Avian Influenza Preparedness

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The statistical probability is that when a disaster strikes, it will strike elsewhere -- primarily because there is so much ‘elsewhere.’”

THOMAS DRABEK
UNIVERSITY OF DENVER, 1991
Overview

1. Background and historical perspectives
2. Current status
3. Legislation framework
4. Preparations and planning process
5. Will it happen?
6. Policy Issues
6. Conclusions and the road ahead
I had a little bird,
Its name was Enza,
I opened the window,
And in-flu-enza.

-1918 Child Jump Rope Rhyme

Obey the laws
And wear the gauze
Protect your jaws
From Septic Paws
Influenza (\textit{Influenzia})

- \textbf{A}: H1N1, H3N2
  - 1977
  - H1N2
  - 2001
  - H1N2
  - 2005

- \textbf{B}: LPAI
  - H5N1
  - HPAI

- \textbf{C}: Antigenic
  - Drift
  - Shift

- \textbf{H5N1}
  - 1918: 40 to 100 Million Deaths
  - 1957: 2 Million Deaths
  - 1968: 2 to 7.4 Million Deaths
  - H5N1 estimates 1 Billion Deaths
Lakes as reservoirs

Viral Drift

Viral Shift

Value of Poultry and Eggs as Percent of Total Market Value of Agricultural Products Sold: 2002

Percent

United States: 11.8 percent

Less than 1

10-24

25-50

51-75

75 or more

Map of the United States showing distribution of poultry and egg production.
20th Century Influenza Timelines (Shifts)

**Dates**
- 1918 H1N1 *Pandemic*
- 1957-58 H2N2 *Pandemic*
- 1968 H3N1 *Pandemic*
- 1977 H1N1 *Pandemic*
- 1997 H5N1 *Epidemic*

**Fatalities**
- 20 to 50 Millions (700K)
- 1 to 2 Millions (70K)
- 700,000 (34,000)*
- Infecting children
- 174 fatalities worldwide (>70% mortality rate)
### 20th Century Influenza Timelines (Shifts)

#### Dates
- 1999 H9N2 Hong Kong
- 2002 H7N2 Virginia
- 2003 H5N1, H7N7, H7N2, H9N2
- 2004 H5N1, H7N3, H10N7
- 2005 H5N1
- 2006 H5N1

#### # Cases
- 2 children
- 1 person
- 3 people in HK, 89 in Netherlands, 1 in NY, 1 in HK
- 47 in Viet.+Thai., 2 in Canada, 1 child in Egypt
- 142 in S.E. Asia
- Spread to Europe and Africa (over 300 in 2007)
Peak Months for Flu Activity
Over the past 21 years

- Dec: 4 years
- Jan: 5 years
- Feb: 9 years
- Mar: 3 years
TRANSPORTATION-RELATED TRANSMISSION of INFECTIONS

- **Aircraft**
  - Fecal-oral most common
    - (1947-1999: 41 contaminated food-borne outbreaks with 11 deaths)
  - Norwalk agent gastroenteritis among 30 passengers (2005)
  - 1992: Cholera outbreak from Buenos Aires to LA; 75 infected/10 admissions/one death
  - SARS in 2002-2003
  - TB 1995 transmitted to 4 passengers

- **Trucks & rails**
- **POV**
- **Cruise ships**

Lancet 2005;365:989
National Goals for pandemic preparedness

1) STOPPING, SLOWING, OR OTHERWISE LIMITING THE SPREAD OF A PANDEMIC TO THE UNITED STATES
2) LIMITING THE DOMESTIC SPREAD OF A PANDEMIC AND MITIGATING DISEASE, SUFFERING, AND DEATH AND
3) SUSTAINING INFRASTRUCTURE AND MITIGATING IMPACT TO THE ECONOMY AND THE FUNCTIONING OF SOCIETY.
## Classification, Predicted Mortality & Mitigation

<table>
<thead>
<tr>
<th>Pandemic Phase</th>
<th>Mortality Risk</th>
<th>Case Fatality Ratio</th>
<th>Projected Number of Deaths*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter-pandemic phase</td>
<td>Low risk</td>
<td>≥0.1%</td>
<td>≤90,000</td>
</tr>
<tr>
<td>New virus in animals, no human cases</td>
<td>Higher risk</td>
<td>0.1% - &lt;0.5%</td>
<td>90,000 - &lt;450,000</td>
</tr>
<tr>
<td>Pandemic Alert</td>
<td>No or very limited human-to-human transmission</td>
<td>0.5% - &lt;1.0%</td>
<td>450,000 - &lt;900,000</td>
</tr>
<tr>
<td>New virus causes human cases</td>
<td>Evidence of increased human-to-human transmission</td>
<td>1.0% - &lt;2.0%</td>
<td>900,000 - &lt;1,800,000</td>
</tr>
<tr>
<td>Pandemic</td>
<td>Efficient and sustained human-to-human transmission</td>
<td>&lt;2.0%</td>
<td>≥1,800,000</td>
</tr>
</tbody>
</table>

*Assumes 30% illness rate and unmitigated pandemic without interventions

### Mitigation Strategy

- **W or U attack rate?**
15 states will provide
- emergency vaccines, antidotes, and medical supplies from the Strategic National Stockpile.

25 states would run out of
- hospital beds within two weeks of a moderate pandemic flu outbreak.

40 states face a shortage of nurses.

13 states show declining rates for vaccinating seniors for the seasonal flu.

11 States and D.C. lack sufficient capabilities to test for biological threats.

4 states do not test year-round for the flu

6 states cut their public health budgets from fiscal year (FY) 2005 to 2006; the median rate for state public health spending is $31 per person per year.
National Guidance, Legislation and International Considerations
Select Guidance and Legislation
Framework & Budgetary Realities

1. NATIONAL STRATEGY FOR PANDEMIC INFLUENZA IMPLEMENTATION PLAN (MAY 2006)
2. PANDEMIC AND ALL HAZARDS PREPAREDNESS ACT (DECEMBER 2006)
3. OSHA GUIDANCE ON PREPARING THE WORKPLACE FOR AN INFLUENZA PANDEMIC (FEBRUARY 2007)
4. CDC GUIDANCE FOR TRAVEL (UPDATED JULY 2007)
2007 Fiscal support to the states ($ 896.7 Millions)

1. $175 million for preparedness to assist public health departments in planning efforts.
2. $57.3 million to support the Cities Readiness Initiative (CRI). CRI is designed to ensure that selected cities provide oral medications during a public health emergency to 100 percent of their affected populations.
3. $35 million to improve the early detection, surveillance, and investigative capabilities of poison control centers to provide information to health care providers and the public to respond to CBRNE.
4. $5.4 million is specifically allocated for states bordering Mexico and Canada (including the Great Lakes States) for the development and implementation of a program to provide effective detection, investigation, and reporting of urgent infectious disease cases in the three nations’ shared border regions.

Total $ 7 Billions since 2002
Border Control

- USDA inspects and tests all birds (not CANADA)
- Capacity fn 30 days quarantine and testing for AI
- Prohibition of import of poultry from areas affected by AI
- International assistance
- Vaccines
  - Create Firewall around quarantine areas
  - 40 million doses (H5 and H7 as 50/50)
- 39 Labs
- 2006 Supplemental $91 millions
- 2007 additional $81 M
Progress report for 2006-2007

U.S. engaged more than 100 countries through WHO

- Trained more than 129,000 animal health workers and 17,000 human health workers in H5N1 surveillance and outbreak response.
- Deployed over 300,000 personal protective equipment kits to more than 70 countries for use by surveillance workers and outbreak-response teams.
- Provided technical expertise to national investigations of actual outbreaks of H5N1 in countries on three continents and provided technical assistance, commodities, and logistical or financial support to 39 of the 60 countries and jurisdictions affected by H5N1.
- Support efforts to improve laboratory diagnosis and early warning networks in 75 countries.

U.S. is working on a Global Scale

- Creating the Wild Bird Global Avian Influenza Network for Surveillance project;
- Enhancing the Global Emerging Infections Surveillance and Response System;
- Funding the World Health Organization Global Outbreak Alert and Response Network;
- Expanding the network of Global Disease Detection Centers; and
- Providing the genome sequences of more than 2,250 human and avian influenza isolates as a result of the Influenza Genome Sequencing Project to track genetic changes in viral strains.
### White House Report Card Released on July 17, 2007

#### Improve Pandemic Preparedness
- **Enhance**
  - National and global surveillance
  - International coordination
  - Layered border measures
  - Rapid diagnostics and care
  - Stockpile medical materiel
  - Sustenance of government services, CI and CO
  - Communications

#### Reduce Impacts of Disease Spread
- Personal hygiene
- Use of face masks
- Community measures
- Vaccine production, efficacy and stockpile
- Stockpile antivirals
- Educational campaigns

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**2005 request $6,7 Billions Supplemental. Funding appropriated in three installments (2008) + $5 Millions for compensation to vaccine use**
FY 2007 outlays will total $698 billion, an increase of $58 billion over FY 2006.

- Transform the Healthcare System;
- Secure the Homeland;
- Modernize Medicare and Medicaid;
- Advance Medical Research;
- Protect Life, Family and Human Dignity; and
- Improve the Human Condition Around the World.
False Planning Assumptions

Hospitals will receive prompt notification after disaster occurs.
Communications from disaster site to hospital occurs in less than 1/3 of cases [EL Quarantelli, 1983]
When communications do occur, exchange frequently does not include critical information
Many hospitals learn about disaster from mass media, arriving casualties or EMS arrivals, rather than from official sources

Courtesy Dan Hanfling INOVA Health Care System
False Planning Assumptions

Responding EMS units will triage victims, provide stabilizing medical care, and then distribute casualties evenly so that no one hospital is inordinately overloaded. Majority of disaster casualties are not transported by ambulance, and are not under control of EMS system.
False Planning Assumptions

- Majority of disaster casualties are not transported by ambulance, and are not under control of EMS system.

1989, Loma Prieta Earthquake
- 23% of patients transported to hospital Eds arrived by ambulance [KJ Tierney, 1992]

1995, Oklahoma City Bombing
- 139 (32%) casualties transported by ambulance
- 300 (68%) transported by bus, van or POV

[Maningas PA, et.al., The EMS response to the Oklahoma City bombing, Prehospital Disaster Med 1997;12:80-85.]
Planning Assumptions

1995, Tokyo Sarin Gas Attacks
10% of the 640 patients arriving at nearby St. Luke’s Hospital came by ambulance, 5% by fire department minivan, and 85% by private vehicle


2001, Pentagon Attack
42/106 (39%) patients transported by ambulance
JCAHO Guidelines and Emergency Management

Fundamental assumption:

Disaster plans alone are not effective unless they are supported by people and a process brought together by good management skills.
TRANSPORTATION-RELATED TRANSMISSION

- **Aircraft: Zoonotic disease**
  - Malaria: Loudoun County (2003)
  - Dengue fever

- **Aircraft: Airborne transmission**
  - Rhinovirus, influenza
  - TB
  - SARS (5 flights = probable)

...usually correlates with ≥ 8 hours air travel

Lancet 2005;365:989
<table>
<thead>
<tr>
<th>Policy Issues</th>
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<tbody>
<tr>
<td><strong>Who shall live . . .</strong></td>
</tr>
<tr>
<td><strong>When not all can live?</strong></td>
</tr>
<tr>
<td><strong>Who should die?</strong></td>
</tr>
<tr>
<td><strong>Choices</strong></td>
</tr>
<tr>
<td>○ Individuals</td>
</tr>
<tr>
<td>○ Community/Society</td>
</tr>
<tr>
<td>○ Economy and Security (CIP)</td>
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</tbody>
</table>

Ethical and societal issues under debate
The 12 ESFs

Transportation
Department of Transportation

Communications
National Communications System

Public Works and Engineering
Department of Defense/U.S. Army Corps of Engineers

Firefighting
Department of Agriculture/Forest Service

Information and Planning
Federal Emergency Management Agency

Mass Care
American Red Cross

Resource Support
General Services Administration

Health and Medical Services
Department of Health and Human Services

Urban Search and Rescue
Federal Emergency Management Agency

Hazardous Materials
Environmental Protection Agency

Food
Department of Agriculture/Food and Nutrition Service

Energy
Department of Energy
ESF- 8 Functional Areas

1. Assessment of Health/Medical Needs
2. Health Surveillance
3. Medical Care Personnel
4. Health Medical Equipment and Supplies
5. Patient Evacuation
6. In-Hospital Care
7. Food/Drug Medical Device Safety
8. Worker Health/Safety
PANDEMIC INFLUENZA: COUNTER MEASURES

- Federal plan ($6.7B)
- Therapeutic
  - Vaccines ($4.7B . . . cell-based technology)
  - Antivirals ($1.4B . . . Oseltamivir stockpiling)
- Nonpharmaceutical
  - Infection control
  - Social separation
    - Distancing
    - Isolation
  - Quarantine

JAMA 2006;295:554
Pandemic Influenza Plan Funding
2006 Appropriations: HHS Allocation ($3.3B)
(Dollars in Millions)

- Vaccine: $1,781
- Antivirals: $731
- State & Local Preparedness: $350
- Medical Supplies: $162
- Other Domestic*: $133
- International Activities**: $125
- Risk Communications: $38

*Other Domestic Includes:
  Surveillance, Quarantine, Lab Capacity, Rapid Tests
**International Activities Includes:
  International Preparedness, Surveillance, and Response
# CDC Assumptions for Procurement of Vaccine

<table>
<thead>
<tr>
<th>Categories</th>
<th>Needs</th>
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<tbody>
<tr>
<td>Option A</td>
<td>Availability of Vaccine at current level (77.4 million vaccines about )</td>
</tr>
<tr>
<td>Option B</td>
<td>Additional 20 million (99.2 M.)</td>
</tr>
<tr>
<td>Option C</td>
<td>40% of the U.S. population (106.1 M.)</td>
</tr>
<tr>
<td>Option D</td>
<td>60% U.S. coverage (159.2 M.)*</td>
</tr>
</tbody>
</table>

* Saves most lifes

Adapted from Martin Meltzer et al. CDC 2006
Biosecurity (sanitary) practices are part of daily operations at commercial poultry farms.

Commercial poultry are typically raised in covered buildings – offering limited exposure to wild birds.

Most commercial operations control access to and from those buildings and require workers to follow sanitary procedures as they come and go.

The U.S. commercial poultry industry is highly consolidated – meaning many birds in close, confined locations – so it would be easier to wipe-out the virus.

National Animal Health Emergency Reserve Corps

**Issue:** Integration of Human and Veterinary Medicine training and practice
The study assumes a morbidity rate (the percentage of the population infected) of 30% and a mortality rate (the percentage of those infected who die) of 2.5%. On average, those infected would take three weeks off work. That translates to some 150 million Europeans becoming ill, and 3.75 million of those dying (or 7.5 deaths per thousand of the European population).
WMA Recommendations

- **WHO** is responsible for coordination and establishing levels of pandemic escalation.
- National Governments will lead the implementation efforts. *National physicians should be involved in the planning and response.*
- **General principle to be followed**
  - The prioritization of one or two goals for the nation's pandemic planning is essential. Depending on these goals, the prioritization and use of vaccines and antivirals will vary:
    - A goal of reducing *morbidity* and *mortality* will have very different planning criteria from a goal of *preserving societal infrastructure.*
    - Nations needs will be determined on *basic assumptions* about the severity of the pandemic. *(Consultation with other nations on priority setting required)*
What remains to be addressed

- Absenteeism in health sector
- Continuity of operations in the critical service and manufacturing areas
- Uniformity of the protocols among states
- Private health sector incentives (reimbursements, insurance, etc.)
- Continuity of health care services
- Health Care Providers reciprocity credentialing
- Supplemental legislation for mandatory vaccination of potential vector of the virus
- Good Samaritan liability coverage vs Federal Coverage under the uniform physician compensation
- Knowledge base on the efficacy of countermeasures, antivirals and vaccines in different population sub-groups.
- Handling PSTD and violence
- Allocation of scarce resources in the early phases of pandemic
- Better guidance for continuity of operations
An Influenza Pandemic and the Clinician

- Know clinical and epidemiological features
- Teach your colleagues
  - Have a pandemic plan
  - Have antivirals and protective equipment
- Be prepared to lead
  - Confirm the diagnosis
  - Get the virus
  - Get a lot of help, fast
<table>
<thead>
<tr>
<th>Factors</th>
<th>Human</th>
<th>Agent or Vector</th>
<th>Physical</th>
<th>Socio-Cultural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
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<tr>
<td>Pre Event</td>
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<tr>
<td>Event</td>
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<tr>
<td>Post Event</td>
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</tbody>
</table>
Conclusions

• **Risk Assessment**
  - Probability
  - Severity
  - Consequences
  - Uncertainties

• **Risk Management**
  - Epidemiological and Scientific Evidence
  - Formulation of Preventive Strategies based on the Integrated Risk
  - Policy Formulation based on evidence + risk
  - Public and Professional Education and Risk Communication
  - Informed Media Involvement
  - Continuous monitoring

The Road Ahead
Additional Resources

Guidance on Preparing Workplaces for an Influenza Pandemic: guidance and recommendations on infection control in the workplace, including information on engineering controls, work practices, and personal protective equipment, such as respirators and surgical masks.

Guidance for Protecting Workers against Avian Flu: information for protecting employees who may have been exposed to avian influenza.

Cover Your Cough: flyers and posters showing ways to reduce transmission of respiratory illnesses.

Stopping the Spread of Germs at Work: basic precautions for protecting employee health.

Quick Cards for Employees to Protect Yourself from Avian Flu: general precautions and specific information for poultry employees, laboratory employees, animal handlers, food handlers, and healthcare workers.
Resources for Clinicians

- www.cdc.gov
  - U.S. public health guidelines
- www.pandemicflu.gov
  - U.S. pandemic plan
- www.who.int
  - Global updates and official case reports
- More coming