1. Hello and welcome to “Community Health Safety & Disaster Preparedness, Response, and Recovery.” This lecture is taken, among other cited sources, from Public Health Administration, edited by Lloyd F. Novick et al. Chapter 23, Roles and Responsibilities of Public Health in Disaster Preparedness and Response by Linda Young Landesman and Cynthia Morrow.

2. The objectives of this lecture are:
   - Explain public health approach of ensuring community health safety
   - Describe the elements of the disaster management cycle, including preparedness
   - Understand public health disaster response and escalation
   - Describe public health’s role in the disaster examples provided

3. As you’ve learned in previous lectures, a focus of public health is safety and well-being of entire populations. The CDC-sourced model presented here is helpful in understanding the public health approach to ensuring community health safety. It applies to a variety of public health concerns, including violence, suicide, motor vehicle accidents, home injury prevention, and the other issues.

   The first step is to define the public health problem. That is, what is magnitude of the problem and who does it impact? Data can demonstrate causes, localities, and trends. These data can be obtained from vital records, hospital charts, registries, population-based surveys, police reports, and other sources.

   Next, it is important to understand the individual, environment, community, and societal factors associated with health outcomes. These risk and protective factors are not causes, but rather, associated with the relevant health outcomes. For example, poverty does not cause domestic violence, but may be associated with other social/environmental factors that cause the violence to occur. You will probably learn (or have already learned) about the Social-Ecological Model in other classes, but it is worth mentioning here. The Social-Ecological Model considers the complex interactions between individual, environment, community, and societal factors in health outcomes.

   Then, based on this research data and findings, intervention and prevention programs are developed and tested. This “evidence-based” approach to program planning continues after implementation through rigorous evaluation to determine their effectiveness.

   Finally, once prevention programs have been proven effective, they must be adopted more broadly. This is accomplished through widespread scholarly publications, training, networking, technical assistance, and evaluation.

4. There is a multilevel approach to ensuring community health and safety. At the national level of the U.S., activities include improving and expanding health information and data systems, effectively transitioning research into practice, providing funding and other resources, and identify connections between multiple lines of research. At the state level, activities include the development of statewide agendas, prevention-focused training, technical assistance, and financial support for local community efforts, and identifying new funding streams from the federal government. Finally, at the local level, health departments build coalitions and
partnerships, enhance public awareness, link to and support the medical community’s clinical response role, and conduct surveillance, among many other activities.

5. Now let’s begin the material on Disaster Preparedness, Response, and Recovery. A disaster is an event concentrated in time and space that causes significant physical and social impacts. It can be distinguished from other public health topics by the time and space dimensions. For example, an earthquake with 50 deaths in a matter of minutes vs. automobile fatalities with about 40,000/year in the U.S. (Lindell, 2011). There are two main categories of disasters – natural disasters and man-made disasters. Natural disasters are rapid, sudden-onset phenomena with profound effects, such as earthquakes, floods, tropical cyclones, and tornadoes. Manmade disasters are technological events not caused by natural hazards, such as fire, chemical spills and explosions, and airplane crashes. I will present the role of public health using examples in each of these categories later in the lecture.

6. Ensuring public health and safety in the event of disasters can be divided into multiple categories. In the subsequent slides, I will present prevention/mitigation (these are pre-impact activities), planning/preparedness (these are pre-impact activities), response and epidemiologic activities (during impact activities), and recovery (post-impact activities).

7. Disaster prevention or mitigation includes measures that are taken to reduce the harmful effects of a disaster by attempting to limit impacts on human health and economic infrastructure. Prevention strategies are often grouped into three categories: primary prevention, secondary prevention, and tertiary prevention. Primary prevention relates to the prevention of the occurrence of deaths, injuries, or illnesses related to the disaster event (e.g., evacuation of a community in a flood-prone area, sensitizing warning systems for tornadoes and severe storms). Secondary prevention is the mitigation of health consequences of disasters (e.g., use of carbon monoxide detectors when operating gasoline-powered generators after loss of electric power, building a “safe room” in dwellings located in tornado-prone areas). Tertiary prevention is employed in connection with persons with preexisting health conditions and in whom the health effects from a disaster event may exacerbate those health conditions. Examples include appropriate sheltering of persons with respiratory illnesses from haze and smoke originating from forest fires, and sheltering elderly who are prone to heat illnesses during episodes of extreme ambient temperatures.

8. Disaster preparedness practices are pre-impact actions that provide the human and material resources needed to support active responses at the time of hazard impact. The goals of planning are to work cooperatively with other disciplines and understand the resources, skills, and tools that public health professionals bring to the diseased community.

An important step in emergency preparedness is to use community hazard/vulnerability analysis (HVA) to identify the geographic areas and population segments at risk. To do this, public health officials must identify all internal and external threats and estimate the probability of each occurring. Then, for each threat, the level of preparedness should be assessed in order to determine vulnerabilities and areas of needed improvement.

In addition, communities should develop emergency operations plans, conduct emergency response training, acquire facilities and equipment, and perform emergency drills, exercises and critiques (Perry and Lindell, 2007).
There has been an increase in disaster preparedness funding since the September 11, 2001 terrorist attacks. This funding has led to increase preparedness at the state and local levels, as well as improved coordination by the CDC and other federal agencies (Khan & Curran, 2011).

9. At this point we need to look at the role of health departments and preparedness. LHDs are first-line responders for all incidents involving the health of the community. These principles of preparedness can be used in all hazards, including bioterrorism. The following list is a brief overview of the essential elements in planning at a local level, regardless of the threat.

Readiness and impact assessment: In developing public health preparedness plans, the state or local health department needs to consider both the state of readiness of the community and the potential impact of the threat. In assessing readiness, all other components of planning listed below must be considered.

Expansion of surveillance and epidemiology capacity: In order to maximize opportunities to mitigate, community plans should include an ongoing effort to enhance the capacity for surveillance. A surveillance system to track the large numbers of potentially exposed individuals can be designed in accord with the guidance.

Infection control measures including isolation and quarantine: Isolation and quarantine are among the most complicated infection control measures that must be addressed in the LHD disaster plan. Discussions with local law enforcement and legal authorities to clarify conditions for declaring a public health emergency, or issuing and executing court orders to protect the public’s health, should be part of LHD planning. While LHD may have powers under their normal authority, advance clarification is required about when it might be necessary to establish and use extraordinary legal powers.

Mass provision of clinical interventions (vaccine or medications): Depending on the threat facing a community, clinical interventions such as vaccine for smallpox or antibiotics for a bacterial agent may be available to mitigate a biologic threat. Uniform protocols with respect to vaccine distribution or prophylactic antibiotic usage are advisable.

Coordination and capacity assessment of health care delivery system: Communication between the responders and coordination of the health care delivery system is essential to minimize the morbidity and mortality associated with a biologic threat. Preparedness plans should include a mechanism for surge capacity, including ongoing assessment of needs, identification of alternate triage and treatment sites, and local capacity for isolation.

10. What is the role of public health personnel in disaster preparedness? What is public health’s responsibility in disaster response? What are public health’s major tasks?

First, public health officials are trained to conduct assessments. Using the management information systems that public health officials have developed throughout the public health and health care industry, public health professionals are well prepared to share information. The goal of conducting assessments is to convey information quickly in order to recalibrate a system’s response. Examples of assessment areas include the viability of the health care infrastructure, including the drug supply, environmental infrastructure (food, water, sanitation, and vector control), the needs of the elderly and other special populations, and level of access to health care providers (acute, continuity of care, primary care, and emergency care).
In the discipline of Applied Epidemiology, there is a sub discipline called disaster epidemiology. The ultimate aim of disaster epidemiology is to determine strategies to prevent or reduce deaths, injuries, or illnesses related to the disaster.

When planning for the delivery of services in a disaster, the responsibilities of public health practitioners is to build on the triage procedures used in emergency medicine to help other responders prioritize both medical and public health problems. Public health has a major responsibility in ensuring the continuation of the delivery of all health care. The participants include “sectors of response” (i.e., fire, EMS, emergency management) and other parts of the health care delivery field (such as hospitals and emergency medical facilities).

Finally, the public health response to disasters also encompasses relief efforts, which focuses attention on saving lives, providing first aid, restoring emergency communications and transportation systems, and providing immediate care and basic needs to survivors, such as food and clothing or medical and emotional care.

11. There has been a significant amount of research regarding disaster response. The following are some are the more interesting points to understand. First, emergency response units often self-dispatch. This means that there’s no coordinated effort to send emergency teams to the disaster site; they arrive at their own prerogative.

Next, most initial search and rescues are carried out by the survivors themselves. For example a group of active-duty soldiers from the Massachusetts National Guard finished the 2013 Boston Marathon in full combat uniform and carried a “ruck,” a military backpack weighing about 40 pounds. Three of them immediately responded to the emergency by pulling metal barriers away so that medical personnel could respond – within a minute of the blasts (Mother Jones, April 16, 2013).

Also, casualties are likely to bypass on-site triage and go directly to hospitals. In the sarin attack on Tokyo, Japan in 1995, the Tokyo Metropolitan Fire Department had its own triage tagging system, but these were not used for the majority of the victims, who went to hospitals without the aid of fire department ambulances.

Furthermore, most casualties arrive at hospitals by private cars, police vehicles, buses, taxis, or foot. For example, in the terrorist attack on the World Trade Center, New York City, 2001, of the 7,364 patients treated at hospitals after the attack, only 504 (6.8%) patients were transported by ambulance.

Also, notification of hospital may come from arriving victims or news media rather than from authorities in field.

Finally, in a disaster, the least serious casualties often arrive first (called a “reverse-triage”). Because of this phenomenon, it is recommended that hospitals hold ED beds open for the more serious patients who may arrive after those patients with more minor conditions.

12. Disasters can be classified by the resultant anticipated necessary response. Each level of response changes the command responsibilities. For example, in a Level 1 disaster, local emergency response personnel and organizations contain and deal effectively with the disaster and its aftermath. A Level II response requires regional efforts and mutual aid from surrounding communities. Finally, in a Level III response, local and regional assets are overwhelmed, requiring statewide or federal assistance.
13. In the United States, the response to disasters is organized through multiple jurisdictions, agencies, and authorities. The basis for all local public health emergency responses resides in the LHD. In planning a response strategy, LHDs should identify key responders in the community, including emergency medical services, HAZMAT, and police and fire agencies. The American Red Cross (ARC) provides emergency shelter; basic health services for those residing in shelters; food services on-site and in shelters; counseling (including mental health services or referrals); and family reunification. Also, discussions about coordinating the response and surveillance should also take place with hospitals and poison control centers.

14. All disasters are local events. However, it is critical to emphasize that the local response structure must be flexible enough to expand readily as additional resources (particularly from outside the jurisdiction) are added to match the level of demands posed by an escalating event. In the event of insufficient local resources, the local public health officials may escalate a request to the state or federal level, or both. The coordinating agency can seek help from surrounding jurisdictions (often referred to as mutual aid resources) or can escalate a request to the state or federal level, or both. The call for outside aid is often called “escalate upward.” Local officials are warned that federal resources may require 72 hours to arrive, according to the Federal Emergency Management Agency (2003).

Federal resources are made available to the states, such as the National Guard, CDC (i.e., Epidemic Intelligence Service) and the U.S. Public Health Service (i.e., the Agency for Toxic Substances and Disease Registry).

15. All states have an emergency management authority (EMA), sometimes called an office of emergency preparedness (OEP). It is the responsibility of the EMA, under the authority of the governor’s office, to coordinate the efforts of all state resources used during an emergency or disaster. These resources may be expansive and include the state’s health department, housing and social services agencies, and public safety agencies (i.e., state police).

16. Multiple layers of law and regulations— the Stafford Act, the Homeland Security Act of 2002, the Post Katrina Emergency Management Reform Act of 2006, and the National Response Framework—mean a disaster can simultaneously be responded to in accordance with the provisions of all multiple laws. This can result in confusion as to which set of regulations apply during a crises.

The Stafford Act (1988) provides for federal government assistance to state and local governments during major disasters and emergencies. Specifically, the law defines how federal disasters are declared, determines the types of assistance to be provided by the federal government, and establishes cost sharing arrangements among federal, state, and local governments. The Federal Emergency Management Agency (FEMA) carries out the provisions of the Stafford Act.

The U.S. Department of Homeland Security, established through the Homeland Security Act of 2002, coordinates federal programs and assists states through operational and/or resource coordination and on-scene incident command structures to respond to those events that rise to the level of national significance.

Hurricane Katrina brought to bare systemic problems of management, resource allocation, and leadership within FEMA. The Post Katrina Emergency Management Reform Act of 2006, signed
by President Bush in 2006, sought to correct the most significant errors of FEMA’s management capabilities.

17. Public health has the expertise to help communities handle the most common health-related problems in the aftermath of a disaster. Disaster recovery begins with stabilization of an incident and ends when the community has re-established normal social, economic and political routines.

Displaced populations always require food, water, shelter, some type of sanitation services, and vector control, such as mosquito spraying and mosquito monitoring.

18. Epidemiologic activities in the impact phase of a disaster are critical.

Rapid needs assessment represents a collection of techniques—epidemiologic, statistical, and anthropological—designed to provide information about an affected community’s needs after a disaster. The objective is to obtain a quick and objective snapshot of a disaster-stricken community, so that immediate relief actions may be taken.

Disease surveillance refers to an ongoing and systematic collection, analysis, and interpretation of information linked to planning, implementation, and evaluation of public health practice, and is closely integrated with the timely dissemination of these data for decision making by public health authorities. Often, disease surveillance systems are implemented to signal whether outbreaks of infectious diseases are occurring in the community. Surveillance most commonly looks for health outcomes, defined as a health event of interest, usually illness, injury, or death.

Descriptive and analytic investigations may be undertaken by health authorities in situations where assessment and surveillance raise further questions and hypotheses concerning a health condition in the affected population. These investigations are designed to address questions or test hypotheses so that recommendations can be made for the prevention of any adverse health outcomes related to the disaster event.

Data Collection is an important aspect of surveillance. During the relief phase, the following data help gauge appropriate relief efforts by emergency managers and public health officials:

- demographic characteristics of the affected area and surrounding vicinities
- casualty assessment, including deaths, injuries, and selected illnesses
- assessment of the needs of the displaced population, and
- coordination of volunteer assistance.

19. In recent years, there has been a global recognition of the potential peril from bioterrorism and other emerging threats such as Severe Acute Respiratory Syndrome (SARS) and pandemic influenza. The following slides will discuss public health’s role in the following disaster examples:

- Hurricane Katrina
- Terrorism preparedness (small pox threat)
- Pandemic Influenza
- SARS
- Avian flu
- Boston Marathon bombing

20. One of the most devastating natural disasters in U.S. history occurred in August 2005 when Hurricane Katrina claimed over 1,833 lives along the U.S. Gulf Coast. Over 400,000 Louisiana residents were displaced because of mandatory evacuation orders and the flooding that followed the hurricane.
Public health activities in response to Hurricane Katrina included investigations of infectious disease, environmental assessments, morbidity and mortality-surveillance, shelter-based surveillance, community health and needs assessments, location and follow-up of displaced persons with tuberculosis, and broad utilization of immunization registries for displaced children.

Hurricane Katrina demonstrated the importance of developing advance creative solutions for the maintenance and continuation of home-based services (e.g., dialysis, intravenous antibiotics, visiting nurses services, etc.). Patients in all residential care facilities (long-term care, psychiatric, rehabilitation) may need to be evacuated and placed elsewhere.

21. According to some experts, the likelihood of a chemical or biological warfare attack (CBW) is increasing (Galamas, 2011). To address this, the Pandemic and All-Hazards Preparedness Act of 2006 established within the DHHS, a new Assistant Secretary for Preparedness and Response, whose agency is responsible for developing and acquiring medical countermeasures. The organization is called Biomedical Advanced Research and Development Authority (BARDA).

The five highest biological warfare threat priorities among the diseases are:

1. Anthrax
2. Smallpox
3. Plague
4. Botulism
5. Tularemia

22. Let’s look at smallpox. Smallpox was a highly contagious disease caused by a virus. It is very dangerous for unimmunized populations, with an attack rate of up to 90%, and mortality rate as high as 35%. Public health officials eradicated the natural illness from the planet by 1980, but samples of live virus are maintained in the U.S. and Russia.

The U.S. State Department under George W. Bush stated that North Korea may be developing a smallpox biological weapon. Recently, according to New York Times, the U.S. “government is buying enough of a new smallpox medicine to treat two million people in the event of a bioterrorism attack.” This purchase is conducted by the Biomedical Advanced Research and Development Authority (BARDA), mentioned above.

In addition, the Strategic National Stockpile (SNS) Program was established to maintain a stockpile of smallpox vaccines, medical supplies and equipment. Upon request, the SNS Program can deliver materials anywhere in the United States within 12 or fewer hours.

23. No discussion regarding disaster preparedness would be complete without making a few statements about influenza. Influenza, a common but frequently serious disease known as the “flu,” annually results in more than 200,000 hospitalizations, 36,000 to 40,000 deaths, and $1 billion to $3 billion in direct costs for medical care in the U.S. Influenza spreads rapidly and can be transmitted by those who are asymptomatic but infected, leading to the near simultaneous occurrence of multiple community outbreaks in an escalating fashion.

24. Influenza pandemics are explosive global events in which most, if not all, persons are at risk for infection and illness worldwide. Such events have the potential to quickly overwhelm countries and their health systems that have not made adequate preparation. Using projection models, public health authorities predict that the next influenza pandemic has the potential to infect 30% percent of the U.S. population, resulting in between 209,000 and 1.9 million deaths, based on mortality data from the 1957 and 1968. Pandemic influenza occurs on average every three to four decades when a new strain of the flu, capable of causing significant morbidity and mortality, emerges. Four influenza pandemics occurred in the 20th Century - 1918, 1957, 1968 and 2009.
25. A good question is why control by vaccination is problematic. Current methods necessitate that manufacturers make advance predictions about both the demand and the type of vaccine to produce. Should the virus change from what was predicted to infect a population, the vaccine developed is likely to be less effective, if it protects at all. Further, when a new influenza strain spreads worldwide, sufficient vaccines won’t be available for 6 to 8 months due to current manufacturing capabilities.

In an effort to alleviate these concerns, the federal government has earmarked over a billion dollars to develop cell-based vaccine and manufacturing capacity in the U.S. In late 2012, the FDA approved the first cell-based flu vaccine. According to a Center for Infectious Disease Research and Policy report, Nicholas Kelley, Ph.D. stated that “the arrival of cell-based flu vaccine is an incremental improvement that could speed production by a week or two and boost the production volume over the long term.”

26. Vaccine and antiviral distribution will be a massive undertaking. Because of limited supply, procedures have to be established to do the following:
   - Acquire and take delivery of the drugs
   - Prioritize who will receive available drugs
   - Carry out public health planning and preparedness for pandemic flu
   - Track supplies, their distribution and use
   - Conduct mass vaccination clinics
   - Track adverse events due to vaccination

27. During a pandemic, hospitals should prepare for an increase in inpatient medical care. Even a mild pandemic could produce a 25% increase in demand for inpatient beds, ICU beds, and ventilators. With a 30% attack rate, staff absenteeism is expected to be high and there will be limited availability of critical resources. Hospital preparations should address:
   - Guidance for hospital employees,
   - Infection control guidelines,
   - Mass mortality issues,
   - Support for staff and their families,
   - Tracking hospital resources, and
   - Role of triage centers and home care.

28. Severe Acute Respiratory Virus Syndrome or SARS is a type of coronavirus that was first reported in Asia in February 2003. According to the World Health Organization (WHO), a total of 8,098 people worldwide became sick with SARS during the 2003 outbreak. Of these, 774 died. In the United States, only eight people had laboratory evidence of SARS-CoV infection. All of these people had traveled to other parts of the world with SARS. SARS did not spread more widely in the community in the United States.

At first, medical authorities tried to hide that disease by stating that only a handful of people were sick. Then, a Chinese doctor, Jiang Yanyong, exposed the cover-up in a letter circulated to international news organizations explaining that, in fact, at least 100 people were being treated in Beijing hospitals for SARS. China’s top leaders then acknowledged that they had provided false information about the epidemic. This period of hesitation to address the outbreak undoubtedly increased the infection rate.

Since the shock of SARS, a lot of progress has been made in preparing for global pandemics. In 2005 the members of the World Health Organization (WHO) agreed on a new set of International
Health Regulations, with rules for responding to outbreaks that are of global concern. Many countries developed their own plans for dealing with a pandemic. As of 2011, 158 countries had official provisions in place. The U.S. Biomedical Advanced Research and Development Authority (BARDA) have 130 products in development, including 45 for influenza.

New influenza viruses occasionally emerge among humans as part of the natural ecology and biology of influenza viruses. Large reservoirs of influenza viruses circulate among other animal species, notably wild birds. Wild birds are considered the ultimate reservoir for influenza viruses because they usually harbor the virus without becoming sick and readily transmit the virus to domestic chickens or ducks. Normally, animal influenza viruses do not infect humans. However, avian influenza viruses can sometimes “jump” the species barrier and directly infect humans. This was first demonstrated in 1997 with an outbreak of avian influenza A (H5N1) virus infected both domestic poultry and humans in Hong Kong, leading to 18 hospitalizations and 6 deaths.

Unlike SARS, Chinese officials have been transparent in dealing with a recent influenza virus, H7N9. China has reported 87 cases and 17 fatalities H7N9 influenza from late March to mid April 2013. As of April 18, Chinese public health officials suspect that human-to-human transmission had occurred. They warned of a potential H7N9 pandemic should this mutation be confirmed to have occurred. China shipped the virus to labs around the world, and the U.S. CDC began working on vaccine within a week of the outbreak.

This lecture is being recorded the very sad week of the Boston Marathon bombing tragedy. While is tragedy has occurred too soon to evaluate the public health response to the crisis, there are some elements from the reported current events from which we can learn.

As mentioned above, when planning for the delivery of services in a disaster, the responsibilities of public health practitioners is to help other responders prioritize both medical and public health problems. Personnel that are vital to an emergency response effort would be emergency medical technicians (EMT) and other higher-trained paramedics (EMT-Ps). These professionals are trained to identify and treat the medical injuries in the field and on route to the hospital, and to distribute patients based on available hospital resources. According to the New York Times reporting, “The distribution worked wonderfully.” This meant that the number of patients matched the resources available at each of the Boston hospitals. According to the article, doctors at Massachusetts General Hospital said that none of the hospitals were overwhelmed. This meant that victims could be attended to quickly – thereby saving lives. The New York Times wrote, “Some victims were wounded so badly that even a delay of a few minutes could have been fatal.” Research on patient distribution and hospital preparedness supports this anecdote. A report published by the CDC in 2011 stated that “most U.S. hospitals had regional communication systems to track available hospital beds” and almost 80% “had plans for explosive or incendiary accidents or attacks.”

Time Magazine reported that the arriving patients were “tested with elaborate detectors for hazardous residue in an effort to rule out a chemical or radiological attack - … standard procedure following a suspected terrorist attack.” The idea is that they don’t want patients to bring harmful materials into the hospitals.

Rapid transportation to a hospital emergency department allows emergency physicians and certified emergency nurses to begin treating patients quickly. Within 10 or 15 minutes of the blasts, patients began to arrive at the various hospitals. According to the New York Times article, doctors described operation at the hospitals following the bombings response as “calm and efficient.”
This concludes the lecture on Community Health Safety & Disaster Preparedness, Response, and Recovery. The following questions are some that you will be expected to know:

1. Describe the steps of the CDC model for ensuring community health safety.
2. Give an example of state-level agenda setting for a population health problem important to you.
3. Explain the difference between primary and secondary disaster prevention/mitigation.
4. In the event of insufficient local resources, what should the local public health authorities do?
5. Name a reason that federal response policy is complex.
6. Describe three epidemiological activities in the impact phase of disaster response.

Thank you for watching and listening.