as 40% in febrile cases during peak seasonality.
- Received recognition for tracking the 2013–2014 dengue epidemic.

LABORATORY

Lao PDR continues to perform quality laboratory testing using the WHO suggested diagnostic algorithm, testing 2,746 specimens in 2014 from both surveillance and study-related activities.

The U.S. Centers for Disease Control and Prevention (CDC) coordinated assistance from the U.S. Defense Threat Reduction Agency (DTRA) for the following at NCLE: 1) new generator; 2) enhanced cold storage capacity; and 3) new roofing.

LABORATORY ACTIVITIES

- Continued to contribute viral isolates (169 in 2014–2015) to GISRS through the WHO CC in Atlanta.
- Participated in WHO's External Quality Assurance Project (EQAP) and CDC's performance panel: scoring 100% on both programs.
- Shared laboratory expertise with the National Institute of Public Health (NIPH) in Cambodia, to assist in establishing first-time cell culture capabilities for the production of viral isolates.

PREPAREDNESS

After a lapse of years, pandemic preparedness activities in Lao PDR were reactivated with avian influenza A (H7N9) and (H5N1) virus threats in China and Cambodia, respectively. In October 2014, regional training workshops combining Ebola and avian influenza (AI) were instituted. Additionally, recognition of seasonal influenza vaccine deployment in adult populations has proven critical in preparing EPI activities to meet pandemic vaccine demands in the future.

PREPAREDNESS ACTIVITIES

Current efforts have had policy effects in at least three major areas:

- Prepared AI and Ebola policy guidelines.
- Prepared AI and Ebola workshop training materials.
- Facilitated WHO procurement of personal protective equipment (PPE) materials and antivirals.

TRAINING

- Conducted AI and Ebola training in Vientiane (September 2014), Luang Prabang (November 2014), and Pakse (January 2015).
- Conducted national surveillance workshops in Thalat (March 2014/April 2015).
- Conducted national ILI/SARI refresher training in all provincial hospitals (February–March 2015).
- Conducted One-Health training on avian influenza A (H7N9) virus in the Northern provinces, Luang Prabang (May 2014).
- Conducted biosafety laboratory training for animal and human laboratory sectors in collaboration with DTRA (January and April 2015).
- Conducted laboratory training targeting the National Animal Health Center Laboratory in necropsy and pathology (in collaboration with DTRA and MORU-AFRIMS).
- Trained national and local staff from the National Immunization Program (NIP) in seasonal influenza vaccine delivery (April/May 2014).
- Trained hospital staff in Vientiane and Luang Prabang in conducting vaccine impact assessments in pregnant women (including Ballard scoring).
- Trained NIP data management staff in conjunction with seasonal influenza vaccine related projects.



Interview of mother in Luang Prabang.



INFLUENZA VACCINE ACTIVITIES

- Deployed 763,000 doses of bioCSL donated vaccine for the third year since seasonal influenza vaccine introduction, again targeting pregnant women, elderly, chronically ill, and all health care workers (May–June 2014).
- Shared experiences in numerous WHO/GAVI forums, including the April/May 2015 meeting in Geneva.
- Established new initiative to promote sustainable vaccine sharing.
- Highlighted seasonal influenza vaccine deployment as an important pandemic preparedness measure.
- Conducted impact assessment activities involving 6,000 vaccinated and non-vaccinated pregnant women linked with birth outcome findings and post-delivery data collection (May 2014–February 2015).

RESEARCH

With the introduction of seasonal influenza vaccine, Lao PDR, in collaboration with U.S. CDC, has started a research agenda to evaluate vaccine impact. Other partners include the Oxford Wellcome Trust, UNICEF and WHO. Findings from recent U.S. CDC-supported publications highlight the successful deployment of both pandemic and seasonal influenza vaccines in Lao PDR, attesting to safety and acceptability in prioritized targeted populations (e.g., pregnant women), and serve as an example to other low income countries considering such disease reduction vaccine strategies.

Vaccine policy adoption in Lao PDR has enabled opportunities to assess vaccine issues related to pregnant women, not only in terms of safety, but impact on birth outcomes. Finally, and complementary, newly created community-based influenza research platforms allow for influenza disease burden estimates in pregnant women. Findings to date have critical implications in moving low income countries toward seasonal influenza vaccine uptake and future pandemic vaccine considerations. These include:

- No serious adverse events following immunizations (AEFI) in pregnant women, elderly, chronically ill or health care workers (HCWs), in three years of seasonal influenza vaccine campaigns in which over one million doses were administered.
- No negative impact of seasonal influenza vaccine on birth weight outcome measures, in a study population of 6,000 vaccinated and non-vaccinated pregnant women. Preliminary findings suggest that seasonal influenza vaccination could contribute to a reduction in premature birth outcomes.
- Seasonal influenza recognized as the single most detected etiology in pregnant women presenting with fever from community based study findings.

MONGOLIA

OVERVIEW

Due to rapid growth in population size and urbanization, Mongolia has been experiencing a serious public health challenge with influenza-like illness (ILI) since the 1970's. The National Influenza Center (NIC) was established in 1974 and joined the WHO Global Influenza Surveillance and Response System (GISRS) in 1978. The U.S. Centers for Disease Control and Prevention's (CDC) Influenza Division began working with Mongolia in 2004 through a capacity building cooperative agreement to improve influenza surveillance, laboratory capacity, and preparedness activities. This partnership restored the system and improved its quality. After 10 years of capacity building and sustainability support, the country has moved to maintenance support through a maintenance cooperative agreement. This cooperative agreement provides support to the existing influenza surveillance sentinel sites to continue the influenza reporting system; the collection of timely and high-quality epidemiologic data; the provision of supportive supervision and continued trainings; and to complete assessment and evaluation activities in the sentinel sites.

SURVEILLANCE

The new surveillance system was established with financial support from CDC through the project "Development of Laboratory-based Surveillance System Network". The two-stage project successfully completed its mission in 2013–2014 and CDC continues supporting surveillance activities in the country through a maintenance program.

At present, nationwide there are 152 outpatient and 37 hospital-based influenza sentinel surveillance sites (ISSS) involved in surveillance activities. The ISSS's data on influenza-like illness (ILI) are routinely entered into an online information system (<http://www.flu.mn>).

The NIC has developed and installed an online program (FLULAB 1.0) to provide information on database samples, laboratory testing protocols, inventory system for reagents, and supplies. Both epidemiologic and virologic databases (FLU LAB 1.0), hosted on the National Center of Communicable Diseases (NCCD) servers, are important for monitoring ILI and severe acute respiratory infection (SARI) trends and virus circulation at the national level. Information is provided to health authorities and the general public through the www.flu.mn website.

HIGHLIGHTS

- Conducted refresher training for four regional laboratory staff in handling specimens, laboratory techniques, diagnostic tests for influenza, and other emerging viruses.
- Obtained approval for the Plan of Influenza Surveillance Sustainability (PISS) covering the period 2014–2018 by a Minister of Health order.
- Continued routine real time reporting of ILI and SARI surveillance data online through the website www.flu.mn.

An MOH order decreed that the sentinel sites be divided into two categories instead of three. Surveillance activities including data collection, data analysis, interpretation, and feedback reports which are completed on a weekly basis. NIC specialists have developed an assessment questionnaire for ISSS's depending on their service responsibilities, and assessments were performed in November 2014 and April 2015.

SURVEILLANCE ACTIVITIES

- Conducted a monthly joint audio-conference with specialists from the Maternal and Child Health Research Center for ISSS's regarding ILI/SARI surveillance and clinical management.
- Assessed seven aimags (administrative subdivision) with support from WHO's PIP Project.
- Initiated a study on the "Epidemiology of influenza infection among pregnant women and children under 6 months" in Baganuur District, Ulaanbaatar City with technical and financial support from Tohoku University, Japan.
- Conducted supervisory visits to sentinel sites in Ulaanbaatar and 11 aimags.
- Organized the 7th National Influenza Workshop (NIW7) with 200 participants including Dr. N. Udval, Minister of Health, and other stakeholders (October 2014).



LABORATORY

The influenza virologic surveillance system in Mongolia is based on weekly collection of samples from ISSS's and testing by real-time RT-PCR for detection of influenza and other respiratory viruses at the Virology Laboratory (VL) NIC, NCCD and four regional laboratories throughout the country. The VL is routinely performing influenza virus isolation, gene sequencing, and drug resistance detection and reporting results.

The follow-up training for four regional laboratory staff in handling specimens, real-time RT-PCR techniques and other diagnostic tests for influenza and other emerging virus detection and subtyping is conducted by virologists in the VL. The VL, NIC sent an external quality assessment panel for influenza virus detection by RT-PCR to regional laboratories once a year and provided individual feedback. The NIC provides the required reagents, kits and supplies for regional virology laboratories through the CDC project fund.

The web-based FLULAB (1.0) Program, developed with project support, stores sample information and laboratory testing protocols, provides an inventory system for reagents and supplies and supports data analysis and feedback reporting; it has been in routine use since the 2012–2013 influenza season. The influenza epidemiologic and virologic database, hosted on NIC/NCCD servers, is a key point for monitoring ILI and SARI trends and virus circulation at the national level, and information is provided to health authorities and the general public through the www.flu.mn website.

LABORATORY ACTIVITIES

- Tested 8,656 samples from 126 sentinel sites; 4,885 samples were collected from hospitalized patients, and 3,771 samples were collected from outpatients.
- Implemented activities in two new regional virology laboratories in Dornod and Khovd provinces in February 2014, and optimized the real-time RT-PCR platform for influenza and other respiratory pathogens.
- Sequenced the HA gene of nine influenza viruses and NA gene of 11 during the 2013–2014 season and sequenced the HA, NA, MP genes of 15 influenza viruses in 2014–2015; deposited results in GenBank.

- Participated in WHO's External Quality Assessment Project (EQAP) Panel 12 in July 2013 and Panel 13 in June 2014. Scored 100%.
- Participated in the Influenza Quality Assessment Panel for Influenza Molecular Diagnostic Evaluation from CDC Atlanta in December 2014. Scored 100%.
- Conducted follow-up visits to regional laboratories to provide technical training and assistance.
- Provided the necessary reagents, kits, and laboratory supplies for use in regional virology laboratories.

PREPAREDNESS

The NIC has developed the Plan of Influenza Surveillance Sustainability, and in October 2014, it was approved by a Minister of Health order. This order replaced all previous Minister of Health orders related to influenza epidemiologic and virologic surveillance activities.

Based on the order, in January 2015 Mongolia adopted case definitions for ILI and SARI, as well as age groups, and sample collection forms reflecting the Global Influenza Surveillance Standard recommended by WHO. During the NIW7, all 21 aimags and Ulaanbaatar City sentinel surveillance sites' main officers and department heads were trained on the additional updates included in this issued order.

NIC staff have recommended implementation at the local level. The national and regional virology laboratories have real-time RT-PCR capacity to detect influenza and other emerging viruses.

PREPAREDNESS ACTIVITIES

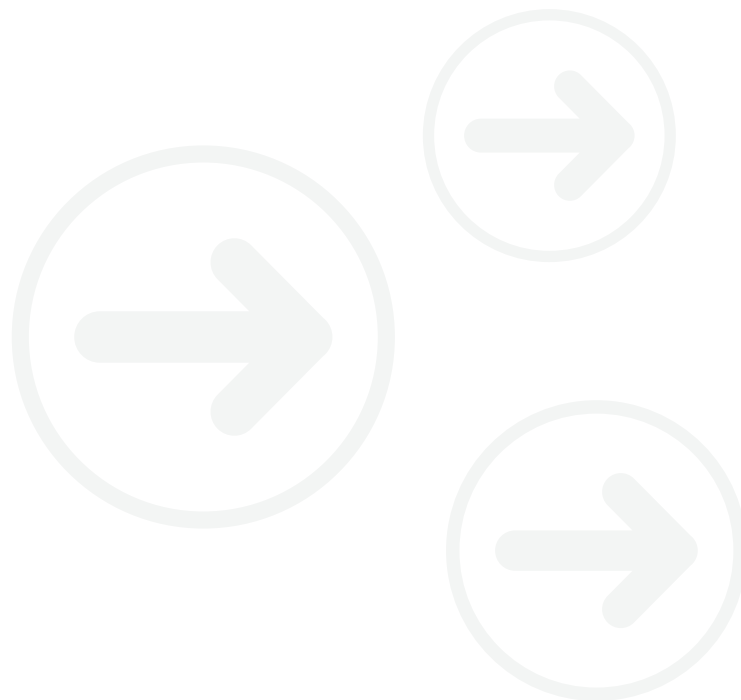
- Assessed influenza surveillance activities in the field using the questionnaires developed by NIC staff.
- Designated a team of specialists to visit CDC Beijing to study Ebola virus and infection control for other potential emerging pandemic viruses.

TRAINING

- Organized training on sample collection from SARI cases for nurses working in influenza surveillance hospitals in southern border provinces (October 2013).
- Organized training on “Laboratory Biosafety and Infection Control of Emerging Infectious Diseases” in 2014; 80 specialists from Health, Veterinary and Inspection Agency, Border Control Points in Ulaanbaatar were in attendance.
- Assigned virologists to perform follow-up visits to regional laboratories and provide technical advice to laboratory staff on testing protocols and training on ABI 7500 real-time RT-PCR system maintenance and calibration.
- Organized refresher training for nurses and physicians working at sentinel sites on sample collection, storage, and transport.
- Conducted on-the-job training on allelic discriminating methods for detecting drug-resistant influenza viruses and protocol optimization for real-time RT-PCR used to discriminate influenza B virus lineages for laboratory staff (training provided by Dr. Mina Nakauchi Hori, Senior Researcher, NIID, Tokyo, Japan).

INFLUENZA VACCINE ACTIVITIES

- Purchased 30,000 (2013–2014) and 50,000 (2014–2015) doses of influenza vaccines (Mongolian Government).
- Distributed vaccine to all 21 provinces and Ulaanbaatar City’s Health Departments and other medical facilities nationwide advising vaccination of health care workers as well as other risk groups including specialists and staff in emergency, military, and transportation agencies.
- Allocated 3,000 to 5,000 doses at the NIC for use on a voluntary basis.
- Utilized 100% of the purchased doses of vaccine during the 2013–2014 season and 97.4% during the 2014–2015 season. Among the vaccinated during both seasons, 35.3% to 74.5% were people aged 20 to 49 years and about 0.5% were people 65 years and older.



SECRETARIAT OF THE PACIFIC COMMUNITY (SPC)



Laboratory technicians during an IATA training in the Cook Islands.

OVERVIEW

The cooperative agreement between the Secretariat of the Pacific Community (SPC) and the Centers for Disease Control and Prevention (CDC) began in 2005 and supports the development of influenza surveillance networks across the Northern and Southern Pacific. Currently, SPC is in the last year of a five-year sustainability cooperative agreement and will be graduating to the maintenance program at the end of the fiscal year. SPC is an international organization with a membership of 22 Pacific Island Countries and Territories (PICT). SPC, through its Public Health Division, is the focal-point of the Coordinating Body of the Pacific Public Health Surveillance Network (PPHSN). The PPHSN was established by SPC and the World Health Organization (WHO) in 1996, and is a voluntary network of countries and organizations dedicated to the promotion of public health surveillance and appropriate response to the health challenges in the Pacific. These challenges include influenza.

HIGHLIGHTS

- Strengthened capacity in data analysis, surveillance, and epidemiology based on recommendations from health ministers in the region.
- Revitalized the PPHSN Data for Decision-Making (DDM) training program for the Pacific and trained over 150 people—this included laboratory personnel.
- Concentrated on in-country training on basic surveillance, sample collection and testing.

SURVEILLANCE

Improvements in influenza surveillance have occurred within the framework of overall laboratory and surveillance strengthening to ensure sustainability and coherence of the system. The project has linked to key initiatives aimed at improving surveillance. One such significant initiative is the PPHSN Pacific Syndromic Surveillance (PSS) system, a WHO/SPC joint effort to standardize a syndromic surveillance system within the PICTs and which came into force in many countries during 2010.

Influenza-like illness (ILI) is one of the four core syndromes of the PSS and there is a need to integrate the pre-existing data collected from the sentinel sites into the new PSS. This integration was discussed and adopted with PICTs and WHO/SPC. Animal health surveillance has also been included in discussions at both the national and regional levels.

LABORATORY

Since 2006, fifteen PICTs obtained training in immunofluorescence microscopy to assist in influenza diagnosis at the national level. Training in the use of immunofluorescence microscopy was provided in all sites, with emphasis also on the referral of samples to designated reference laboratories for further characterization and confirmation. The high

turnover of staff in each of the countries required re-training to help facilitate and sustain the influenza laboratory-based surveillance. Implementation of the influenza laboratory-based surveillance took place at the national laboratories and, in some situations, extended to the peripheral laboratories or sentinel sites identified by the national surveillance team.

Each of the implemented countries/sites, has been continuously supported by PPHSN to improve laboratory-based surveillance and PSS. Eighty percent of the laboratories in the Pacific Islands are clinical laboratories with an emphasis on clinically sick patients. Influenza laboratory-based surveillance is incorporated within the work schedules of the clinical laboratory where staff, including those specifically trained on influenza diagnosis, were on an on-call roster to cover after hour services.

Funding is limited to address public health surveillance activities, hence the dependency on the project funding for sustainability.

Fiji, Guam, New Caledonia, French Polynesia and Papua New Guinea (PNG) are the only Pacific Islands that have RT-PCR capacity to confirm an influenza diagnosis. The rest of the Pacific Island laboratories use either rapid diagnostic tests or the immunofluorescence assay for initial screening, and then depend on the reference laboratories for further confirmation.

LABORATORY ACTIVITIES

- Conducted training on the pre-analytical, analytical, and post-analytical process of influenza laboratory-based surveillance at each of the implemented sites.
- Conducted sub-regional trainings that were co-facilitated by regional partners and included other outbreak prone disease areas in the Pacific region.
- Continued yearly reference laboratory training at the WHO CC in Melbourne.
- Strengthened the capacity of laboratories in basic microbiology and serology.
- Increased data collection and sharing between the laboratory and clinicians.
- Strengthened shipping mechanisms to reference laboratories by conducting ongoing IATA certification/re-certification.
- Continued training on nasopharyngeal sample collection in clinical settings.

PREPAREDNESS

In 2005, SPC in collaboration with other PPHSN partners, initiated a five-year project for the development of influenza surveillance networks in the Pacific region, funded by CDC. In August 2010, an additional five-year extension was awarded by CDC, to further develop and consolidate systems, build on the successes of the first phase of the project, and address challenges that were identified.

The new project aims to establish sustainable and integrated influenza surveillance systems in PICTs to monitor influenza activity, detect outbreaks and contribute to the global influenza surveillance program. The surveillance of communicable diseases including Influenza surveillance, in the Pacific region is mainly based on syndromic surveillance, laboratory-based surveillance and event-based surveillance.

PPHSN has integrated strengthening activities, of syndromic surveillance to include ILI and influenza surveillance. Through implemented activities, the links between laboratory-surveillance and other types of surveillance have been strengthened and the Data for Decision Making (DDM) course, focusing on the interaction between clinics and laboratories emphasized the importance of this interaction for effective surveillance.

PREPAREDNESS ACTIVITIES

- Conducted DDM training with experts from SPC and PPHSN, designed to build the skills of public health workers to improve surveillance and health information systems in the Pacific Islands.
- Continued IATA certification/re-certification for laboratory technicians for all the Pacific countries. More than 50 technicians have been IATA trained in the Pacific (2013–2015).

TRAINING

PPHSN continues to provide technical assistance and training to ensure the functioning of the sentinel surveillance systems, quality of the surveillance data collection and tools to ensure prompt data analysis through the DDM modules.

National Trainings:

- Conducted training for laboratory technicians, surveillance officers, and clinicians on influenza sample collection.
- Conducted IATA training for laboratory technicians (certification/re-certification).



- Conducted analytical testing training using rapid diagnostic tests and immunofluorescence assay, including the interpretation of test results.
- Conducted DDM training.

Sub-regional Trainings:

- Conducted training on outbreak prone diseases to include influenza surveillance and testing.
- Conducted DDM training.

INFLUENZA VACCINE ACTIVITIES

No influenza vaccine activities occurred during this time.



THE PHILIPPINES



OVERVIEW

The Research Institute for Tropical Medicine (RITM) has completed 10 years of support through a capacity building and sustainability cooperative agreement with the U.S. Centers for Disease Control and Prevention (CDC). As part of their sustainability plan, the grantee successfully institutionalized their influenza surveillance and laboratory program with the Philippines Department of Health (DOH) to ensure the continued existence of their influenza surveillance capacity. Currently, the grantee is receiving support under a maintenance cooperative agreement which provides limited support to augment the Philippines National Influenza Center's (PNIC) regular surveillance activities, further improve operations to support the country's compliance with the International Health Regulations (2005), and contribute to regional and global health security efforts.

SURVEILLANCE

Through the collaboration between the PNIC and DOH, surveillance for severe acute respiratory infections (SARI) is being planned for implementation in the second half of 2015. In order to cover the severe end of the spectrum of influenza disease, six sentinel sites in government tertiary hospitals, including RITM, have been identified. Guidelines have been drafted and are now being revised following a workshop for the SARI manual of operations. Moreover, two years after downsizing, the PNIC influenza-like illness (ILI) sentinel surveillance network will undergo review and right-sizing to determine the most appropriate number and locations of sentinel sites.

SURVEILLANCE ACTIVITIES

- Reported 13,823 ILI cases in 33 sentinel sites throughout the country (September 2013–September 2014). Nasopharyngeal and/or oropharyngeal swabs were obtained from 2,827 (20.5%) of these cases.
- Discovered an increase in ILI activity during the second half of the year around the end of June or July.
- Completed the Influenza Burden of Disease study in 2015, with findings to be published soon.

HIGHLIGHTS

- Obtained official recognition of RITM as the Philippine National Influenza Center (PNIC) through an administrative order released by the Department of Health.
- Conducted a project closeout meeting to discuss the 10-year accomplishments of influenza surveillance and plan surveillance activities after CDC funding ends.
- Established the capacity to test for influenza viruses and screen for MERS-CoV at five subnational laboratories.

LABORATORY

PNIC continued to perform testing following its revised algorithm of RT-PCR-based screening followed by virus isolation, producing high quality results that are uploaded within two weeks to the WHO FluNet.

Isolates that are not able to be subtyped and representative isolates for quality assurance were sent to the WHO Collaborating Center in Melbourne.

PNIC also undertook the task of building the capacity and quality assurance of the subnational laboratories as a component of the country's surge capacity for screening influenza and other respiratory viruses.

LABORATORY ACTIVITIES

- Continued to provide proficiency testing for the five subnational laboratories.
- Conducted a laboratory assessment in collaboration with CDC and the Association of Public Health Laboratories (APHL) in November 2014.
- Identified an influenza virus positivity rate of 23% which was 80% of all respiratory viruses detected.
- Identified high virus detection rates in weeks 39 to 42 in 2013 (47%–58%) and weeks 19 and 22 in May 2014 which coincided with the peaks in ILI case reporting.



PREPAREDNESS

CDC support has provided the framework for the continuous development of the Philippines' national preparedness plan.

PREPAREDNESS ACTIVITIES

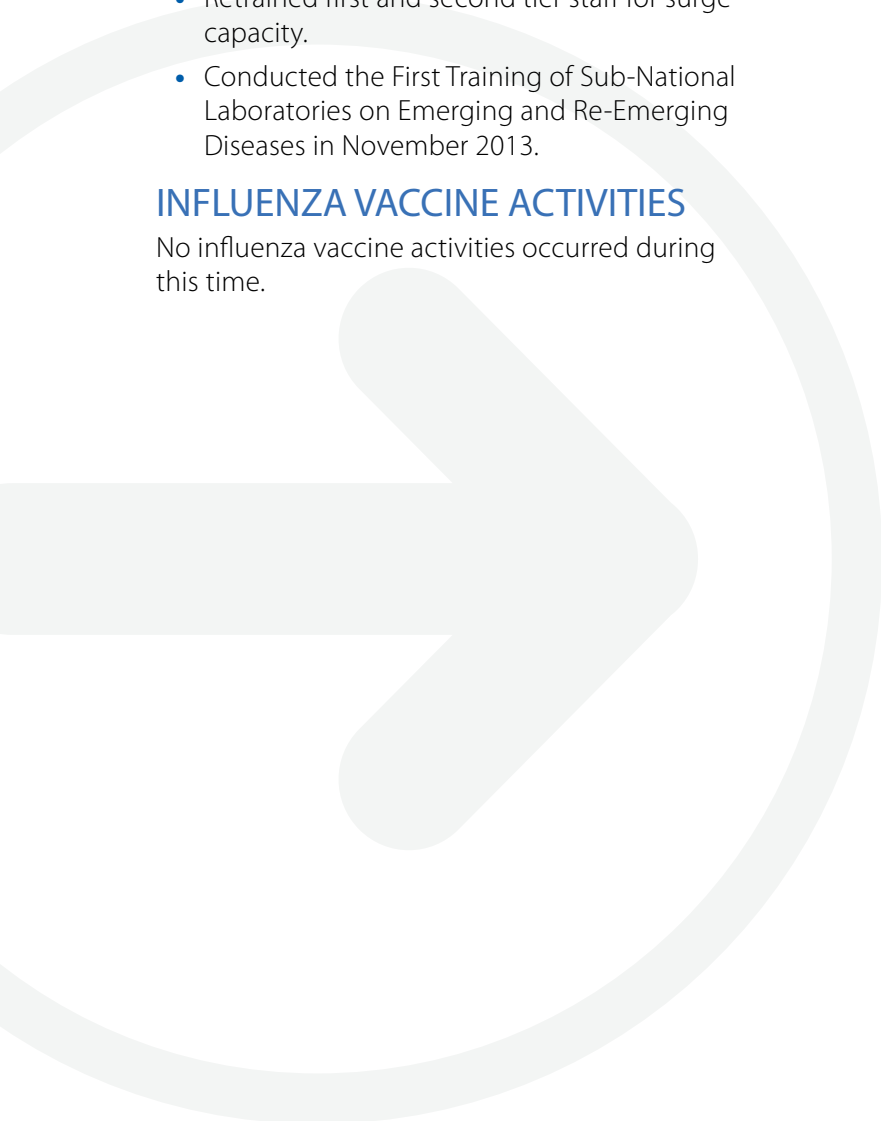
- Increased laboratory surge capacity by identifying and training first and second tier staff capable of performing RT-PCR to identify influenza viruses and who are expected to respond during outbreaks and pandemics.
- Assisted during the response to the first confirmed case of MERS-CoV in the country.

TRAINING

- Attended the 7th NIC Meeting in Beijing, China, which highlighted the need for establishing SARI surveillance.
- Retrained first and second tier staff for surge capacity.
- Conducted the First Training of Sub-National Laboratories on Emerging and Re-Emerging Diseases in November 2013.

INFLUENZA VACCINE ACTIVITIES

No influenza vaccine activities occurred during this time.



VIETNAM



A sample taken from a pig in Nam Dinh Province as a part of the cross-sectional study of influenza at slaughterhouses.

OVERVIEW

The Vietnam Ministry of Health (MOH) has been conducting influenza-like illness (ILI) surveillance since 2006, through the National Influenza Surveillance System (NISS). It originally was conducted at 15 sentinel hospitals distributed across Vietnam but has been reduced down to four sites for sustainability purposes. The grantee is currently completing the last year of their sustainability cooperative agreement and will be graduating to the maintenance phase of the program. The National Influenza Surveillance System Project had two regional Hygiene and Epidemiology/Pasteur Institutes and two sentinel sites (enrolling cases of both ILI and severe acute respiratory infection [SARI]), located in Hanoi (the National Pediatric Hospital) and HCMC (the Hospital of Tropical Diseases). The principal objective of the project is to sustain the nationwide influenza surveillance network in Vietnam that provides epidemiologic and virologic information to guide influenza prevention and control policies and activities.

SURVEILLANCE

In 2005, the U.S. Centers for Disease Control and Prevention (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 (NISS).

HIGHLIGHTS

- Submitted and presented six abstracts at international conferences.
- Provided assistance to the Global Health Security (GHS) Program in Vietnam, including MOH/EOC enhancements and proposed national multi-pathogen SARI surveillance.
- Completed the Animal-Human Interface (AHI) Longitudinal study in people, pigs, and poultry; second Burden of Disease study.
- Provided teaching and mentoring assistance to FETP in Vietnam.

Developed primarily as an outpatient surveillance system for ILI, the system supported up to 15 sites that were strategically located throughout the country's four geographic regions. The system also includes nationwide passive surveillance that detected cases of severe viral pneumonia (SVP) in hospitals, including the majority of Vietnam's confirmed human cases of avian influenza A (H5N1) virus infection.

A second five-year cooperative agreement, in 2010, expanded surveillance to include hospitalized cases of severe acute respiratory infection (SARI), and to provide sustainability by MOH in supporting the surveillance system. Currently, and with some variability in surveillance sustainability over the last two years, the cooperative agreement supports four ILI and eight SARI surveillance sites in fiscal year 2014, and two ILI and five SARI surveillance sites in fiscal year 2015. The MOH administratively supports seasonal influenza surveillance sustainability, yet only provided limited financial support for four ILI sites in 2014.

SURVEILLANCE ACTIVITIES

- Continued to monitor and identify the primary influenza season in Vietnam, including optimal time for vaccination.
- Identified year-round influenza virus activity in Vietnam, with on average one identifiable period of increased influenza activity over a five-month period from late-April to mid-September,

indicating an “influenza season” primarily during the late spring and summer months.

- Continued antigenic characterization and antiviral resistance surveillance from viral isolates collected from the NISS.
- Conducted SARI surveillance for cases of avian influenza A (H7N9) virus in up to four hospitals in three northern Vietnam provinces likely to receive referral cases. No samples were positive for avian influenza A (H7N9) virus.
- Worked with NIHE epidemiology and laboratory staff to provide the “Influenza Weekly Update Vietnam” report of influenza virus surveillance activity in Vietnam, including ILI, SARI, and SVP.
- Conducted surveillance for avian influenza A (H7N9) virus in poultry in traditional and non-traditional live bird markets in three Northern provinces likely to receive poultry from China.

LABORATORY

Vietnam has two National Influenza Centers (NIC), at the National Institute of Hygiene and Epidemiology (NIHE) of Hanoi and the Pasteur Institute of Ho Chi Minh City (PI-HCMC). NIHE and PI-HCMC continue to send human seasonal influenza virus samples to the WHO Collaborating Centers (CC) at CDC Atlanta.

The AHI Program collaborates with the National Center for Veterinary Diagnostics (NCVD) of the Department of Animal Health/Ministry of Agriculture and Rural Development (DAH/MARD), which provides avian influenza poultry samples to CDC Atlanta for review and analysis. Human and animal samples provide information on the influenza virus types, characterization, and evolution in Vietnam, and also contribute to the knowledge of influenza viruses and anti-viral resistant patterns in Asia. With CDC Vietnam support and through the DAH cooperative agreement, CDC Poxvirus and Rabies Branch provided technical support and laboratory equipment for rabies diagnosis at NCVD.

LABORATORY ACTIVITIES

- Tested 1,220 ILI samples from the outpatient sentinel sites from October 1, 2013–April 12, 2015, with an influenza positivity rate of 19%.
- Tested 729 SARI samples from inpatient sentinel sites from October 1, 2013–April 30, 2015, with an influenza positivity rate of 5%.

- Tested and identified no positive samples for avian influenza A (H7N9) virus through NISS or NCVD.
- Tested 26 samples from persons with severe viral pneumonia from October 1, 2013–April 30, 2015, detecting four (15%) cases caused by seasonal influenza viruses and no cases of avian influenza A (H5N1) virus.
- Conducted ten site visits to the influenza laboratory under the Regional Public Health Institutes participating in NISS.

PREPAREDNESS

The Influenza and AHI Programs provided One Health support to MOH and MARD for preparedness and response activities related to avian influenza A (H7N9) virus, MERS-CoV, and Ebola virus.

This included a risk assessment on avian influenza A (H7N9) virus conducted with MOH, MARD, WHO and the Food and Agriculture Organization (FAO) and Influenza and AHI Program support during MOH/EOC activation for Ebola preparedness, Vietnam Ministerial National Steering Committee meetings and other preparedness activities.

In addition, the Influenza and AHI Programs at CDC Vietnam, through their support of the Global Health Security Agenda, provided leadership and technical expertise to the CDC Vietnam GHS Program. This included ensuring that the already established CDC Influenza platform in Vietnam was considered part of the enhancements to MOH’s public health preparedness, including for the International Health Regulations. Specifically, this allowed the national SARI surveillance system to be used as part of the GHS project and the Global Public Health cooperative agreement awarded to GDPM in 2014.

PREPAREDNESS ACTIVITIES

- Supported both GHS Program Emergency Management Systems and Emergency Operations Center (EOC) Lanes, including completion of an EOC Operations Handbook, SOPs, and forms.

TRAINING

- Supported Vietnam FETP, including assisting with the development of training modules, classroom training sessions and mentoring, and providing technical review of abstracts, presentations, and manuscripts.



A photo taken at Hai Boi Market in Vietnam.

INFLUENZA VACCINE ACTIVITIES

The MOH General Department of Preventive Medicine (GDPM) was awarded a vaccine policy cooperative agreement. GDPM conducted the first meeting in Hanoi on 11 September 2014 with 50 attendees from various MOH departments, institutes, and hospitals. They also prepared the Terms of Reference for a Technical Advisory Group to assist in providing data and information generated by these activities to the MOH and the National Immunization Technical Advisory Group for influenza vaccine policy considerations.

The Influenza and AHI Programs assisted GDPM in the development, training, and pilot of a knowledge, attitude, and practice (KAP) survey regarding influenza vaccine knowledge and use for physicians and pregnant women. The Influenza and AHI Programs also assisted GDPM in the review and development of a vaccine use needs assessment, including identifying gaps in data for introducing a seasonal influenza vaccination program and estimation of current seasonal influenza vaccine use.

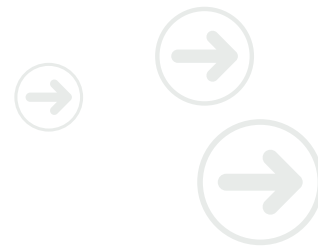
RESEARCH

Currently, CDC's Influenza Division has four bilateral cooperative agreements with the Government of Vietnam, three with the Ministry of Health (MOH) and one with the Ministry of Agriculture and Rural Development (MARD). The agreements provide for support to build sustainable public health capacity through surveillance, research and policy development activities.

Two cooperative agreements, one with MOH and the other with MARD, focus on One Health research activities at the animal-human interface of influenza virus evolution and transmission among avian, swine, and humans. The MOH agreement also focuses on identifying the burden of influenza disease in Vietnam and the health care utilization practices of the population.

All research projects occur at the local, provincial and national levels, and obtain information and data to enhance both human and animal health policies for influenza prevention and control. The following are examples of completed research activities between Vietnam MOH and MARD and CDC's Influenza Division.

- Animal-human interface longitudinal study to identify influenza viruses infecting humans and animals.
- Serological survey to assess asymptomatic infection with avian influenza A (H5N1) virus in communities in northern and southern Vietnam in 2012.
- Cross-sectional study of influenza viruses in humans and swine at slaughterhouses, 2013–2014.
- Survey to assess healthcare seeking behavior for respiratory illness in a northern province of Vietnam.
- Analysis of influenza-related severe acute respiratory infection in the North of Vietnam to assess healthcare burden and economic impact.



Research Activities



Auckland City Hospital, study site.

- Two active, prospective, population-based surveillance systems have been established covering the 906,000 residents living in central, east and south Auckland, New Zealand: (1) hospital surveillance for influenza virus and other respiratory pathogens among those patients with respiratory illness; (2) sentinel general practice surveillance for influenza.
- Surveillance was expanded to include all under 1-year-olds visiting the emergency department or admitted to the hospital regardless of whether or not they exhibit respiratory symptoms.
- Interim and final influenza vaccine effectiveness estimates have been published each influenza season.
- A seroepidemiologic survey is underway to estimate rates of mild, atypical, or asymptomatic influenza virus infections that do not trigger medical care.

NEW ZEALAND

In 2009, the influenza A (H1N1)pdm09 virus emerged just before the Southern Hemisphere influenza season, highlighting the importance of having established systems in the Southern Hemisphere able to collect high quality data on the impact and transmission of influenza and other respiratory viruses.

In 2011, CDC established direct country support through a cooperative agreement with The Institute of Environmental Science and Research, a government-owned Crown Research Institute in New Zealand.

Countries in the Southern Hemisphere typically experience seasonal influenza circulation during their winter (the Northern Hemisphere summer). Therefore, the main goal of this support is to provide critical information on circulating influenza viruses in the Southern Hemisphere, the epidemiology and burden of influenza illness, and the effectiveness of influenza vaccines in preventing outpatient and inpatient medical care associated with influenza.

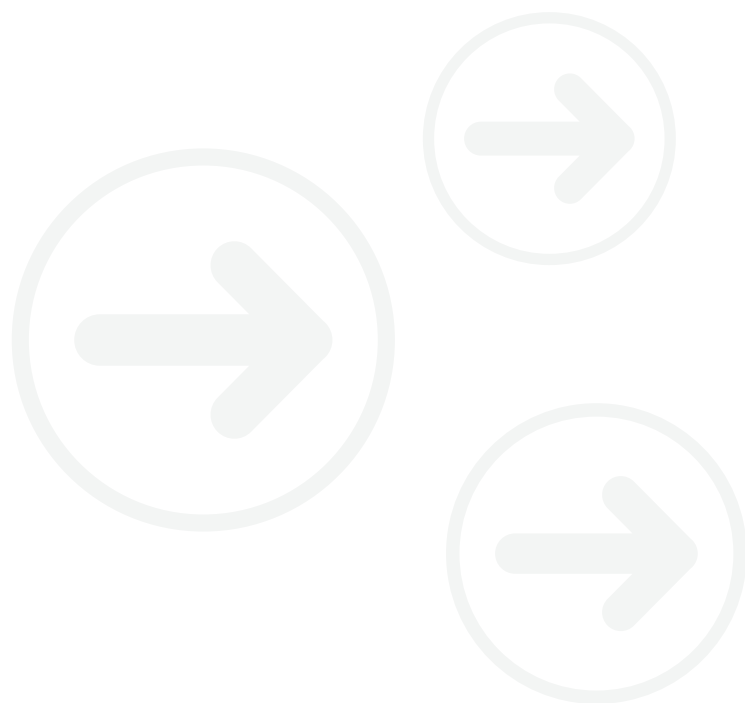
Research Activities—Global

Severe Acute Respiratory Infection among Children less than Five Years of Age in India, Malawi, Peru, and South Africa (TAC-KID)

- Prospective study aimed at understanding the causes of severe respiratory disease among hospitalized children less than five years of age.
- Children less than five who met the WHO case definition for severe acute respiratory infections (SARI) and control children who visit outpatient clinics but are not currently ill were enrolled.
- From this study we will be able to estimate the prevalence of viral and bacterial respiratory pathogens among children less than five years of age hospitalized with SARI and among children without respiratory illness, during a 12-month period.
- We will also identify risk factors for severe acute respiratory infection for this population.
- Enrollment is complete at three sites, laboratory testing is complete at one site.

Global Role and Burden of Influenza in Respiratory Hospitalizations

- This effort will generate global estimates of the contribution of influenza viruses to respiratory hospitalizations among different age groups, including infants, older children, and adults.
- Data used to inform these estimates are from a systematic literature review, as well as influenza surveillance platforms in 34 countries, shared through the “Global Respiratory Hospitalizations—Influenza Proportion Positive” (GRIPP) working group.
- Preliminary pooled estimates for infant populations have been shared with the World Health Organization and other partners to determine the burden of illness that could be prevented through maternal immunization and other prevention strategies worldwide.





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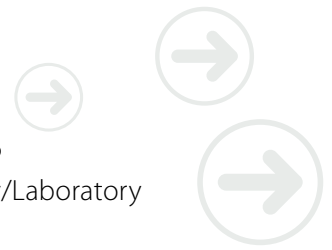
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Meetings, Trainings, & Workshops



Meetings, Trainings, & Workshops

FY 2014

Grants Management Training Course

Location: Antananarivo, Madagascar

Dates: February 24–28, 2014

Summary: The course provided grants administration training to familiarize and assist grantee recipients with fulfilling the terms and conditions of their new and/or existing CDC Cooperative Agreement Award.

Attendees: Twenty-four (24)

Countries: Bhutan, Cameroon, Central African Republic, Madagascar, Mali, Mauritius, Mozambique, Republic of Congo, Seychelles, WHO AFRO, and South Africa

Data Management and Epidemiologic Analysis Training (EUR)

Location: Athens, Greece

Dates: April 7–11, 2014

Summary: CDC, in collaboration with the Council of State and Territorial Epidemiologists (CSTE) and the WHO Regional Office for Europe, hosted

a course for data managers and epidemiologists working on influenza in the European Region. The course was designed to help data managers establish, maintain, and improve influenza surveillance systems, understand the importance of how good data management leads to good, efficient, and complete epidemiologic data analysis. The course focused on teaching Influenza epidemiologists or data managers to apply good data management & analysis technique and wove didactic presentations in with concrete examples and practical exercises. Participants brought their own data to work with; they were able to apply their learning directly to their own work and take that product back home with them. The hands-on nature of the exercises, combined with the theoretical talks, and one-on-one help from the facilitators made the course a great success. CDC staff were joined by facilitators from CSTE, the Florida and Utah Departments of Health, Ministry of Health of Georgia, and Ministry of Health of Russia.

Attendees: Twenty-six (26)

Countries: Albania, Armenia, Bosnia and Herzegovina, Bulgaria, Croatia, Georgia, Kosovo, Kyrgyzstan, Macedonia, Moldova, Montenegro, Republic of Kazakhstan, Serbia, and Ukraine



Group photo from the Data Management and Epidemiologic Analysis Training in Athens, Greece.

South Eastern European Influenza Laboratory Management Course

Location: Istanbul, Turkey

Dates: May 19–23, 2014

Summary: The course was designed to help laboratories achieve, maintain, and improve global influenza surveillance systems

by presenting various laboratory management topics to influenza laboratory managers and staff. The format for the course was a combination of lectures, demonstrations, and hands-on exercises. This format allowed participants to gain knowledge and information for implementation within their laboratories. Course topics included: Human Resources Basics, Biosafety for Laboratory Managers, Quality Assurance and Quality Control, Inventory Management, Specimen Collection and Processing, Laboratory Testing and Test Result Reporting, and NIC Designation.



Participants and instructors from the South Eastern European Influenza Laboratory Management Course.

Attendees: Twenty-three (23)

Countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Moldova, Montenegro, Romania, Russian Federation, and Serbia

APHL and CDC Assessor Training

Location: Atlanta, GA

Dates: August 26–27, 2014

Summary: The training provided updates to both APHL and CDC assessors on the international laboratory assessment tool. An exercise on inter-rater reliability was also completed during the training.

Attendees: Thirty (30)

Burden of Disease Webinar

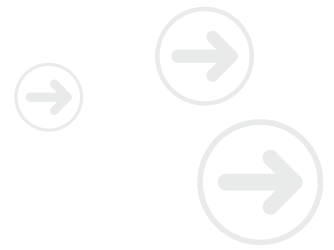
Location: Atlanta, GA

Dates: October 30, 2014

Summary: The webinar provided partner programs in the African Region with an opportunity to receive an overview on burden of disease estimates, insight on practical experiences in determining burden of disease estimates, and determine their readiness to move forward with estimating burden of disease for their country. The webinar was a pre-requisite for countries interested in participating in the Burden of Disease Workshop prior to the ANISE Meeting.

Attendees: Thirty-six (36)

Countries: Burkina Faso, Côte d'Ivoire, Democratic Republic of Congo (DRC), Ghana, Madagascar, Mali, Mozambique, Niger, Nigeria, Rwanda, Tanzania, Togo, Uganda, and Zambia



Grants Management Webinar for SEAR Grantees—Part I & II

Location: Atlanta, GA

Dates: December 2, 2014 (Part I) and December 8, 2014 (Part II)

Summary: The webinars provided grants administration training to familiarize and assist grantee recipients with fulfilling the terms and conditions of their new and/or existing CDC Cooperative Agreement Award. Partners who were unable to participate in the Grants Management Course in February 2014, experienced staffing changes, or wanted a refresher were encouraged to participate.

Attendees: Twenty (20) for each webinar

Countries: Bangladesh, Bhutan, Indonesia, Maldives, Nepal, Nigeria, Sri Lanka, and WHO SEARO

Burden of Disease Workshop

Location: Cape Town, South Africa

Dates: December 4, 2014

Summary: Country representatives worked to assess available numerator and denominator data, missing data, and to chart a way forward. The workshop featured short lectures and hands-on exercises to learn the methodology used to estimate the burden of influenza disease. Participants brought their own data to work with during the workshop and were each assigned a mentor.

Attendees: Twenty-four (24)

Countries: Burkina Faso, Cote d'Ivoire, Democratic Republic of Congo (DRC), Ghana, Madagascar, Mali, Morocco, Mozambique, Niger, Nigeria, Senegal, Tanzania, Togo, Uganda, and Zambia

4th African Network for Influenza Surveillance and Epidemiology (ANISE) Meeting

Location: Cape Town, South Africa

Dates: December 5–6, 2014

Summary: The meeting brought together laboratorians, epidemiologists, veterinarians and other public health practitioners involved in influenza related public health activities or influenza research in Africa to share and promote the use of standardized surveillance methods in the region. The theme for the meeting was Generating Evidence for Influenza Vaccination in Africa.

Attendees: Ninety (90)

Countries: Burkina Faso, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mali, Morocco, Mozambique, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, South Africa, Tanzania, Togo, Uganda, and Zambia

FY 2015

CDC/APHL International Advanced Influenza Real-time RT-PCR Workshop [African Countries]

Location: Antananarivo, Madagascar

Dates: January 27–30, 2015

Summary: The Institute Pasteur de Madagascar (IPM) hosted the workshop for African influenza laboratories. The workshop included lectures and hand-on laboratory exercises covering all aspects of influenza testing using the CDC Influenza Real-time RT-PCR Panel for influenza detection and characterization. Testing procedures, testing algorithms, and results interpretation were also covered.

Attendees: Twenty (20)

Countries: Burkina Faso, Cameroon, Central African Republic, Democratic Republic of Congo (DRC), Ethiopia, Madagascar, Mali, Mauritania, Mozambique, Niger, Nigeria, Rwanda, Seychelles, South Africa, Tanzania, Togo, Uganda, and Zambia



Group photo from the CDC/APHL International Advanced Influenza Real-time RT-PCR Workshop (Madagascar).

USAPI Influenza Laboratory Management Course

Location: Hagatna, Guam

Dates: February 2–3, 2015

Summary: The course was designed to help US-affiliated Pacific Island laboratories improve their respiratory surveillance systems. The format for the course was a combination of lectures and hands-on exercises including a demonstration. The format allowed participants to gain knowledge and information for implementation within their laboratories. Course topics included: Human Resources Basics, Biosafety for Laboratory Managers, and Quality Assurance and Quality Control.

Attendees: Fourteen (14)

Islands: American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Palau, and the Republic of the Marshall Islands

CDC/APHL International Advanced Influenza Real-time RT-PCR Workshop

Location: Atlanta, GA

Dates: March 2–5, 2015

Summary: The workshop included lectures and hands-on laboratory exercises covering all aspects of influenza testing using the CDC Influenza Real-time RT-PCR Panel for influenza detection and characterization. Information regarding updates in testing procedures, testing algorithms, and results interpretation, emerging influenza viruses and regional surveillance program support was also provided.

Attendees: Sixteen (16)

Countries: Bangladesh, Bhutan, Cambodia, Egypt, Georgia, Kosovo, Kyrgyzstan, Laos, Macedonia, Maldives, Moldova, Morocco, Nepal, Sri Lanka, Ukraine, and WHO EURO



Group photo from the CDC/APHL International Advanced Influenza Real-time RT-PCR Workshop (Atlanta).

Grants Proposal Writing Workshop

Location: Johannesburg, South Africa

Dates: April 13–17, 2015

Summary: The National Institute of Communicable Diseases (NICD) co-hosted the workshop. Participants learned how to successfully identify opportunities and write funding proposals. Representatives from the Bill and Melinda Gates Foundation, European Union Delegation, and High Commission of Canada participated in a panel review at the end of the workshop.

Attendees: Twenty-six (26)

Countries: Burkina Faso, Cameroon, Côte d'Ivoire, Democratic Republic of Congo (DRC), Ghana, Mali, Morocco, Mozambique, Niger, Nigeria, Senegal, South Africa, Tanzania, Togo, Tunisia, and Uganda



Grants Proposal Writing Workshop

CDC/APHL/EURO Influenza and Laboratory Quality Assurance Mentoring Project Meeting

Location: Tirana, Albania

Dates: May 7–8, 2015

Summary: CDC in partnership with APHL, SECID, WHO EURO, the Royal Tropical Institute, and KIT Netherlands convened a meeting in Tirana to launch the Influenza and Laboratory Quality Assurance Mentoring Project. The purpose of the meeting was to establish a year-long mentorship program with laboratories and a public health laboratory expert with experience in quality management systems with a focus on influenza NIC status and enhancing laboratory quality systems.

Attendees: Twenty-eight (28)

Countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo, Macedonia, Montenegro, Romania, and Slovenia



Group photo from the CDC/APHL/EURO Influenza and Laboratory Quality Assurance Mentoring Project Meeting.

Workshop on Data Management and Epidemiological Analysis of Influenza

Location: Quito, Ecuador

Dates: July 14–16, 2015

Summary: PAHO in partnership with CDC conducted the course. The purpose of the workshop was to orient the participants on best practices for influenza surveillance data management, basic epidemiological data analysis methods and to apply these methods using their own sentinel and SARI surveillance data with facilitators using a lecture and exercise format.

Attendees: Twenty-three (23)

Countries: Ecuador, Bolivia, Colombia, Peru, Paraguay, and Uruguay



Group photo from the CDC/APHL/EURO Influenza and Laboratory Quality Assurance Mentoring Project Meeting.



Monitoring & Evaluation Tools





Monitoring & Evaluation Tools

Under the cooperative agreements between the U.S. Centers for Disease Control and Prevention's (CDC) Influenza Division and its partner countries, the Division supports the monitoring and evaluation (M&E) of activities associated with international influenza program capacity-strengthening. The purpose of M&E in this context is to:

- Document each country's baseline capacity for influenza surveillance, laboratory diagnostics and pandemic preparedness in a standardized way in order to measure progress toward defined criteria and thereby demonstrate meaningful improvement
- Use results to inform ongoing investment and programmatic planning for influenza detection, assessment, and response systems
- Demonstrate accountability for resources and activities tied to capacity-strengthening
- Identify best practices for capacity-strengthening that can be shared

The Influenza Division has developed three tools which are described below. Countries participate voluntarily in these assessments.

National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response

Purpose: The National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response (National Inventory) is a comprehensive tool by which countries can systematically and quantitatively measure their capability and capacity to respond to an influenza pandemic.

Structure and content: The National Inventory 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, the core capability of 'Infection Control' is measured by determining performance in the following indicators (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 country determined which allows for variation in public health priorities across countries with differing resource constraints. Countries repeated the assessment every two years to monitor changes in pandemic preparedness between 2008 and 2012. For a copy of the National Inventory, please visit www.cdc.gov/flu/international/tools.htm.

Implementation: In 2008, 40 countries completed baseline self-assessments, facilitated by CDC staff. A further 12 countries participated in late 2009 and early 2010 to establish baselines. By the end of 2010, 36 of the initial 40 countries completed a repeat assessment to monitor changes in their level of pandemic preparedness since 2008. In 2012, 33 out of the 36 countries were able to complete a third assessment to continue to track changes in their level of pandemic preparedness. 10 of the 12 countries that established 2010 baselines also completed their first re-assessment in 2012. Since 2012, the tool is available for use, but CDC is no longer completing facilitated assessments with partner countries.

Outcomes: All of the countries improved their scores between 2008 and 2012 indicating an overall improvement in pandemic preparedness for each country over the period.

- The biggest improvements in pandemic preparedness capabilities were made between 2008 and 2010 whereas between 2010 and 2012 four capabilities improved, six remained the same and two decreased although they remained higher than the 2008 level (Figure 1).
- Among the 12 core capabilities for pandemic preparedness, countries scored 'routine influenza surveillance' capability highest in 2008, 2010, and 2012, and scored 'health sector pandemic response' lowest in 2008, 2010, and 2012.

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.
- The assessments in 2012 helped countries identify whether improvements in 2010 were sustained.
- Identifying areas for Influenza improvement is also enhancing capacity-building for other infectious diseases as well as encouraging compliance with International Health Regulations 2005 (IHR).
- The tool can be used to document progress in countries to help target collaboration with different partners & advocate for continued support.



Cover art left to right:
 International Influenza Surveillance Assessment Tool
 International Influenza Laboratory Capacity Review Tool
 National Inventory of Core Capabilities for Pandemic Influenza Preparedness and Response

International Influenza Laboratory Capacity Review Tool

Purpose: The International Influenza Laboratory Capacity Review Tool (IILCRT) is designed for assessing the capability and capacity of an influenza laboratory to perform influenza diagnostics and use of good laboratory practices.

Structure and content: The IILCRT is a series of questions divided into nine sections for assessing laboratories across a wide variety of influenza laboratory functions including, general laboratory functions, virology and molecular biology techniques, availability and maintenance of equipment, specimen handling, collection and reporting, staff training, laboratory safety and methods for quality assurance and quality control. The results from these sections form the basis of laboratory capacity summary reports and recommendations for countries. The structure and content of the tool was updated in 2011 for clarity. For a copy of the tool, please visit www.cdc.gov/flu/international/tools.htm.

Implementation: Between September 2009 and September 2015, 63 national laboratories in 60 countries completed laboratory assessments, facilitated by staff from CDC and the Association of Public Health Laboratories (APHL). Several national laboratories completed re-peat assessments between FY 2013 and 2015.



Outcomes: The tool has helped highlight overall laboratory strengths, while recommendations are provided by reviewers where opportunities for improvement present themselves. For example, a training needs assessment based on the first 26 laboratories reviewed, identified six country laboratories in the Africa region that did not perform virus isolation; all 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 need for better laboratory management, also surfaced during reviews, and as a consequence the course “Improving Influenza Laboratory Management Practices”, was developed in partnership with the American Association of Public Health Laboratories (APHL) in order to build grantee skills in this area. To date, these data management courses have been held in Johannesburg (2011), Bangkok (2012), and Greece (2014). In 2015 a review of the biosafety issues identified in assessments was used as the basis to develop a biosafety course to address common issues. A pilot training with the new curriculum will be conducted in October 2015.

Analytic Framework: During FY 2011, CDC and APHL enhanced the ILLCRT by adding a quantitative component to the analysis of data collected. A quantitative analysis can be presented visually allowing quick identification of the status of an influenza laboratory’s capacity. It can also provide a standardized approach to tracking changes in laboratory capacity over time. Approximately 150 questions have been selected for analyzing laboratory capacity across eight categories which have been identified as critical to the functioning of a national influenza laboratory. The eight categories for analysis include: National Influenza Center (NIC) Criteria, Laboratory Management, Biosafety, Quality Assurance and Quality Control, Molecular Biology, Virology, Specimen Handling, Collection, and Reporting and Equipment. Each selected question has been assigned one point. The points are aggregated by category and converted to a percentage performance measure. Beginning in 2012, the quantitative analysis has been included in summary reports.

International Influenza Surveillance Assessment Tool

Purpose: The International Influenza Surveillance Assessment Tool (IISAT) is 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.

Structure and content: The IISAT 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: In FY 2011, CDC’s Influenza Division also entered into a cooperative agreement with the Council of State and Territorial Epidemiologists (CSTE) who provide epidemiologists to assist with conducting reviews in partner countries. Between March and September 2015, surveillance assessments were completed in 55 countries, with 16 of them repeating follow-up assessments to review progress.

Outcomes: The tool has served to highlight overall surveillance strengths and challenges with specific recommendations documented and sent formally to the Institute reviewed. Recommendations have included: weekly and quarterly analysis of risk factor data, dissemination of data to stakeholders, and better coordination between national staff and sites.

Partnership for Influenza Vaccine Introduction (PIVI)



Partnership for Influenza Vaccine Introduction

The Partnership for Influenza Vaccine Introduction (PIVI) has a mission to help low and middle income countries reduce morbidity and mortality from influenza and enhance their pandemic preparedness through introduction of vaccine and expansion of existing vaccination programs. PIVI plays a pivotal role by supplying donated influenza vaccine and supplies to countries that lack those resources but are otherwise ready to establish or expand their influenza vaccination programs. PIVI is based at the Task Force for Global Health's Center for Vaccine Equity, which coordinates a broad partnership that includes CDC, ministries of health and a variety of private partners (BioCSL, Becton Dickinson) and public partners (Bill and Melinda Gates Foundation, Pan-American Health Organization), that donate supplies or funding for the project. PIVI operates on a model of using the donations to ensure that partners in ministries of health have available influenza vaccines and resources to protect key target populations. CDC's Influenza Division has supported PIVI because of its unique value to protect vulnerable populations in partner countries, to provide countries with experience in delivering influenza vaccines which will be useful for pandemic preparedness goals, and to catalyze the development of sustainable influenza vaccination programs. The experience gained from the vaccine campaigns delivered under PIVI also helps create the evidence base for global use of influenza vaccines, especially in high priority populations, such as pregnant women. PIVI began in 2012, and since that time has helped vaccinated more than 1 million persons in Lao PDR, Nicaragua, Armenia and Morocco. <http://pivipartners.org/>

2014 Activities

In 2014, a donation of 763,000 doses of influenza vaccine to the Lao PDR Ministry of Health allowed the existing program to expand nationwide to encompass all 38 provinces. Vaccine was provided for five target populations—pregnant women, elderly, health care workers, essential government personnel, and those with chronic disease. Nationally 36,173 pregnant women were targeted for vaccination



A healthcare worker in Tavush Marz being vaccinated for influenza during the National Immunization Campaign.

using hospitals and antenatal clinic settings. The 2014 influenza vaccine campaign launch integrated with National Immunization Day activities for children receiving EPI vaccines and other health interventions (Vitamin A and deworming). In the antenatal clinic setting, pregnant women also received tetanus toxoid vaccine.

In Nicaragua ~25,000 pregnant women were immunized in Managua, achieving 96% coverage of the target population, and closing a gap that enabled the Nicaragua Ministry of Health to immunize the full cohort of pregnant women nationwide. The vaccine was delivered through a national immunization campaign and through antenatal clinics with deployment of the tetanus toxoid vaccine. Building on the 2013 PIVI donation, Nicaragua expanded its coverage of pregnant women and assumed progressive responsibility for full country ownership of the program.

In 2014, the Partnership received a donation of >180,000 doses of vaccine from Green Cross, facilitated by PAHO, enabling the PIVI program to expand to Armenia and Morocco. In Armenia the National Immunization Program distributed 60,000 doses of donated influenza vaccine. The vaccine was distributed nationwide through existing vaccine and health programs, targeting 18-27 year old adults, health care workers in primary health care facilities,

and elderly persons and children living in residential care institutional settings. Although pregnant women were not a specific target population in 2014, vaccine was offered to interested pregnant women.

In Morocco, the National Immunization Program and DELM conducted a national 6-week campaign distributing 123,310 doses of donated influenza vaccine, targeting health personnel and health care students (medicine, nursing, pharmacy, and dentistry), diabetics through NGOs, elderly in nursing home settings, persons with chronic renal failure receiving dialysis treatment, and a sample of pregnant women. Although in Morocco the vaccine is not currently approved for use in pregnant women, this year's program provided an opportunity to hold discussions with the national agency responsible for pharmacovigilance and plan focus groups to better understand issues related to influenza vaccine hesitancy in current and future target populations.

To measure program impact, PIVI implemented an evaluation protocol in all four countries (Armenia, Lao PDR, Morocco, and Nicaragua). In Nicaragua and Lao PDR, the evaluation focused on understanding the impact of vaccine on birth outcomes among pregnant women. Results are expected in late 2015. Program evaluation reports summarizing the influenza vaccine campaigns in Armenia and Morocco have been finalized. PIVI is currently working on further developing knowledge, attitudes and practices survey protocols for use in PIVI countries and is exploring cost-effectiveness protocols and models of vaccine impact in experienced PIVI countries.

Discussions on vaccine procurement for the current year and beyond are underway with multiple vaccine manufacturers. In addition to discussions on vaccine donations, the project team is holding discussions with vaccine manufacturers and UNICEF to negotiate vaccine purchase at a reduced cost for the program and provide an opportunity to discuss supply for future sustainable country programs. PIVI also engaged Gavi in discussions on how best to use data to inform a potential 2018 vaccine information statement deliberation to consider support for influenza vaccine.

Strategic planning to raise awareness and support among donors in partner countries is ongoing. A landscape analysis of potential private sectors donors has been conducted and a strategic communications plan will be developed.

Objectives of PIVI

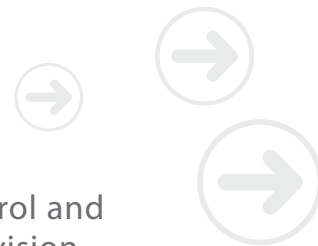
- Reduce morbidity and mortality from seasonal influenza by protecting at risk populations, particularly those prioritized by WHO/SAGE recommendations, such as pregnant women.
- Evaluate the programmatic aspects of seasonal influenza vaccine implementation.
- Demonstrate that the introduction of seasonal influenza vaccine can be both feasible and accepted and can strengthen future public-private partnerships for the introduction of new vaccines into the Expanded Program on Immunization.

Principles

- Vaccine donation should not interfere with current influenza vaccine program growth and should serve as a catalyst for sustainable vaccine program.
- There must be demonstrated commitment from MoH, country and regional WHO offices.
- The country must have existing influenza surveillance systems in place and/or a National Influenza Center.
- Vaccine target groups should be based on local data and be informed by WHO SAGE recommendations.
- An evaluation plan must be developed to assess the vaccine program's introduction and impact.
- A sustainability plan should be developed by the country to develop a sustainable source of seasonal influenza vaccine among priority groups.
- The program should be coordinated with WHO Global Action Plan and other partners.



The central deposit cold room in Casablanca, Morocco.



Partnership Deliverables

- Increases in vaccine coverage in vaccine target groups in partner countries.
- Successful integration of influenza vaccine in partner countries' current immunization programs.
- Reduction in influenza-associated health outcomes in immunized populations in partner countries.
- High acceptability of influenza vaccine among stakeholders in partner countries.
- Sustainability of respiratory disease surveillance, laboratory capacity and rapid response capabilities that have been developed in response to pandemic preparedness priorities.
- Develop data to support evidence-based decision making related to influenza vaccination of potential target populations.

Future Plans

The program targets the most vulnerable populations as designated by WHO's SAGE recommendations with an emphasis on maternal immunization. The program seeks to meet country partners' target requirements from PIVI supply resources. PIVI plans to engage new country partners on an annual basis. PIVI's expansion will be governed by the level of vaccine and other donations and the successful transitioning of existing partner countries to sustainable programs. Factors that will aid in successful implementation include PIVI's collaboration with WHO's Global Action Plan for Influenza Vaccines (GAP-2), incorporation as a key component of CDC's Influenza Division's International Strategic Plan, recognition of HHS/BARDA influenza vaccine development program, and cooperation with Gavi's future consideration of support for influenza vaccine in Gavi-eligible countries. Constraints to PIVI implementation may include limitations in vaccine supply, delays in regulatory time frames for approval of new vaccines, unpredictability of donations, variable timing of influenza season in partner countries paired with the available vaccines formulation, limitations in the provision of immunization supplies and challenges in the logistics and transport of vaccines and supplies.

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Sustainability





Sustainability

Sustainability can be defined as a country's ongoing maintenance and support of a routine virologic and epidemiologic influenza surveillance system including the capacity to financially maintain the system or a portion of the system.

When countries transition from the capacity-building phase to the sustainability phase, they are asked to develop and implement a plan for influenza surveillance initiated or enhanced during the capacity-building phase. The plan should be reviewed annually or as changes occur.

Developing such a sustainability plan is a critical part of the transition to a sustainable system. A written plan can provide overarching guidance for your initiative. A plan can help an organization:

- Sustain systems using government funds.
- Obtain input and agreement from key stakeholders (i.e. MOH, WHO, etc.).
- Make the best use of human capital, funding and other resources to achieve your objectives.
- Develop strategies for long-term success.

CDC International Influenza Program Sustainability Framework and Element Descriptions



Internal resources and support needed to effectively manage your program



Establishing a financial base for your program



Systematic process that guides your program's direction, goals, and strategies



Conveying information to stakeholders and the public about your program



Establish and foster connections between your program and its stakeholders



Analyzing your program for effectiveness and efficiency

CDC International Influenza Program Sustainability Guide 

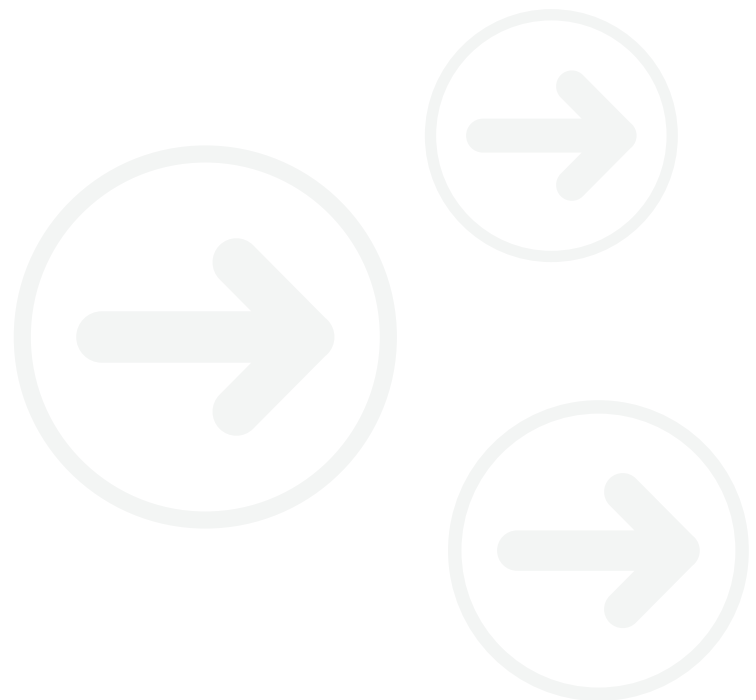
Sustainability Framework and Element Descriptions for CDC's International Influenza Program.

To assist grantees with their plans, CDC's Influenza Division developed the International Influenza Program Sustainability Guide and Framework (Guide). The Guide consists of six elements: Program Capacity, Strategic Planning, Partnerships, Funding, Communications, and Program Evaluation. These elements provide the framework for sustainability planning and implementation.

Some expectations of sustainability include:

- Establishing country ownership and investing in country-led plans (Global Health Initiative).
- Aligning goals with national priorities.
- Developing and implementing sustainability plans with a detailed budget to fully assume responsibilities and funding for robust and timely routine surveillance systems for seasonal, novel and pandemic influenza.
- Ensuring systems have the ability for rapid detection of and response to potential pandemic influenza as well as for monitoring the occurrence and assessing the impact of seasonal influenza in the country.
- Maintaining or making progress towards having an active World Health Organization (WHO) National Influenza Center (NIC) laboratory and contributing regularly to the Global Influenza Surveillance and Response System (GISRS).

Sustainability should be discussed continuously and plans updated as things change so countries can develop surveillance networks that will continue after U.S. government funding ends and provide the necessary data to accurately identify and track potential public health issues.





Acronyms





Acronyms

AET	Applied Epidemiology Training
AFR	WHO African Region
AFRIMS	Armed Forces Research Institute of Medical Sciences
AFRO	WHO Regional Office for Africa
AI	Avian Influenza
AHI	Animal-Human Interface
AMR	WHO Region of the Americas
ANISE	African Network for Influenza Surveillance and Epidemiology
APHL	Association of Public Health Laboratories
ARI	Acute Respiratory Illness
BEP	Biosecurity Engagement Program
BSL	Biosafety level
CARPHA	Caribbean Public Health Agency
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 Regional Office of the Eastern Mediterranean
EOC	Emergency Operations Center
EPT	Emerging Pandemic Threats
EQAP	WHO External Quality Assessment Project
EUR	WHO European Region
EURO	WHO Regional Office for Europe
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
FMOH	Federal Ministry of Health
GDD	Global Disease Detection
GIP	WHO Global Influenza Program
GISRS	WHO Global Influenza Surveillance and Response System
HA	Hemagglutinin (a protein on the surface of the influenza virus)
HAI (or HI)	Hemagglutination Inhibition Assay
HAI	Health care-associated Infection
HHS	United States Department of Health and Human Services
HPAI	High Pathogenic Avian Influenza
IATA	International Air Transport Association
ID	Influenza Division
IDSR	Integrated Disease Surveillance and Response
IHR	International Health Regulations
IFA	Immunofluorescence Assay
IEIP	International Emerging Infections Program
ILI	Influenza-like Illness
IRR	Influenza Reagent Resource
LPAI	Low Pathogenic Avian Influenza
MDCK	Madin-Darby Canine Kidney Cells
MERS-CoV	Middle East Respiratory Syndrome Coronavirus
MOH	Ministry of Health
NA	Neuraminidase (a protein on the surface of the influenza virus)
NAI	Neuraminidase Inhibitors
NAMRU	United States Naval Medical Research Unit
NCIRD	National Center for Immunization and Respiratory Diseases
NGO	Non-Governmental Organization
NI	Neuraminidase Inhibition Assay
NIC	National Influenza Center
NP	Nasopharyngeal swab
NPHCDA	National Primary Health Care Development Agency
OIE	World Organisation for Animal Health
OP	Oropharyngeal swab
PAHO	Pan American Health Organization





PATH	Program Appropriate Technology in Health
PCR	Polymerase Chain Reaction
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
QMS	Quality Management System
RRT	Rapid Response Team
RSV	Respiratory Syncytial Virus
RT-PCR	Reverse Transcription 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 Regional Office for South-East Asia
SECID	South East European Center of Infectious Diseases Surveillance and Control
SOP	Standard Operating Procedure
SPC	Secretariat of the Pacific Community
TB	Tuberculosis
TESSy	The European Surveillance System
TLDA	TaqMan Low Density Array
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VTM	Viral Transport Media
WPRO	WHO Regional Office for the Western Pacific
WPR	WHO Western Pacific Region
WHO	World Health Organization
WHO CC	World Health Organization Collaborating Center for Reference and Research on Influenza

Appendix





Descriptions for maps and figures

Page 4

US CDC International Activities and Support, FY 2004

A global map outlining the countries in which the U.S. CDC conducted international influenza activities and provided support for Fiscal Year 2004. The Influenza Division has Cooperative Agreements with the following countries: China, India, Indonesia, Mongolia, Pakistan, Philippines, South Korea and Thailand. These countries are shaded light green.

The Influenza Division also has cooperative agreements with WHO, as indicated by a blue star, in the following countries: Philippines (Manila), Switzerland (Geneva) and the United States (Washington, DC).

The Division collaborates with the U.S. Department of Defense (DoD), indicated by an orange triangle, in Indonesia (Jakarta).

US CDC International Activities and Support, FY 2007

A global map outlining the countries in which the U.S. CDC conducted international influenza activities and provided support for Fiscal Year 2007. The Influenza Division has Capacity Building Cooperative Agreements with the following countries: Afghanistan, Angola, Argentina, Bangladesh, Brazil, Cambodia, China, Cote d'Ivoire, Democratic Republic of Congo, Ethiopia, India, Indonesia, Kazakhstan, Kenya, Mexico, Mongolia, Morocco, Nigeria, Pakistan, Peru, Philippines, Romania, Rwanda, South Africa, Tanzania, Thailand, Uganda, Ukraine and Vietnam. These countries are shaded light green.

The Influenza Division provided indirect funding to Lao People's Democratic Republic (PDR). This country is shaded dark green.

The Influenza Division also has Cooperative Agreements with World Health Organization (WHO), indicated by a blue star, in the following countries: Democratic Republic of Congo (Kinshasa), Denmark (Copenhagen), Egypt (Cairo) India (New Delhi), Philippines (Manila), Switzerland (Geneva) and the United States (Washington, DC).

The Division collaborates with the U.S. Department of Defense (DoD) indicated by an orange triangle in the following countries: Cambodia, Egypt, Indonesia, and Peru.

Global Disease Detection (GDD) Sites, indicated by the red X's, are located in the following cities: Beijing (China), Cairo (Egypt), Guatemala, New Delhi (India), Almaty (Kazakhstan), Nairobi (Kenya), Pretoria (South Africa), and Bangkok (Thailand).

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Page 5

US CDC International Activities and Support, FY 2009

A global map outlining the countries in which the U.S. CDC conducted international influenza activities and provided support for Fiscal Year 2009. The Influenza Division has Capacity Building Cooperative Agreements with the following countries: Afghanistan, Angola, Argentina, Bangladesh, Brazil, Cambodia, Cote d'Ivoire, Democratic Republic of Congo, Egypt, Ethiopia, Ghana, Kenya, Madagascar, Mexico, Moldova, Mongolia, Morocco, Nepal, Nigeria, Paraguay, Peru, Rwanda, South Africa, Sri Lanka, Tanzania, Uganda, Ukraine, Vietnam, and Zambia. These countries are shaded light green.

The Influenza Division also has Sustainability Cooperative Agreements with the following countries: China, India, Indonesia, Pakistan, Philippines, and Thailand. These countries are shaded dark green.

The Influenza Division provided indirect funding to Kazakhstan, Lao People's Democratic Republic (PDR), Papua New Guinea and Romania. These countries are shaded pink.

The Influenza Division also has Cooperative Agreements with World Health Organization (WHO), indicated by a blue star, in the following countries: Democratic Republic of Congo (Kinshasa), Denmark (Copenhagen), Egypt (Cairo) India (New Delhi), Philippines (Manila), Switzerland (Geneva) and the United States (Washington, DC).

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Global Disease Detection (GDD) Sites, indicated by the red X's, are located in the following cities: Beijing (China), Cairo (Egypt), Guatemala, New Delhi (India), Almaty (Kazakhstan), Nairobi (Kenya), Pretoria (South Africa), and Bangkok (Thailand).

US CDC International Activities and Support, FY 2011

A global map outlining the countries in which the U.S. CDC conducted international influenza activities and provided support for Fiscal Year 2010. The Influenza Division has Capacity Building Cooperative Agreements with the following countries: Afghanistan, Angola, Argentina, Bangladesh, Brazil, Cambodia, Cote d'Ivoire, Democratic Republic of Congo, Egypt, Georgia, Indonesia, Kenya, Madagascar, Mexico, Moldova, Mongolia, Morocco, Nepal, Nigeria, Paraguay, Peru, Philippines, South Africa, Sri Lanka, Tanzania, Uganda, Ukraine, and Zambia. These countries are shaded light green.

The Influenza Division also has Sustainability Cooperative Agreements with the following countries: China, India, Indonesia, Mongolia, Pakistan, Philippines, Thailand, and Vietnam. These countries are shaded dark green.

The Influenza Division provided indirect funding to Lao People's Democratic Republic (PDR), Papua New Guinea and Romania. These countries are shaded pink.

The Influenza Division also has Cooperative Agreements with World Health Organization (WHO), indicated by a blue star, in the following countries: Democratic Republic of Congo (Brazzaville), Denmark (Copenhagen), Egypt (Cairo), India (New Delhi), Philippines (Manila), Switzerland (Geneva) and the United States (Washington, DC).

The Division collaborates with the U.S. Department of Defense (DoD) indicated by an orange triangle in the following countries: Cambodia, Egypt, Indonesia, and Peru.

Global Disease Detection (GDD) Sites, indicated by the red X's, are located in the following cities: Astana (Kazakhstan), Bangkok (Thailand), Beijing (China), Cairo (Egypt), Guatemala City (Guatemala), Johannesburg (south Africa), Nairobi (Kenya), and New Delhi (India).

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US CDC International Activities and Support, FY 2013

A global map outlining the countries in which the U.S. CDC conducted international influenza activities and provided support for Fiscal Year 2013. The Influenza Division has Capacity Building Cooperative Agreements with the following countries: Bhutan, Kyrgyzstan, Maldives, Mali, Mozambique, SECID (Albania, Bosnia and Herzegovina, Macedonia, and Montenegro), and Tunisia. These countries are shaded light green.

The Influenza Division also has Sustainability Cooperative Agreements with the following countries: Afghanistan, Angola, Armenia, Bangladesh, Brazil, Cambodia, China, Cote d'Ivoire, Democratic Republic of Congo (DRC), Egypt, Ethiopia, Georgia, India, Indonesia, Madagascar, Mexico, Moldova, Mongolia, Morocco, Nepal, Nigeria, Pakistan, Paraguay, Peru, Philippines, Russian Federation, Rwanda South Africa, Secretariat of the Pacific Community (SPC), Sri Lanka, Tanzania, Thailand, Uganda, Ukraine, Vietnam and Zambia. These countries are shaded dark green.

In addition, the Influenza Division has Vaccine Policy Cooperative Agreements with the following countries: China, Morocco, Kenya, Uganda and Vietnam. These countries are indicated by blue shading with dots.

The following countries have Research Cooperative Agreements: Bangladesh, Ghana, India, Kenya, Senegal, and Vietnam. These countries are identified by pink hash marks.

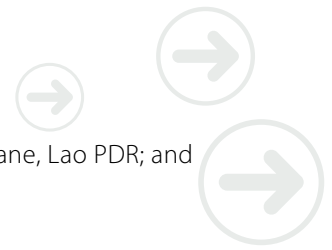
The Influenza Division also has Cooperative Agreements with World Health Organization (WHO), indicated by a blue star, in the following countries: Democratic Republic of Congo (Brazzaville), Denmark (Copenhagen), Egypt (Cairo), India (New Delhi), Philippines (Manila), Switzerland (Geneva) and the United States (Washington, DC).

CDC Influenza Division Field Staff, indicated by a yellow dot outlined in red, are located in: Accra, Ghana; Bangkok, Thailand; Copenhagen, Denmark; Dhaka, Bangladesh; Geneva, Switzerland; Guatemala City, Guatemala; Hanoi, Vietnam; Manila, Philippines; Nairobi, Kenya; New Delhi, India; Pretoria, South Africa; Vientiane, Lao PDR; and Washington, DC, USA.

The Influenza Division provided indirect funding to Belize, Costa Rico, Dominican Republic, El Salvador, Fiji, Ghana, Guatemala, Honduras, Lao People's Democratic Republic (PDR), Malawi, Nicaragua, Panama, Papua New Guinea, Republic of Congo, and Romania. These countries are shaded pink.

US CDC International Activities and Support, FY 2015

A global map outlining the countries in which the U.S. CDC conducted international influenza activities and provided support for Fiscal Year 2015. The Influenza Division has Capacity Building Cooperative Agreements with the following countries: Bhutan, Kyrgyzstan, Maldives, Mali, Mozambique, SECID (Albania, Bosnia and Herzegovina, Macedonia, Montenegro and Kosovo), and Tunisia. These countries are shaded light green.



The Influenza Division also has Sustainability Cooperative Agreements with the following countries: Afghanistan, Armenia, Bangladesh, Brazil, Cambodia, Côte d'Ivoire, Democratic Republic of Congo (DRC), Egypt, Ethiopia, Georgia, Madagascar, Mexico, Moldova, Morocco, Nepal, Nigeria, Paraguay, Peru, Russian Federation, Rwanda, South Africa, Secretariat of the Pacific Community (SPC), Sri Lanka, Tanzania, Uganda, Ukraine, Vietnam and Zambia. These countries are dark green.

Five countries have Maintenance Cooperative Agreements; they are China, Indonesia, Mongolia, Pakistan, and Philippines. These countries are shaded yellow on the map.

In addition, the Influenza Division has Vaccine Policy Cooperative Agreements with the following countries: China, Morocco, Kenya, Uganda, and Vietnam. These countries are identified by blue shading with dots.

The following countries have Research Cooperative Agreements: Bangladesh, Ghana, India, Kenya, Malawi, Senegal, South Africa, and Vietnam. These countries are identified by pink hash marks.

The Influenza Division provided indirect funding to Belize, Costa Rica, Dominican Republic, El Salvador, Fiji, Guatemala, Honduras, Lao People's Democratic Republic (PDR), Mauritius, Nicaragua, Panama, Papua New Guinea and Seychelles. These countries and/or islands are shaded pink.

The Influenza Division also has Cooperative Agreements with WHO, indicated by a blue star, in the following countries: Denmark (Copenhagen), Egypt (Cairo), India (New Delhi), Philippines (Manila), Republic of Congo (Brazzaville), Switzerland (Geneva) and the United States (Washington, DC).

The Division collaborates with the U.S. Department of Defense [DOD], indicated by an orange triangle, in the following countries: Egypt and Peru.

Global Disease Detection [GDD] Sites, indicated by the red X's, are located in the following cities: Beijing (China), Cairo (Egypt), Tbilisi (Georgia), Guatemala City (Guatemala), New Delhi (India), Almaty (Kazakhstan), Nairobi (Kenya), Pretoria (South Africa), and Bangkok (Thailand).

CDC Influenza Division Field Staff, indicated by a yellow dot, are located in: Accra, Ghana; Bangkok, Thailand; Copenhagen, Denmark; Dhaka, Bangladesh; Geneva, Switzerland; Guatemala City, Guatemala; Hanoi, Vietnam; Manila, Philippines; Nairobi, Kenya; New Delhi,

India; Pretoria, South Africa; Vientiane, Lao PDR; and Washington, DC, USA.

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Figure 2—The IRR provides influenza reagents to 426 laboratories in 155 countries including the US to support year-round research and surveillance activities.

The International Reagent Resource (IRR) was established in 2008 by the U.S. CDC to provide influenza viruses, reagents, kits and panels to researchers, public health laboratories, vaccine manufacturers and diagnostic test developers in order to improve influenza diagnostics and vaccines and promote basic influenza research. This map shows the locations of influenza reagents in 426 laboratories in 155 countries, including the U.S.

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International Influenza Activities: CDC-AFRO 2015

A map of the WHO African Region (AFR) shows all 47 AFR member states/countries. The member countries, outlined with gray borders, include Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinée-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of Congo, Rwanda, Sao Tome & Principe, Senegal, Seychelles, Sierra Leone, South Africa, South Sudan, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia and Zimbabwe.

Countries with shading indicate that the Influenza Division provides project funding and technical assistance through cooperative agreements. Kenya, Malawi, Senegal and South Africa are shaded with red diagonal stripes to indicate Research Cooperative Agreements. Mali and Mozambique are shaded light green to indicate Capacity Building Cooperative Agreements. Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Madagascar, Nigeria, Rwanda, South Africa, Tanzania, Uganda and Zambia are shaded dark green to indicate Sustainability Cooperative Agreements. Mauritius and Seychelles are shaded with pink hash marks to indicate that they receive indirect funding

from the Division. Kenya and Uganda are also shaded blue with dots to indicate Vaccine Policy Cooperative Agreements.

CDC Influenza Division Field Staff, indicated by a yellow dot, are located in the following cities: Accra, Nairobi, and Pretoria.

WHO National Influenza Centers (NICs), indicated by a purple circle are located in the following cities: Abidjan, Accra, Algiers, Antananarivo, Bangui, Candas, Cape Town, Dakar, Entebbe, Ibadan, Nairobi, Sandringham, and Yaoundé.

The WHO Regional Office for Africa (AFRO) Headquarters, indicated by a blue star, is located in Brazzaville, Republic of Congo.

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International Influenza Activities: CDC-EMRO 2015

A map of the WHO Eastern Mediterranean Region (EMR) shows all 22 EMR member states/countries. The member countries, outlined with gray borders, include Afghanistan, Bahrain, Djibouti, Egypt, Iraq, Iran, Jordan, Kuwait, Lebanon, Libya, Oman, Pakistan, Morocco, Occupied Palestinian Territory, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, and Yemen.

Countries with shading indicate that the Influenza Division provides project funding and technical assistance through cooperative agreements. Tunisia is shaded light green to indicate a Capacity Building Cooperative Agreement. Egypt is shaded dark green to indicate Sustainability Cooperative Agreements. Morocco, Afghanistan, and Pakistan are shaded medium green to indicate a Maintenance Cooperative Agreement. WHO National Influenza Centers (NICs), indicated by a purple dot, are located in the following cities: Amman, Baghdad, Beirut, Cairo [2], Damascus, Doha, Islamabad, Kabul, Khartoum, Manama, Muscat, Rabat, Shaab, Tehran and Tunis.

The WHO Regional Office for the Eastern Mediterranean (EMRO), indicated by a pink star, is located in Cairo, Egypt.

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International Influenza Activities: CDC-EURO 2015

A map of the WHO European Region (EUR) shows all 53 EUR member states/countries. The member countries, outlined with gray borders, include Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, North Macedonia, Turkey, Turkmenistan, Ukraine, United Kingdom of Great Britain and Northern Ireland, and Uzbekistan.

Countries with light green shading indicate that the Influenza Division provides project funding and technical assistance through Capacity Building Cooperative Agreements. Kyrgyzstan, the Southeast European Center for Surveillance and Control of Infectious Diseases (SECID) priority countries (Albania, Bulgaria, Croatia, Montenegro, Romania, Serbia and Kosovo) as well as Bosnia and Herzegovina and North Macedonia are included in this group. The Republic of Moldova is shaded dark green to indicate that they have a Sustainability Cooperative Agreement. Shaded medium green on the map are Armenia, Georgia, the Russian Federation, and Ukraine, which are the countries in the Maintenance phase of the Cooperative Agreement cycle.

CDC Influenza Division Field Staff, indicated by a yellow dot, are located at the WHO Regional Office for Europe in Copenhagen, Denmark and at WHO Headquarters in Geneva, Switzerland.

The Global Disease Detection [GDD] Sites, indicated by the red "X", are located in Georgia and Kazakhstan.

WHO National Influenza Centers (NICs), indicated by a purple dot, are located in Albania (Tirana), Armenia (Yerevan), Austria (Vienna), Belarus (Minsk), Belgium (Brussels), Bulgaria (Sofia), Croatia (Zagreb), Czech Republic (Prague), Denmark (Copenhagen), Estonia (Tallinn), Finland (Helsinki), France (Lyon and Paris), Georgia (Tbilisi), Germany (Berlin), Greece (Athens and Thessaloniki), Hungary (Budapest), Iceland (Reykjavik), Ireland (Dublin), Israel (Tel Hashomer), Italy (Rome), Kazakhstan (Almaty), Kyrgyzstan (Kyrgyzstan), Latvia (Riga), Lithuania (Vilnius), Luxembourg (Luxembourg),

Malta (Msida), Netherlands (Rotterdam), Norway (Oslo), Poland (Warsaw), Portugal (Lisboa), Romania (Bucharest [2] and Lasi), Russia Federation (Moscow and St. Petersburg), Serbia (Belgrade and Novi Sad), Slovakia (Bratislava), Slovenia (Ljubljana), Spain (Barcelona, Madrid and Valladolid), Sweden (Solna), Switzerland (Geneva), Turkey (Ankara), Ukraine (Kiev), and United Kingdom (Aberdeen, London and Glasgow).

The WHO Regional Office for Europe (EURO), indicated by a blue star, is located in Copenhagen, Denmark. WHO Headquarters is located in Geneva, Switzerland.

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International Influenza Activities: CDC-PAHO 2015

A map of the WHO Region of the Americas (AMR) shows all 35 AMR member states/countries. The member countries include Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Columbia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, United States of America, Uruguay, and Venezuela.

Countries with shading indicate that the Influenza Division provides project funding and technical assistance through cooperative agreements. Jamaica is shaded light green to indicate a Capacity Building Cooperative Agreement. Paraguay is shaded dark green to indicate a Sustainability Cooperative Agreement. Mexico and Brazil are shaded medium green to indicate Maintenance Cooperative Agreements. Peru, Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua and Panama are shaded with pink hash marks to indicate that they receive indirect funding from the Division.

CDC Influenza Division Field Staff, indicated by a yellow dot, are located in the following cities: Washington, DC and Guatemala City, Guatemala.

WHO National Influenza Centers (NICs), indicated by a purple dot, are located in Argentina (Buenos Aires, Córdoba, and Mar Del Plata), Brazil (Ananindeua, Sao Paulo, and Rio de Janeiro), Canada (Winnipeg), Chile (Santiago), Columbia (Bogota), Costa Rica (Cartago), Cuba

(Havana), Ecuador (Guayaquil), El Salvador (San Salvador), France–French Guiana (Cayenne), Guatemala (Barcenus), Honduras (Tegucigalpa), Jamaica (Kingston), Mexico (Mexico City), Nicaragua (Managua), Panama (Panama City), Paraguay (Asunción), Peru (Lima), Trinidad and Tobago (Port of Spain), United States of America (Atlanta, Georgia), Uruguay (Montevideo), and Venezuela (Caracas).

The Pan American Health Organization (PAHO) Headquarters, indicated by a blue star, is in Washington, DC (USA).

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International Influenza Activities: CDC-SEARO 2015

A map of the WHO South-East Asia Region (SEAR) shows all 11 SEAR member states/countries. The member countries, outlined with gray borders, include Bangladesh, India, Indonesia, Nepal, Sri Lanka, Thailand, Bhutan, DPR Korea, Myanmar, Maldives and Timor-Leste.

Countries with shading indicate that the Influenza Division provides project funding and technical assistance through cooperative agreements. Bhutan and the Maldives are shaded light green to indicate Capacity Building Cooperative Agreements. Nepal and Sri Lanka are shaded dark green to indicate Sustainability Cooperative Agreements. Bangladesh is shaded medium green to indicate a Maintenance Cooperative Agreement. Bangladesh, India and Thailand have diagonal stripes across the country to indicate Research Cooperative Agreements.

CDC Field Staff, indicated by a yellow dot, are located in the following cities: Bangkok, Dhaka and New Delhi.

The Global Disease Detection [GDD] Sites, indicated by red X's, are located in Bangkok, Thailand; Dhaka, Bangladesh; and New Delhi, India.

WHO National Influenza Centers (NICs), indicated by a purple dot, are located in the following cities: Colombo, Dhaka, Jakarta, Kathmandu, Nonthaburi, Pune, Pyongyang, and Yangon.

The WHO Regional Office for South-East Asia (SEARO), indicated by a blue star, is located in New Delhi, India.

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International Influenza Activities: CDC-WPRO 2015

A map of the WHO Western Pacific Region (WPR) shows 12 of the 37 WPR member states/countries. The member countries shown, outlined with gray borders, include Australia, Cambodia, China, Japan, Lao PDR, Malaysia, Mongolia, Papua New Guinea, Philippines, Singapore, South Korea, and Vietnam.

Countries with dark green shading indicate that the Influenza Division provides project funding and technical assistance through Sustainability Cooperative Agreements. Cambodia, Secretariat of the Pacific Community (SPC), and Vietnam are shaded dark green on the map. Fiji, Lao PDR and Papua New Guinea are shaded with pink hash marks to indicate that they receive indirect funding from the Influenza Division. Vietnam has black diagonal stripes to indicate that they have a Research Cooperative Agreement. China and Vietnam are also shaded with blue dots to indicate that they have Vaccine Policy Cooperative Agreements. China, Mongolia, and Philippines are shaded medium green to indicate Maintenance Cooperative Agreements.

CDC Influenza Division Field Staff, indicated by a yellow dot, are located in the following cities: Beijing, Hanoi, Manila, and Vientiane.

The Global Disease Detection [GDD] Site, indicated by a red "X", is located in Beijing.

WHO National Influenza Centers (NICs), indicated by purple dots, are located in the following cities: Beijing, Goroka, Hanoi, Ho Chi Minh City, Hong Kong, Kuala Lumpur, Manila, Phnom Penh, Singapore, Taipei, Tokyo, Ulaanbaatar and Vientiane.

The WHO Regional Office of the Western Pacific (WPRO), indicated by a blue star, is located in Manila, Philippines.

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