Influenza Surveillance
2008-09
United States and Global

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Department of Health and Human Services
With grateful thanks to
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www.pandemicflu.gov  www.cdc.gov/flu
Percentage of Visits for Influenza-like Illness (ILI) Reported by the US Outpatient Influenza-like Illness Surveillance Network (ILINet), National Summary 2008-09 and Previous Two Seasons

NOTE: Week ending dates vary by influenza season

*Preliminary ILI data for week 24, as of June 24, 2009 (n=818 weekly ILI reports received from 50 states)

† There was no week 53 during the 2006-07 and 2007-08 seasons, therefore the week 53 data point for those seasons is an average of weeks 52 and 1.
Rate of Confirmed and Probable Novel H1N1 Cases by State
As of June 24, 2009

Cases per 100,000 Population
- 0.46 - 2.79
- 2.8 - 4.59
- 4.6 - 7.3
- 7.31 - 12.16
- 12.17 - 75.13
Weekly Influenza Activity Estimates Reported by State & Territorial Epidemiologists*

Week ending June 20, 2009 - Week 24

* This map indicates geographic spread & does not measure the severity of influenza activity
Epidemiology/Surveillance
Pandemic H1N1 - 25 Jun 2009
Pneumonia and Influenza Mortality for 122 U.S. Cities
Week Ending 06/20/2009

Weeks

% of All Deaths Due to P&I

2005 2006 2007 2008 2009

21 30 40 50 10 20 30 40 50

Epidemic Threshold
Seasonal Baseline
Number of Influenza-Associated Pediatric Deaths by Week of Death: 2005-06 season to present

- 2005-06: Number of Deaths Reported = 46
- 2006-07: Number of Deaths Reported = 78
- 2007-08: Number of Deaths Reported = 88
- 2008-09: Number of Deaths Reported = 83

Legend:
- Green: Seasonal influenza deaths
- Blue: Pandemic H1N1 deaths
Number of Influenza-Associated Pediatric Deaths by Week of Death: 2008-09 season to present

2008-09
Number of Deaths Reported = 83

Seasonal influenza deaths
Pandemic H1N1 deaths

Number of Deaths
H1N1 Reported = 17
Antigenic Characterization, 2008-09
Influenza Viruses, United States

CDC characterized 1,626 influenza viruses since October 1, 2008*

Seasonal influenza A(H1N1) [n=947]:
• 947 (100%) similar to A/Brisbane/59/2007 (2008-09 vaccine strain)
• Includes H1N1 resistant to oseltamivir

Influenza A(H3N2) [n=162]
• 162 (100%) similar to A/Brisbane/10/2007 (2008-09 vaccine strain)

Influenza B [n=517]
• 65 (13%) in B/Yamagata lineage
  – Similar to B/Florida/04/2006 (2008-09 vaccine strain)
• 452 (87%) in B/Victoria lineage

Pandemic influenza A (H1N1) [n=125]
• 125 (100%) similar to prototype a/California/07/2009 – proposed pandemic influenza vaccine strain

*as of June 12, 2009
Pandemic H1N1 in the United States

www.pandemicflu.gov  www.cdc.gov/flu
HA denotes the hemagglutinin gene, M the M protein gene, NA the neuraminidase gene, NP the nucleoprotein gene, NS the nonstructural protein gene, PA the polymerase PA gene, PB1 the polymerase PB1 gene, and PB2 the polymerase PB2 gene.
Summary of Events

• Between April 15-17, 2009,
  – 2 cases of febrile respiratory illness
  – residents of adjacent counties in southern California
  – swine influenza A (H1N1) virus

• Both viruses are genetically closely related to each other
  – resistant to amantadine and rimantadine
  – contain a unique combination of gene segments
    previously not recognized among swine or human
    influenza viruses in the United States

• Neither child had contact with pigs

www.pandemicflu.gov   www.cdc.gov/flu
Epidemiology/Surveillance
Number and onset dates of confirmed cases, SwIV infection, 
(n=10*) 26 Apr 2009 0200 EDT

CA = 7
TX = 2
OH = 1
Cases under investigation 6 states

*onset dates available for 10/20 cases
Descriptive Statistics of Novel Influenza A (H1N1) Cases Reported to CDC by States--17 JUN 2009 (n=27,717)

- 27,717 cases reported to CDC
- Hospitalizations: 3,065 (11%)
- Deaths: 127 (0.4%)
- Sex: 50% male/female
- Median age:
  - all cases 12 years
  - hospitalized 20 years
  - died 37 years
Epidemiologic Parameters

- Secondary attack rate in household contacts:
  - ARI—18-19%
  - ILI—8-12%

- Generation time:
  - ARI—2.0-3.1 days
  - ILI—2.4-3.1 days

- Community incidence (ILI)
  - NYC telephone survey 6.9%
  - Chicago door-door survey 6%
  - Delaware 6%-11% (University)
Pandemic H1N1 Cases by Report Date
As of 18 JUN 2009 (n=27,717) (Weekly*)

*Data for week ending 20 June 2009 include reports submitted between 1:00 AM EDT 6/17/2009 and 11:00 AM. Dates not available for 92 cases.
Epidemiology/Surveillance
Pandemic H1N1 Cases by Age Group
Data reported as of 18 JUN 2009 (n=21,449)
Percentages represent proportion of total cases

- 0-4 Yrs: 2,146 (10%)
- 5-24 Yrs: 11,720 (55%)
- 25-64 Yrs: 4,041 (19%)
- ≥65 Yrs: 218 (1%)
- Unknown: 3,324 (15%)
Epidemiology/Surveillance
Pandemic H1N1 Cases Rate per 100,000 Population by Age Group
As of 18 JUN 2009 (n=18,125*)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Rate / 100,000 Pop</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 Yrs</td>
<td>10.2</td>
<td>2,146</td>
</tr>
<tr>
<td>5-24 Yrs</td>
<td>14.2</td>
<td>11,720</td>
</tr>
<tr>
<td>25-64 Yrs</td>
<td>2.5</td>
<td>4,041</td>
</tr>
<tr>
<td>≥65 Yrs</td>
<td>0.6</td>
<td>318</td>
</tr>
</tbody>
</table>

*Excludes 3,324 cases with missing ages.
Epidemiology/Surveillance
Pandemic H1N1 Hospitalizations by Age Group
Data reported as of 18 JUN 2009 (n=2,228)
Percentages Represent Proportion of Total Hospitalizations

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Hospitalizations (n)</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 Yrs</td>
<td>445</td>
<td>20%</td>
</tr>
<tr>
<td>5-24 Yrs</td>
<td>859</td>
<td>39%</td>
</tr>
<tr>
<td>25-64 Yrs</td>
<td>756</td>
<td>34%</td>
</tr>
<tr>
<td>≥65 Yrs</td>
<td>86</td>
<td>4%</td>
</tr>
<tr>
<td>Unknown</td>
<td>82</td>
<td>4%</td>
</tr>
</tbody>
</table>
Epidemiology/Surveillance
Pandemic H1N1
Hospitalization Rates* by Age Group (n=2,228)
As of 18 Jun 2009

*Hospitalizations with unknown ages are not included (n=82)
*Rate / 100,000 by Single Year Age Groups: Denominator source: 2008 Census Estimates, U.S. Census Bureau at:
Epidemiology/Surveillance
Incidence* of Hospitalization for Pandemic H1N1
by Age Group and Selected Sites - 18 Jun 2009
(Note Different Scale for NYC)

*Denominator: U.S. Census population estimates for July 2008 for all states, 2007 American Community Survey for NYC
Hospitalizations with unknown ages are not included (US=90, AZ=1, IL=24, WA=1, WI=19)
Epidemiology/Surveillance
Cumulative Seasonal Influenza Hospitalization Rates by Age, Emerging Infections Program (EIP) sites

Seasonal Influenza, EIP sites

<table>
<thead>
<tr>
<th>Age Group</th>
<th>08_09</th>
<th>07_08</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 years</td>
<td>36.6%</td>
<td>64%</td>
</tr>
<tr>
<td>5-17 years</td>
<td>6.8%</td>
<td>5.8%</td>
</tr>
<tr>
<td>18-49 years</td>
<td>3.9%</td>
<td>7.3%</td>
</tr>
<tr>
<td>50-64 years</td>
<td>5.2%</td>
<td>15.0%</td>
</tr>
<tr>
<td>65+ years</td>
<td>14.6%</td>
<td>75.6%</td>
</tr>
</tbody>
</table>

Hospitalization per 100,000 population
Hospitalizations

- 3,065 hospitalizations among 27,717 cases
- Detailed clinical data available on ~268 patients
  - 21% admitted ICU
  - 13% mechanical ventilation
  - 17 deaths
- Median time from onset of illness to hospital admission
  - 3 days (range 1-14 days)
- Median length of stay
  - 3 days (range 1-53)
Descriptive Epidemiology

- 128 female (48%), 140 male (52%)
- Median age 22 years (range 21 days-86 years)

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Hospitalized No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=268</td>
<td></td>
</tr>
<tr>
<td>0-23 months</td>
<td>24 (9)</td>
</tr>
<tr>
<td>2-4 years</td>
<td>20 (8)</td>
</tr>
<tr>
<td>5-9 years</td>
<td>28 (10)</td>
</tr>
<tr>
<td>10-18 years</td>
<td>55 (20)</td>
</tr>
<tr>
<td>19-49 years</td>
<td>95 (35)</td>
</tr>
<tr>
<td>50-64 years</td>
<td>31 (12)</td>
</tr>
<tr>
<td>≥65 years</td>
<td>15 (6)</td>
</tr>
</tbody>
</table>
## Underlying Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma or COPD</td>
<td>32%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>16%</td>
</tr>
<tr>
<td>Immunocompromised</td>
<td>12%</td>
</tr>
<tr>
<td>Chronic cardiovascular disease**</td>
<td>11%</td>
</tr>
<tr>
<td>Neurocognitive disorder</td>
<td>8%</td>
</tr>
<tr>
<td>Neuromuscular disorder</td>
<td>8%</td>
</tr>
<tr>
<td>Current Smoker</td>
<td>10%</td>
</tr>
<tr>
<td>Pregnant</td>
<td>7%</td>
</tr>
<tr>
<td>Chronic Renal Disease</td>
<td>8%</td>
</tr>
<tr>
<td>Seizure disorder</td>
<td>6%</td>
</tr>
<tr>
<td>Cancer</td>
<td>3%</td>
</tr>
</tbody>
</table>

* * Excludes hypertension

71% with underlying conditions

* 51 people had more than one underlying condition; median 1 (range 1-6)
## Clinical Information

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest radiograph with pneumonia at admission</td>
<td>35%</td>
</tr>
<tr>
<td>ARDS</td>
<td>16%</td>
</tr>
<tr>
<td>Dx with sepsis at admission</td>
<td>12%</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>13%</td>
</tr>
<tr>
<td>Treated with antivirals</td>
<td>73%</td>
</tr>
<tr>
<td>Treated with antibiotics</td>
<td>78%</td>
</tr>
<tr>
<td>Treated with steroids</td>
<td>35%</td>
</tr>
<tr>
<td>Recovered</td>
<td>94%</td>
</tr>
</tbody>
</table>
Epidemiology/Surveillance
Pandemic H1N1 Deaths by Age Group
As of 18 JUN 2009  (n=87)

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Mortalities</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 Yrs</td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td>5-24 Yrs</td>
<td>19</td>
<td>22%</td>
</tr>
<tr>
<td>25-64 Yrs</td>
<td>55</td>
<td>63%</td>
</tr>
<tr>
<td>≥65 Yrs</td>
<td>5</td>
<td>6%</td>
</tr>
<tr>
<td>Unknown</td>
<td>3</td>
<td>3%</td>
</tr>
</tbody>
</table>

20 States
Epidemiology/Surveillance
Pandemic H1N1 Case Fatality Ratio by Age Group
Data reported as of 18 JUN 2009 (n=87)

- 0-4 Yrs: 0.23% (n=5)
- 5-24 Yrs: 0.16% (n=19)
- 25-64 Yrs: 1.36% (n=55)
- ≥65 Yrs: 2.29% (n=5)
- Unknown: 0.09% (n=3)
Epidemiology/Surveillance
Pandemic (H1N1) Deaths Reported to CDC by States
as of 25 JUN 2009

• Limited data available on 99/111 deaths in 20 states

• 49 Female (53%), 44 Male (47%)

• Race/Ethnicity (N=47)
  – 6 non-Hispanic Black (13 %)
  – 19 non-Hispanic White (40%)
  – 19 Hispanic (40%)
  – 3 Other (6%)

• Median time from illness onset to death
  – 7.5 days (range 0 - 40 days)
**Epidemiology/Surveillance**

**Pandemic (H1N1) Deaths Reported to CDC by States**

**as of 25 JUN 2009**

*n=99*

- 12 (12%) persons with **no** underlying conditions
- Conditions may overlap for individual cases

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percent Deceased Cases with Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>11%</td>
</tr>
<tr>
<td>Other Pulmonary disease</td>
<td>24%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>13%</td>
</tr>
<tr>
<td>Chronic cardiovascular disease</td>
<td>14%</td>
</tr>
<tr>
<td>Neurocognitive disorder</td>
<td>15%</td>
</tr>
<tr>
<td>Neuromuscular disorder</td>
<td>11%</td>
</tr>
<tr>
<td>Pregnant</td>
<td>8%</td>
</tr>
<tr>
<td>Seizure disorder</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Morbid obesity</strong></td>
<td><strong>11%</strong></td>
</tr>
<tr>
<td>Obesity</td>
<td><strong>34%</strong></td>
</tr>
<tr>
<td>Other serious (hepatic, cancer, immunosuppressed)</td>
<td><strong>13%</strong></td>
</tr>
</tbody>
</table>
Conclusions

• On April 15, 2009 a novel swine-origin influenza A H1N1 virus was identified in a boy in California

• 27,717 reported cases in US
• 55,000 reported worldwide

• Majority of persons hospitalized and who died had underlying conditions

• Given the rapidly evolving outbreak more cases are expected and transmission will likely continue into the influenza season
Surveillance Plans

- Continue enhanced surveillance this summer
- Convene CSTE - CDC working group to solidify surveillance plans for fall and winter (July 1)
- Likely less focus on case counts as they grow larger and become less representative
- Focus on more severe outcomes, syndromic surveillance data and laboratory data
- Continue enhanced virologic surveillance
- In process of developing revised screening recommendations, and guidance for prioritization of laboratory testing with CSTE and APHL
Influenza Surveillance, 2009-09: Data from other Countries
Epidemiologic Data from Countries with Jun-Sep Influenza Seasons

- Respiratory Syndrome Surveillance
  - Influenza Programs in 32 Countries
    - Built over last 5 years for pandemic preparedness
    - Laboratory capacity improved, reagents provided

- Types of disease surveillance information available
  - Influenza-like illness (ILI)
  - Severe acute respiratory illness (SARI)
  - ILI or SARI with lab confirmation
WHO Global Surveillance Network

- Viral surveillance network established in 1952
- 4 WHO Collaborating Centres (WHO CCs)
- National Influenza Centres (NICs): 126 institutions in 97 countries recognized by WHO
  - Collect specimens in their country
    - ~175,000 patient samples annually
  - Perform primary virus isolation and preliminary antigenic characterization
  - Ship newly isolated strains to WHO CCs for high level antigenic, genetic and antiviral sensitivity analyses
    - ~2,000 viruses sent annually to the WHO CCs
  - 25 NIC’s in S hemisphere
  - Additional NICs in countries in N hemisphere with circulation during Jun-Sep (e.g., Thailand, Bangladesh, Central America)
Summary: Information from surveillance in countries with Jun-Sep influenza virus circulation

- Is the pandemic virus continuing to circulate?  
  - Yes

- Are pandemic viruses circulating at same time as other influenza viruses?  
  - Preliminarily, yes

- Are viruses changing?  
  - Viral surveillance plans in place, existing platform to monitor

- Are epidemiologic parameters changing (e.g., attack rate, incubation period, etc.)?  
  - Will be difficult to obtain representative data in most countries  
  - Ongoing outbreaks in U.S. also provide data

- Are clinical manifestations changing (e.g., severity, secondary infections)?  
  - Difficult given different healthcare parameters  
  - Getting viruses from unusual or severe cases feasible

- Are community mitigation interventions working?  
  - Perhaps possible to study in several countries, likely won’t have lab confirmed outcomes
The Difference between Avian Influenza and Swine Influenza

• The best solution for avian influenza is tweetment!

• The best solution for swine influenza is oinkment!
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State and Local Health Departments
CSTE