Pandemic Influenza 101

LEARN. PREPARE. ACT.

Office of Communicable Disease Surveillance & Epidemiology
Objectives

- Introduction to influenza
- What is an influenza pandemic?
- History of influenza pandemics
- Being prepared for an influenza pandemic
What is Influenza (Flu)?

- A contagious respiratory illness that is caused by one or more influenza viruses
  - Transmission: Person-to-person by coughing and sneezing
  - Incubation period: 7 days or less
  - Communicable period: 1 day before up to 5-7 days after onset of symptoms
Types of Influenza

- **Type A**
  - Can cause world wide pandemics
  - Causes mild to severe illness
  - Flu vaccine provides protection

- **Type B**
  - Can cause seasonal epidemics
  - Causes mild to serious illness
  - Flu vaccine provides protection

- **Type C**
  - Does not cause epidemics or pandemics
  - Causes minor respiratory illness
  - Flu vaccine provides no protection
What are the Symptoms of Influenza?

- Fever
- Cough
- Sore throat
- Runny or stuffy nose
- Muscle or body aches
- Headache
- Fatigue
- Chills
How is Influenza Spread?

- Primarily person-to-person through the coughing or sneezing of a person infected with influenza
- Sometimes influenza can spread by touching an infected surface and then touching your eyes, nose or mouth
Large respiratory droplets are thrust into the air when coughing or sneezing.
Is Influenza a Serious Illness?

- Most healthy people will recover with no serious problems
- Some populations are at a greater risk for complications including:
  - Children
  - Adults 65 year of age an older
  - Pregnant women
  - People with medical conditions
Is Influenza a Serious Illness?

- Anywhere from 3,000 to 49,000 deaths could occur each year
- More than 200,000 hospitalizations are estimated to occur every year
Influenza Prevention

- Get vaccinated!!!
- Cover your nose and mouth with a tissue when you sneeze or cough
- Wash your hands
- Avoid touching your eyes, nose and mouth
- Stay home if you are sick
- Avoid contact with sick people
Flu vaccination provides immunity. Stay healthy!
Learn more about the flu vaccination at www.clevelandhealth.org.

Covering up that sneeze with a tissue is the best way to prevent the spread of germs. For more information visit www.clevelandhealth.org.

Always properly wash your hands with warm water and soap for at least 20 seconds focusing on areas where germs can build up, such as under fingernails and between fingers. For more information visit www.clevelandhealth.org.

Wash Your Hands
Wash your hands with soap and water for at least 20 seconds.
What is an Influenza Pandemic?

- A pandemic is a global disease outbreak
  - Characteristics for an influenza pandemic:
    - An influenza A virus emerges in which the human population has little or no immunity
    - The virus must reproduce in humans and cause disease
    - The virus must be transmittable from person-to-person
Seasonal vs. Pandemic Influenza

- **Seasonal**
  - Outbreaks are usually seasonal
  - Population has some immunity
  - Vaccine available
  - Modest impact on society

- **Pandemic**
  - Outbreaks occur rarely (3 during the 20th century)
  - Population has little or no immunity
  - Vaccine not initially available
  - Major impact on society
How do New Influenza A Viruses Emerge?

- **Antigenic Shift**
  - Occurs when two different flu strains infect the same cell and exchange genetic material

- **Antigenic Drift**
  - Occurs when small, continuous changes happen in type A and B influenza viruses as they make copies of themselves
The genetic change that enables a flu strain to jump from one animal species to another, including humans, is called "ANTIGENIC SHIFT." Antigenic shift can happen in three ways:

A. Without undergoing genetic change, a bird strain of influenza A can jump directly from a duck or other aquatic bird to humans.

B. A duck or other aquatic bird passes a bird strain of influenza A to an intermediate host such as a chicken or pig. When the viruses infect the same cell, the genes from the bird strain mix with genes from the human strain to yield a new strain.

C. A person passes a human strain of influenza A to the same chicken or pig. (Note that reassortment can occur in a person who is infected with two flu strains.)

The new strain may further evolve to spread from person to person. If so, a flu pandemic could arise.
1. Each year’s flu vaccine contains three flu strains — two A strains and one B strain — that can change from year to year.

2. After vaccination, your body produces infection-fighting antibodies against the three flu strains in the vaccine.

3. If you are exposed to any of the three flu strains during the flu season, the antibodies will latch onto the virus’s HA antigens, preventing the flu virus from attaching to healthy cells and infecting them.

4. Influenza virus genes, made of RNA, are more prone to mutations than genes made of DNA.

5. If the HA gene changes, so can the antigen that it encodes, causing it to change shape.

6. If the HA antigen changes shape, antibodies that normally would match up to it no longer can, allowing the newly mutated virus to infect the body’s cells.

This type of genetic mutation is called “ANTIGENIC DRIFT.”
## Historic Influenza Pandemics

<table>
<thead>
<tr>
<th>Pandemic</th>
<th>Deaths in the US</th>
<th>Deaths Worldwide</th>
<th>Population Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish Flu (H1N1) 1918-1919</td>
<td>500,000</td>
<td>40 million</td>
<td>Persons 20-40 years old</td>
</tr>
<tr>
<td>Asian Flu (H2N2) 1957-58</td>
<td>70,000</td>
<td>1-2 million</td>
<td>Infants, elderly</td>
</tr>
<tr>
<td>Hong Kong Flu (H3N2) 1968-69</td>
<td>36,000</td>
<td>700,000</td>
<td>Infants, elderly</td>
</tr>
<tr>
<td>Russian Flu (H1N1) 1977-78</td>
<td>8,300</td>
<td></td>
<td>Persons under 20 years old</td>
</tr>
<tr>
<td>2009 H1N1</td>
<td>~ 9,000</td>
<td>&gt;18,000</td>
<td>Infants, young adults</td>
</tr>
</tbody>
</table>
Timeline of Emergence of Influenza A Viruses in the 20th Century

- Spanish Influenza (1918)
- H1
- H2
- H3
- Russian Influenza (1977)
- H1
- Avian Influenza
- H9 → H7 → H5
- Hong Kong Influenza (1997)
- H5
- 2003
- 1998/9
America’s Deaths from Influenza Were Greater Than the Number of U.S. Servicemen Killed in any War
1918 “Spanish Flu”

- Approximately 500,000 Americans died
- Person aged 20-40 years had the highest mortality rates
- The pandemic came in 3 distinct waves
1957 Asian Flu
H2N2

- Originated in Far East in Feb 1957
- Vaccine production began early May
  - Available in limited supply in Aug
- “Double Wave” of illness/death
  - 1st peak Oct 1957; 2nd peak Jan/Feb 1958
- Number of deaths in U.S.: 69,800
  (Sept 1957-March 1958)
1968 Hong Kong Flu
H3N2

- Four year wave
  - Illness widespread Dec 1968
  - Same virus returned following 3 flu seasons

- Elderly most vulnerable

- Number of deaths in U.S.: 33,800
  (Sept 1968-March 1969)

- Impact mitigated: Similar to 57 Asian flu,
  Peaked late in year, Modern medicine/care
1977 Russian Flu
H1N1

- Virus similar to those circulating from 1947-1957
- Global “epidemic” by Jan 1978
- Persons born before 1957 appeared to have significant immunity
- Mainly affected those <23 years old, illness occurred primarily in children
2009 H1N1 (Swine) Flu Pandemic

- CDC estimated between 43-89 million cases were reported in the U.S.
- CDC estimated between 195,000 and 403,000 hospitalizations were reported in the U.S.
2009 H1N1 Timeline

- April 15, 2009 - First H1N1 case detected in the U.S., in a 10-year old patient in California.
- April 26, 2009 - The U.S. government declares a public health emergency for H1N1 flu.
- June 11, 2009 - The World Health Organization (WHO) declares global H1N1 flu pandemic
- June 19, 2009 - By this date, all fifty states in the U.S., the District of Columbia, Puerto Rico, and the U.S. Virgin Islands report cases of H1N1 flu.
- June 23, 2010 - The U.S. Public Health Emergency for H1N1 flu expires.
- August 10, 2010 - WHO declares an end to the global H1N1 flu pandemic
Graph A: CDC Estimates of 2009 H1N1 Cases in the U.S. by Age Group
(April 2009 - April 10, 2010)

* Vertical solid black lines represent range in estimates

2009 H1N1 Cases

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Data by Date Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-17 Yrs</td>
<td>April - Oct 17, 2009</td>
</tr>
<tr>
<td>18-64 Yrs</td>
<td>April - Nov 14, 2009</td>
</tr>
<tr>
<td>&gt;65 Yrs</td>
<td>April - Dec 12, 2009</td>
</tr>
<tr>
<td>0-17 Yrs</td>
<td>April 2009 - Dec 12, 2009</td>
</tr>
<tr>
<td>18-64 Yrs</td>
<td>April 2009 - Jan 16, 2010</td>
</tr>
<tr>
<td>&gt;65 Yrs</td>
<td>April 2009 - Feb 13, 2010</td>
</tr>
<tr>
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Data based on CDC estimates of 2009 H1N1 cases using statistical modeling http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm
Graph B: CDC Estimates of 2009 H1N1 Cases in the U.S. (April 2009 - April 10, 2010)

* Vertical solid black lines represent range in estimates

Data based on CDC estimates of 2009 H1N1 cases using statistical modeling [http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm](http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm)
Was This The 2009 “Swine” Flu Culprit??
Key Lessons Learned From Previous Pandemics

- Pandemics are unpredictable
- Variations exist in mortality, severity, and patterns
- The number of cases can jump rapidly in a short period of time
- Pandemics tend to occur in waves
Current Concerns About Next Influenza Pandemic

- History tells us that influenza pandemics are unpredictable
- A highly pathogenic avian influenza strain (A/H5N1) emerged in Hong Kong in 1997, re-emerged in birds and humans in 2003, and is now circulating widely in birds in many countries
- Since 2003, this strain has spread from birds to humans and as of August 23, 2006 has infected 241 people (141 deaths) in 10 countries
Current Concerns About Next Influenza Pandemic

- The H5N1 strain has also been documented (rarely, so far) to spread from person to person.
- Re-assortment or mutation could allow this strain to become easily transmissible between humans – there is no way to know if or when this will happen.
Potential Impact of Influenza Pandemic

- 1/3 of the world’s population could potentially become ill
- Health care system could become overwhelmed
- Day-to-day operations would be disrupted
How are Public Health Officials Preparing

- Continue to stock strategic national stockpile
- Rapidly respond to influenza outbreaks
- Continue vaccine research
- Maintain pandemic influenza response plans
- Establish public health guidelines
Preparedness Impact

Community Measures

• Pandemic Outbreak: No Community Measures Used
  1. Delay onset of outbreak
  2. Reduce the peak burden on hospitals/infrastructure
  3. Decrease a) number of cases of death and illness and b) overall health impact

• Pandemic Outbreak: With Measures Taken

Days Since First Case

Number of Daily Cases
Pandemic Influenza Preparedness Challenges

Despite . . .
- Expanded global and national surveillance
- Better healthcare, medicines, diagnostics
- Greater vaccine manufacturing capacity

New risks:
- Increased global travel and commerce
- Greater population density
- More elderly and immunosuppressed
- More daycare and nursing homes
- Bioterrorism
What you can do today
Learn

- What the preparedness plan is for your city and school district
- What you need to do to help protect your family and community
- Stay updated
  - Identify sources you can count on for reliable information
  - Review reliable websites
    - Cleveland Department of Public Health (CDPH) - www.clevelandhealth.org
    - Centers for Disease Control and Prevention (CDC) – www.cdc.gov
    - Cleveland Metropolitan School District (CMSD) – www.cmsdnet.net
Prepare

- Get vaccinated for seasonal flu each year
- Plan for extended absences from school/work
- Plan to check your health each morning for signs and symptoms consistent with the flu
- Develop a communication plan for your family & update emergency contact lists
- Prepare a to-go kit of important resources for your family
  - Store nonperishable foods, bottled water, over-the-counter drugs, health supplies and other necessities
  - What accommodations/needs are there for pets
  - The U.S. Department of Health and Human Services recommends having a 2-week supply
Act

- Stay calm
- Follow instructions from public health and school officials
- Activate your plans
- DO NOT report to school if you are feeling ill
Influenza Informational Resources

- Cleveland Department of Public Health
  - www.clevelandfluandyou.org
  - Facebook.com/ClevelandFightsTheFlu
  - Twitter.com/ClevelandFlu
Questions??

Thank you!!