Welcome to Week 12 on International Surveillance. This is Part 2 of 2 entitled “Global Health Surveillance”. In part I, you learned about the International Health Regulations. In Part II, we will discuss global health surveillance efforts and then use Ebola as a case example of a Public Health Emergency of International Concern or PHEIC.

Global public health surveillance is critical for the identification and prevention of emerging and reemerging diseases, both for infectious and noncommunicable diseases that account for the greatest burden of diseases, even in very poor countries. It should provide health information in a timely manner so that countries have the information that they need to fight epidemics now or to plan for the future. Several public health problems have been addressed effectively by the development and maintenance of surveillance systems. One example is smallpox, which was eradicated through a switch in strategy from mass vaccination to surveillance with rapid response. In the poliomyelitis eradication campaign, the world is covered effectively by an integrated surveillance system that channels specimens rapidly to genotyping within days to weeks.

Individual countries are responsible for disease surveillance and response. The most important and only binding international agreement on disease control is the International Health Regulations (IHR), which were revised in 2005 to include additional infectious diseases and to extend regulation to other public health events of international concern. IHR 2005 further shifts the focus from control at borders to detection and control at the sources and requires countries to document capacity for detection, verification, and response within borders. The regulations require countries that identify public health events of international concern to report to the World Health Organization (WHO), which disseminates the information, as needed, to other countries.

Under the International Health Regulations 2005 (IHR (2005) all States Parties are required to have or to develop minimum core public health capacities to implement the IHR 2005 effectively. The IHR monitoring process involves assessing, through a self-assessment questionnaire sent to State Parties, the implementation status of 13 core capacities. The latest data, from 2014 show that State Parties are making good progress on a number of core capacities, notably in the areas of zoonotic diseases, surveillance, response, laboratories, coordination, risk communication, and food safety.

Specifically for surveillance, the core capacity implementation status is 85% among the 160 reporting countries.

Source: http://www.who.int/gho/ihr/ihr_001.jpg?ua=1
As per the previous slide, globally, reporting countries have achieved 85% of the surveillance attributes required by year 2014. Americas, Eastern Mediterranean, Europe and Western Pacific regions have achieved at least 81% of the required attributes, while Africa has achieved 77% of the required attributes.


The W.H.O. has an interactive graph where the IHR core capacities’ implementation status by country can be monitored. This is a screen shot from this website entitled “International Health Regulations (IHR) monitoring framework: Implementations status of IHR core capacities 2010-2014, Surveillance, 2014”. This graph deals only with the surveillance capacity. The other 12 core capacities that can be viewed with this tool are: legislation, coordination, response, preparedness, risk communication, human resources, laboratory, and points of entry, zoonosis, food safety, chemical and radio nuclear. You are encouraged to go to this website and explore the use of this tool in any area of your interest.

The source is listed on the slide and in the transcript. (*Source: [http://gamapserver.who.int/gho/interactive_charts/ihr/monitoring/atlas.html?indicator=i2](http://gamapserver.who.int/gho/interactive_charts/ihr/monitoring/atlas.html?indicator=i2)*).

The Global Disease Detection (GDD) program is CDC’s principal and most visible program for developing and strengthening global capacity to rapidly detect, accurately identify, and promptly contain emerging infectious disease and bioterrorist threats that occur internationally. The GDD Program is part of the Division of Global Health Protection or DGHP. A weakness in the surveillance system for infectious diseases in any one country is a threat to all countries. This risk to U.S. national and global interests underscores the need for a coordinated and connected system to detect and respond to emerging, and re-emerging, infectious diseases. Through the revised International Health Regulations (IHR 2005) countries are responsible for effective monitoring, reporting, and response to any disease threat with the potential to harm the public’s health. These guidelines require renewed cooperation and coordination between countries for full and effective implementation. The U.S. is committed to helping countries with limited resources develop the essential detection and control capacities in coordination with the World Health Organization (WHO) and Ministries of Health.
A central focus of GDD is the establishment and expansion of GDD Regional Centers, particularly in resource-constrained locations. CDC currently operates 10 GDD Regional Centers in the following locations: 1) Bangladesh, 2) China, 3) Egypt, 4) Georgia and the South Caucasus, 5) Guatemala and Central America, 6) India, 7) Kazakhstan and Central Asia, 8) Kenya, 9) South Africa, and 10) Thailand.

Global Disease Detection Regional Centers are located in all WHO regions. Together with partners, Centers work directly with ministries of health to identify, control and combat priority infectious diseases. Regional Center locations are selected in consultation with invited countries, internal experts, WHO, and national and international partners, and is based on:

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

Global Disease Detection (GDD) Regional Centers assist to strengthen public health systems and improve the essential infrastructure in host countries to rapidly identify and control emerging infectious diseases at the source.

The following 6 core capacities were identified by internal and external GDD stakeholders as critical functions for building in-country ability to comply with the revised International Health Regulations (IHR 2005).

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

2. **Training in field epidemiology and laboratory methods**: Training for scientists and public health practitioners in field epidemiology and laboratory methods builds and strengthens public health systems and increases their capacity to detect and control emerging infectious diseases.
3. Pandemic influenza preparedness and response: Influenza viruses, especially highly pathogenic avian influenza remain the most urgent global infectious disease threat. Development of influenza surveillance capacity – both laboratory and epidemiologic – in host countries, including improving and expanding global surveillance networks, increasing virus isolation and epidemiological data collection through expansion of capacity; and increasing timely identification, reporting, and response to outbreaks.

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

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

and

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

Between 2006-2014, the GDD accomplished the following:

**Outbreak Response** - The GDDs responded to more than 1700 disease outbreaks and other public health emergencies, including Ebola, anthrax, chikungunya, and influenza H7N9.

**Pathogen Discovery** - They discovered 77 new pathogens, either identifying them for the first time anywhere in the world or newly discovered within the GDD Center regions. In addition, the capacity to identify 289 pathogens locally increased, up from 11 in 2006.

**Training** - The number of Field Epidemiology Training Program (FETP) trained epidemiologists and laboratorians within GDD Center regions increased to 676 (from 26 in 2006). In addition, short-term public health training was provided to nearly 100,000 participants worldwide. Training topics have included epidemiology, laboratory, all-hazards preparedness, risk communication, influenza, and others.
Surveillance- 13.1 million people were covered with population-based surveillance for pneumonia and other locally important diseases and syndromes, which serve as demonstration projects for national surveillance efforts. GDDs kept 16 diseases and syndromes under surveillance, including respiratory syncytial virus, adenovirus, pneumococcus, febrile illness of unknown origins, influenza-like illness, and tuberculosis. GDD Centers are using these data to detect outbreaks, make policy recommendations, evaluate new interventions, and measure public health impact.

Building Network Capacity- GDDs worked with WHO and local ministries to control the spread of respiratory infections in healthcare settings as well as collaborated with WHO and other partners to assess the ability of countries to meet the revised International Health Regulations.

Slide 11 Surveillance in Kibera, Kenya
- Click on this link:
  http://www.cdc.gov/globalhealth/video/gdd/in/kibera.htm
Click on the link on this slide or cut and paste the link into your browser. It links to a 5 ½ minute video on global disease surveillance being conducted in Kibera, Kenya. Kenya is one of the GDD Centers. The mini-documentary chronicles how the U.S. reaches out to Kenya’s largest slum to offer aid in disease prevention and control. In Kibera, 30,000 residents routinely confer with community outreach workers in a campaign to learn more about emerging diseases, and simultaneously provide care for the families taking part.

Slide 12 GCD Scientific Publications
- http://www.cdc.gov/globalhealth/gdder/gdd/publications.htm
- Over 100 publications in 2014 alone
There has been a wealth of publications produced as a result of work in the Global Disease Detection Centers. On this slide is a link to the CDC site containing just the publications from 2014, which number over 100.

Slide 13 Background Information on Ebola
- What is Ebola?
- What does it cause & in what species?
- Where is it found?
- How many kinds of Ebola are there?
- What is the natural reservoir host?
- How do humans acquire Ebola?
The unprecedented Ebola epidemic in Africa will serve as a case example for issues regarding the International Health Regulations. As this is a course on surveillance, the emphasis will not be on the disease epidemiology. However, it is important to lay some groundwork on this disease first.

Ebola, previously known as Ebola hemorrhagic fever, is a rare and deadly disease caused by infection with one of the Ebola virus strains. Ebola can cause disease in humans and nonhuman primates (monkeys, gorillas, and chimpanzees). Ebola is caused by infection with a virus of the family Filoviridae, genus *Ebolavirus*. There are five identified Ebola virus strains, four of which are known to cause disease in humans: Ebola virus (*Zaire ebolavirus*); Sudan virus (*Sudan ebolavirus*); Taï Forest virus (*Taï Forest ebolavirus*); and Bundibugyo virus (*Bundibugyo ebolavirus*). The fifth, Reston virus (*Reston ebolavirus*), has caused disease in nonhuman primates, but not in humans. Ebola viruses are found in several African countries. It was first discovered in 1976 near the Ebola River in what is now the
Democratic Republic of the Congo. Since then, outbreaks have appeared sporadically in Africa. The natural reservoir host of Ebola virus remains unknown. However, on the basis of evidence and the nature of similar viruses, researchers believe that the virus is animal-borne and that bats are the most likely reservoir. Four of the five virus strains occur in an animal host native to Africa.

Ebola is introduced into the human population through close contact with the blood, secretions, organs or other body fluids of infected animals such as chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines found ill or dead or in the rainforest. Ebola then spreads through human-to-human transmission via direct contact (through broken skin or mucous membranes) with the blood, secretions, organs or other body fluids of infected people, and with surfaces and materials (e.g. bedding, clothing) contaminated with these fluids.

The 2014-15 Ebola outbreak is the largest Ebola outbreak in history and the first Ebola epidemic the world has ever known affecting multiple countries in West Africa.

The link on this slide is to the most current case counts. As of the time of this presentation, there have been 28,200 cases worldwide and 11,306 deaths.

Political, religious and cultural issues have complicated the control measures.

The first meeting of the W.H.O. Emergency Committee convened by the Director-General under the International Health Regulations (2005), regarding the 2014 Ebola Virus Disease (EVD, or “Ebola”) outbreak in West Africa, was held by teleconference on Wednesday, 6 August 2014.

After discussion and deliberation on the information provided, the Committee advised that:

• the Ebola outbreak in West Africa constitutes an ‘extraordinary event’ and a public health risk to other States;
• the possible consequences of further international spread are particularly serious in view of the virulence of the virus, the intensive community and health facility transmission patterns, and the weak health systems in the currently affected and most at-risk countries.
• a coordinated international response is deemed essential to stop and reverse the international spread of Ebola.

It was the unanimous view of the Committee that the conditions for a Public Health Emergency of International Concern (PHEIC) have been met.
In light of States Parties’ presentations and subsequent Committee discussions, several challenges were noted for the affected countries:

- their health systems are fragile with significant deficits in human, financial and material resources, resulting in compromised ability to mount an adequate Ebola outbreak control response;
- inexperience in dealing with Ebola outbreaks; misperceptions of the disease, including how the disease is transmitted, are common and continue to be a major challenge in some communities;
- high mobility of populations and several instances of cross-border movement of travelers with infection;
- several generations of transmission have occurred in the three capital cities of Conakry (Guinea); Monrovia (Liberia); and Freetown (Sierra Leone); and
- a high number of infections have been identified among health-care workers, highlighting inadequate infection control practices in many facilities.

The Committee provided 3 categories of recommendations to the Director-General to address the Ebola outbreak in accordance with IHR (2005). These were for: 1) States with Ebola transmission, 2) States with a potential or confirmed Ebola Case, and unaffected States with land borders with affected States, and 3) All States. We will focus on those recommendations related to surveillance.

**States with Ebola transmission:**

1. States should activate their national disaster/emergency management mechanisms and establish an emergency operation center, under the authority of the Head of State, to coordinate support across all partners, and across the information, security, finance and other relevant sectors, to ensure efficient and effective implementation and monitoring of comprehensive Ebola control measures. These measures must include infection prevention and control (IPC), community awareness, surveillance, accurate laboratory diagnostic testing, contact tracing and monitoring, case management, and communication of timely and accurate information among countries. For all infected and high risks areas, similar mechanisms should be established at the state/province and local levels to ensure close coordination across all levels.

2. States should conduct exit screening of all persons at international airports, seaports and major land crossings, for unexplained febrile illness consistent with potential Ebola infection. The exit screening should consist of, at a minimum, a questionnaire, a temperature measurement and, if there is a fever, an assessment of the risk that the fever is caused by EVD. Any person with an illness consistent with EVD should not be allowed to travel unless the travel is part of an appropriate medical evacuation.
3. There should be no international travel of Ebola contacts or cases, unless the travel is part of an appropriate medical evacuation.

States with a potential or confirmed Ebola Case, and unaffected States with land borders with affected States

1. Unaffected States with land borders adjoining States with Ebola transmission should urgently establish surveillance for clusters of unexplained fever or deaths due to febrile illness; establish access to a qualified diagnostic laboratory for EVD; ensure that health workers are aware of and trained in appropriate IPC procedures; and establish rapid response teams with the capacity to investigate and manage EVD cases and their contacts.

2. Any State newly detecting a suspect or confirmed Ebola case or contact, or clusters of unexplained deaths due to febrile illness, should treat this as a health emergency, take immediate steps in the first 24 hours to investigate and stop a potential Ebola outbreak by instituting case management, establishing a definitive diagnosis, and undertaking contact tracing and monitoring.

All States

States should be prepared to detect, investigate, and manage Ebola cases; this should include assured access to a qualified diagnostic laboratory for EVD and, where appropriate, the capacity to manage travelers originating from known Ebola-infected areas who arrive at international airports or major land crossing points with unexplained febrile illness.

The Director-General endorsed the Committee’s advice and issued them as Temporary Recommendations under IHR (2005) to reduce the international spread of Ebola, effective 8 August 2014. The Director-General requested their reassessment of this situation within 3 months. It turns out that additional IHR meetings on Ebola were convened in September and October of 2014, and January, April & July in 2015.
Measures for Ill Travelers

- What was done to prevent ill travelers in West Africa from getting on a plane?
  - In West Africa
  - During Travel
  - In the United States

As one of the recommendations for States with cases is to ban international travel for persons from West Africa who are ill (under as part of medical evacuation), what control measures are in place? We will discuss this by looking at West Africa, during travel and in the United States.

In West Africa, CDC’s Division of Global Migration and Quarantine is working with airlines, airports, and ministries of health to provide technical assistance for the development of exit screening and travel restrictions in the affected areas. This includes:
- Assessing the ability of Ebola-affected countries and airports to conduct exit screening,
- Assisting with development of exit screening protocols,
- Training staff on exit screening protocols and appropriate PPE use, and
- Training in-country staff to provide future trainings

During travel, CDC works with international public health organizations, other federal agencies, and the travel industry to identify sick travelers arriving in the United States and take public health actions to prevent the spread of communicable diseases. Airlines are required to report any deaths onboard or ill travelers meeting certain criteria to CDC before arriving into the United States, and CDC and its partners determine whether any public health action is needed. If a traveler is infectious or exhibiting symptoms during or after a flight, CDC will conduct an investigation of exposed travelers and work with the airline, federal partners, and state and local health departments to notify them and take any necessary public health action. When CDC receives a report of an ill traveler on a cruise or cargo ship, CDC officials work with the shipping line to make an assessment of public health risk and to coordinate any necessary response.

In the United States, CDC has staff working 24/7 at 20 Border Health field offices located in international airports and land borders. CDC staff are ready to investigate cases of ill travelers on planes and ships entering the United States. CDC works with partners at all ports of entry into the United States to help prevent infectious diseases from being introduced and spread in the United States. They also works with Customs and Border Protection, U.S. Department of Agriculture, U.S. Coast Guard, U.S. Fish and Wildlife Services, state and local health departments, and local Emergency Medical Services staff. While possible, it is unlikely that an infected person who traveled from an area with Ebola to the United States on an airline would spread the disease to fellow passengers. First, relatively few of the approximately 350 million travelers who enter the United States each year come from these countries. Secondly, most people who become infected with Ebola are those who live with or care for people who have already caught the disease and are showing symptoms. Even so, CDC and healthcare providers in the United States are prepared for the possibility that a traveler could get Ebola and return to the U.S. while sick.
Instances of civil unrest and violence against aide workers were reported in West Africa as a result of the outbreak. The public health systems in the affected countries were being severely strained as the epidemic grew. The Liberian government instituted enhanced measures to combat the spread of Ebola, many of which made travel to, from, and within the country difficult.

The government took the following steps:
- Closed all borders except major entry points
- Instituted prevention and screening measures at entry points that remain open. This new travel policy affected incoming and outgoing travelers.
- Instituted restrictions on public and other mass gatherings
- Instituted quarantine measures for communities heavily affected by Ebola; travel in and out of those communities were restricted
- Authorized military personnel to help enforce these and other prevention and control measures

At the time this presentation was updated, 11 health workers infected with Ebola virus were either evacuated from West Africa and cared for in the U.S. or diagnosed and cared for in the U.S. Of these, there were two deaths. CDC was recommending that U.S. residents avoid nonessential travel to Guinea, Liberia and Sierra Leone. This is a Warning Level 3, the highest of the 3 levels.

At the time of this presentation, the Level 3 Alert is still in effect for Guinea and Sierra Leone but only a Level 1 for Liberia.

Since it is important that humanitarian aide work continue in the region, volunteers aiding in humanitarian assistance have been advised to follow CDC’s guidance for avoiding contact with the blood and body fluids of people who are sick with Ebola.
CDC currently has two types of Check and Report Ebola (CARE) Kits for travelers arriving in the U.S. who go through entry screening.

The kits for travelers arriving from **Guinea or Sierra Leone** contain tools to help these travelers do daily health checks for the next 21 days and report their health checks to their state or local health department. Contents include a booklet of information, a digital thermometer, a CDC contact card and a mobile phone. CARE Kit materials as well as a YouTube video that are being distributed to travelers returning to the U.S. can be downloaded from the links below to learn how to use the materials in the kit. 

- CARE (Check and Report Ebola) Kit for Travelers from Guinea or Sierra Leone[PDF – 16 pages] 
- CDC CARE Card for Travelers from Guinea or Sierra Leone[PDF – 2 pages]

Travelers arriving from **Liberia** receive a different version of the kit because the Ebola outbreak in Liberia is over at the time of this presentation. These travelers receive this kit as an extra precaution. They are encouraged to watch their health for 21 days after leaving Liberia and to call their state or local health department if they develop symptoms. The kit for travelers from Liberia can be accessed using the link below.

- CARE (Check and Report Ebola) Kit for Travelers from Liberia[PDF – 2 pages]

As we are using Ebola as a case example for international surveillance, in a PHEIC, let’s next define and differentiate between active and direct active monitoring of potentially exposed individuals.

**Active monitoring** means that the state or local public health authority assumes responsibility for establishing regular communication with potentially exposed individuals, including checking daily to assess for the presence of symptoms and fever, rather than relying solely on individuals to self-monitor and report symptoms if they develop.

**Direct active monitoring** means the public health authority conducts active monitoring through direct observation.

The purpose of active (or direct active) monitoring is to ensure that, if individuals with epidemiologic risk factors become ill, they are identified as soon as possible after symptom onset so they can be rapidly isolated and evaluated.

Active (or direct active) monitoring could be conducted on a voluntary basis or compelled by legal order. Active (or direct active) monitoring and prompt follow-up should continue and be uninterrupted if the person travels out of the jurisdiction.
Let’s summarize what we covered in Part II. First, we described countries’ responsibilities under the International Health Regulations of 2005. Next we assessed the surveillance capacity of countries to comply with the surveillance requirements of the IHR. The CDC’s Global Disease Detection Program was discussed. Finally, we used the recent epidemic of Ebola Virus disease in West Africa as a case example of a condition meeting the IHR’s definition of a Public Health Emergency of International Concern, with resulting surveillance implications.

This completes the Week 12 Part 2 lecture.