Influenza: The Threat of a Pandemic
Definitions

**Epidemic:** An increase in disease above what you would normally expect.

**Pandemic:** A worldwide epidemic
What is Influenza?

Also called Flu, it is a contagious respiratory illness caused by influenza viruses.

It can cause mild to severe illness, and at times can lead to death

Every year in the United States, on average:

• 5% to 20% of the population gets the influenza;
• More than 200,000 people are hospitalized from influenza complications, and;
• About 36,000 people die from influenza.
Influenza Terms Defined

**Seasonal** (or common) influenza is a respiratory illness that can be transmitted person to person. Most people have some immunity, and a vaccine is available.

**Avian** (or bird) influenza is caused by influenza viruses that occur naturally among wild birds. There is no human immunity and no vaccine is available.

**Pandemic influenza** is virulent human influenza that causes a global outbreak, or pandemic, of serious illness.
## Cold vs. Influenza: What's the difference?

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cold</th>
<th>Influenza</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Rare in adults and older children, but can be as high as 102°F in infants and small children</td>
<td>Usually 102°F, but can go up to 104°F and usually lasts 3 to 4 days</td>
</tr>
<tr>
<td>Headache</td>
<td>Rare</td>
<td>Sudden onset and can be severe</td>
</tr>
<tr>
<td>Muscle Aches</td>
<td>Mild</td>
<td>Usually, and often severe</td>
</tr>
<tr>
<td>Tiredness and weakness</td>
<td>Mild</td>
<td>Can last 2 or more weeks</td>
</tr>
<tr>
<td>Cough</td>
<td>Mild, hacking cough</td>
<td>Usually, and can become severe</td>
</tr>
<tr>
<td>Sneezing and Sore Throat</td>
<td>Often</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>

**Source:** Adapted from National Institute of Allergy and Infectious Diseases. Is it a cold or the flu?
Influenza Virus: Background

Influenza virus infections are the most important cause of medically attended acute respiratory illness.

Three types “A”, “B”, and “C” infect humans.

Type “A” are known to cause pandemics. It has 2 sub types.

- Hemagglutinin (H)-Helps virus attach to respiratory cells.
- Neuraminidase (N)-Helps virus penetrate into the cells once attached.
- There are 144 different H and N combinations.
- Three known ‘A’ subtypes of influenza viruses (H1N1, H1N2, and H3N2) currently circulating among humans.
- Avian Influenza: H5N1, also called Bird Flu, occurs mainly in birds and is extremely dangerous.
Antigenic Drift

A subtle mutation within the SAME subtype.
• Can be associated with epidemics

These changes occur continually.
Antigenic Shift

An entirely new sub-type of virus emerges. Associated with Pandemic because the entire world population is susceptible.
Cycles of the Asian H5N1 Virus in Animals and Humans

Waterfowl → Domestic birds → Humans → Waterfowl

Waterfowl
Domestic birds
Humans
Waterfowl

Mammals (primarily swine)
Pandemic Strain Emergence: Reassortment of Influenza A Viruses

Avian Reservoir

Avian virus

other mammals?

New reassorted virus

Human virus

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## Influenza Type A Antigenic Shift

<table>
<thead>
<tr>
<th>Year</th>
<th>Subtype</th>
<th>Severity of Pandemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1918</td>
<td>H1N1</td>
<td>Severe</td>
</tr>
<tr>
<td>1957</td>
<td>H2N2</td>
<td>Severe</td>
</tr>
<tr>
<td>1968</td>
<td>H3N2</td>
<td>Moderate</td>
</tr>
<tr>
<td>1977</td>
<td>H1N1</td>
<td>Mild</td>
</tr>
</tbody>
</table>
How you become Infected

Influenza is spread by droplet nuclei within 3 to 6 feet.

When an infected person breaths, talks, coughs, or sneezes, tiny particles containing droplet nuclei are expelled into the air.

- 1-5 microns in size.
Airborne Droplet Nuclei

Droplet Nuclei can remain suspended in the air for Several hours.

Talking for 5 minutes can generate 3000 droplet nuclei.

Singing can generate 3000 droplet nuclei in one minute.
Course of Influenza in Adults

<table>
<thead>
<tr>
<th>Day 0</th>
<th>Become Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1-4</td>
<td>Disease incubation (Average 2 days)</td>
</tr>
<tr>
<td>Day 1-6</td>
<td>Contagious</td>
</tr>
<tr>
<td>Day 2-9</td>
<td>Symptomatic (2-5 days)</td>
</tr>
<tr>
<td>Day 4 to ?</td>
<td>Decreased Energy (1 Week)</td>
</tr>
</tbody>
</table>
History of Influenza Pandemics
Spanish Flu: 1918

Catastrophe against which all modern pandemics are measured.

Between September 1918 and April 1919, approximately 500,000 deaths from the influenza occurred in the U.S. alone.

Approximately 20 to 40 percent of the worldwide population became ill and that over 20 million people died.

The attack rate and mortality was highest among adults 20 to 50 years old.
Asian Flu: 1957

A Pandemic of Influenza A (H2N2) in 1957-58, it was first identified in the Far East.

Most influenza and pneumonia-related deaths occurred between September 1957 and March 1958.

The elderly had the highest rates of death.

Although the Asian flu pandemic was not as devastating as the Spanish flu, about 69,800 people in the U.S. died.
Hong Kong Flu: 1968

The Hong Kong flu was the first known outbreak of the H3N2 strain.

It evolved from H2N2 by Antigenic Shift.

Deaths from this virus peaked in December 1968 and January 1969.

Those over the age of 65 were most likely to die.

The number of deaths between September 1968 and March 1969 for this pandemic were 750,000 to 2 Million (Worldwide) and 33,800 (USA).
Today’s Threat
Avian Influenza A: H5N1

- Infection caused by Avian (bird) influenza (flu) viruses.
- Confirmed cases of human infection since 1997 > 200

Transmission
Animal to Human
Human to Human
Environment to Human
• Close contact with droppings of birds
• Oral ingestion of contaminated water?
• Conjunctival inoculation during exposure to water?

Initial Symptoms
High Fever
Lower Respiratory tract Symptoms
Gastro-intestinal symptoms
Avian influenza Scare: 1997

The most recent pandemic "scares" occurred in 1997 and 1999.

In 1997, at least a few hundred people became infected with the avian A/H5N1 influenza virus in Hong Kong and 18 people were hospitalized.

Many of the most severe illnesses occurred in young adults.

To prevent the spread of this virus, all chickens (approximately 1.5 million) in Hong Kong were slaughtered.

In 1999, another novel avian influenza virus – A/H9N2 – was found that caused illnesses in two children in Hong Kong.
Timeline of documented human infection with avian influenza viruses, 1997–present

Sporadic cases of mild human disease associated with avian influenza viruses were reported prior to 1997.

- **1997**
  - H5N1: Hong Kong, 18 cases, 6 deaths
  - H9N2: Hong Kong, 2 cases

- **1998**
  - H9N2: China, 5 cases

- **1999**
  - H7N7: Netherlands, 89 cases, 1 death
  - H9N2: Hong Kong, 1 case

- **2003**
  - H5N1: Hong Kong, 2 cases, 1 death

- **2004/2005**
  - H5N1: Thailand, 22 cases, 14 deaths
  - Vietnam, 93 cases, 42 deaths
  - Indonesia, 13 cases, 8 deaths
  - Cambodia, 4 cases, 4 deaths
  - China, 5 cases, 2 deaths
  - H7N3: Canada, 2 cases
  - H10N7: Egypt, 2 cases
TimeLine Flash Movie

Affected areas with confirmed human cases of H5N1 avian influenza since January 2006

- **Turkey**: Cases: 12, Deaths: 4
- **Azerbaijan**: Cases: 8, Deaths: 5
- **Egypt**: Cases: 14, Deaths: 6
- **Iraq**: Cases: 2, Deaths: 2
- **Djibouti**: Case: 1, Death: 1
- **Cameroon**: Cases: 2, Deaths: 2
- **Indonesia**: Cases: 31, Deaths: 25

Data Source: WHO / Map Production: Public Health Mapping and GIS
Communicable Diseases (CDS) World Health Organization
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The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.
Current WHO Phase of Pandemic Alert (Nov 2005)

<table>
<thead>
<tr>
<th>Inter-pandemic phase</th>
<th>Low risk of human cases</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>New virus in animals, no human cases</td>
<td>Higher risk of human cases</td>
<td>2</td>
</tr>
<tr>
<td>Pandemic alert</td>
<td>No or very limited human-to-human transmission</td>
<td>3</td>
</tr>
<tr>
<td>New virus causes human cases</td>
<td>Evidence of increased human-to-human transmission</td>
<td>4</td>
</tr>
<tr>
<td>Pandemic</td>
<td>Evidence of significant human-to-human transmission</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Efficient and sustained human-to-human transmission</td>
<td>6</td>
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</tbody>
</table>

# Current Human Death Toll

## Cumulative Number of Confirmed Human Cases of Avian Influenza A/(H5N1) Reported to WHO

**23 May 2006**

<table>
<thead>
<tr>
<th>Country</th>
<th>2003 cases</th>
<th>2003 deaths</th>
<th>2004 cases</th>
<th>2004 deaths</th>
<th>2005 cases</th>
<th>2005 deaths</th>
<th>2006 cases</th>
<th>2006 deaths</th>
<th>Total cases</th>
<th>Total deaths</th>
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<tbody>
<tr>
<td>Azerbaijan</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>8</td>
<td>5</td>
<td>8</td>
<td>5</td>
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<tr>
<td>Cambodia</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>6</td>
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<tr>
<td>China</td>
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<td>0</td>
<td>8</td>
<td>5</td>
<td>10</td>
<td>7</td>
<td>18</td>
<td>12</td>
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<tr>
<td>Djibouti</td>
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<td>0</td>
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<td>0</td>
<td>1</td>
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<td>Egypt</td>
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<td>0</td>
<td>14</td>
<td>6</td>
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<tr>
<td>Indonesia</td>
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<td>17</td>
<td>11</td>
<td>25</td>
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<td>0</td>
<td>12</td>
<td>4</td>
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<tr>
<td>Viet Nam</td>
<td>3</td>
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<td>29</td>
<td>20</td>
<td>61</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>93</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>3</td>
<td>46</td>
<td>32</td>
<td>95</td>
<td>41</td>
<td>74</td>
<td>48</td>
<td>218</td>
<td>124</td>
</tr>
</tbody>
</table>

Total number of cases includes number of deaths. WHO reports only laboratory-confirmed cases.
Why Are We Talking About Pandemic Influenza?
Illness will spread quickly and globally

Vaccine’s will be non-existent or very limited for 6 to 8 months – antivirals will be very limited

The health care delivery system will be completely overwhelmed – restructuring and prioritization of services will be necessary

Alternate facilities will be needed to:

• Conduct triage of ill people
• Provide a supportive care environment for patients
• Temporarily store bodies
Social distancing strategies aimed at slowing the spread of disease may be implemented countywide.

Local Emergency Management Plans will be activated countywide directing the management of non-medical information and non-medical resources.

Significant disruptions of critical infrastructure, first response systems, and social services may occur.

Health care workers and EMS responders may face staff shortages exceeding 30%.
Consequences will effect all organizations:

Extreme staffing shortages (30%)

Overwhelming demand for services
- Health care, First responders

Limited supplies (transportation disrupted)

Reduced reliability in communications, power, water, fuel availability, transportation service

Reduced reliability on contractor services (Maintenance and repair)
Impact on Law Enforcement

- 25% - 35% of officers absent due to illness, death, caring for family members

- 911 dispatch centers operating with reduced staff, higher call volumes

- Large numbers of people unable to purchase food, pay bills – high unemployment and schools closed

- Potential for civil unrest over weeks / months

- Hospitals may become high security areas

- No mutual aid available
Impact on Transit & Transportation

• 25% - 35% of drivers, maintenance crews, leadership absent due to illness, death, caring for family members

• Mechanics unavailable to affect repairs

• Fuel deliveries reduced in frequency or erratic

• Contractors normally relied upon also impacted
The Burden of Influenza

Seasonal Influenza
• Globally: 250,000 to 500,000 deaths each year
• In the United States each year:
  – 36,000 deaths
  – >200,000 hospitalizations
  – $37.5 billion in economic costs from influenza
    and pneumonia

Pandemic Influenza
• An ever-present threat
Responding to the Avian Influenza Pandemic Threat
Situation Assessment

• Risk of Pandemic is Great
• Risk will Persist
• Evolution of threat cannot be predicted
• Early warning system is weak
• Preventive intervention possible but not tested.
• Reduction of morbidity and mortality during a pandemic will be impeded by inadequate medical supplies.
Principal opportunities to Intervene

Pre Pandemic
• Reduce opportunities for human infection
• Strengthen the early warning system

Emergence of Pandemic Virus
• Contain or delay spread at the source

Pandemic declared & spreading internationally
• Reduce morbidity, mortality, and social disruption.
• Conduct research to guide response measures
Addressing the Fear

Plan
Education
• What is Flu?
• How is Influenza contracted? Symptoms?
• Methods to prevent

Information
Preparedness
• Medical Response
  – Flu Vaccination
  – Anti Viral Medication
  – Personal/Occupational Hygiene
Goals of a Pandemic
Influenza Response Plan

1. Limit illness and death
2. Preserve Continuity of Government and Business
3. Minimize social disruption
4. Minimize economic loss
Personal Influenza Prevention

Influenza Prevention
• Get a flu shot yearly
• Stay informed
• Stay home when sick
• Cover your cough
• Wash hands regularly and use alcohol hand gel
• Avoid touching eyes, nose, mouth