The Plans

2005  HHS Pandemic Influenza Plan

2006  National Strategy for Pandemic Influenza Implementation Plan

2007  Interim Pre-pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation in the United States—Early, Targeted, Limited Use of Nonpharmaceutical Interventions
The Planning Scenario
The Leading Suspect

Areas with confirmed human cases of H5N1 avian influenza since 2003 *

*All dates refer to onset of illness

Source: WHO

Map Produced: Public Health Information and Geographic Information System (GIS)
World Health Organization
Pandemic Severity Index

Case Fatality Ratio

- >2.0% Category 5
- 1.0 - <2.0% Category 4
- 0.5 - <1.0% Category 3
- 0.1% - <0.5% Category 2
- <0.1% Category 1

Projected Number of Deaths:

- >1,800,000
- 900,000 - <1,800,000
- 450,000 - <900,000
- 90,000 - <450,000
- <90,000

* Assumes 30% Illness Rate
Severe Scenario: Pandemic Plans

• Revise objectives from prevention of transmission and preservation of societal functioning to minimize morbidity and mortality and protect healthcare system
Severe Scenario: Pandemic Plans

- Community mitigation measures
  - School closures
  - Social distancing
  - Exclusion periods for school and work

- Pandemic vaccination plan
  - Re-define target groups
  - De-emphasize critical infrastructure

- Medical advice including antiviral use

- All informed by evolving epi data
  - Identify high-risk populations, new risk factors
Morbidity and Mortality Weekly Report

Update: Swine-Origin Influenza A (H1N1) Virus – United States and Other Countries

Prevalence and Most Common Causes of Disability Among Adults – United States, 2005

Since 1994, disability-related costs for medical care and lost productivity have exceeded an estimated $300 billion annually in the United States and other countries.

Swine Influenza A (H1N1) Infection in Two Children – Southern California, March–April 2009

On April 21, this report was posted as an MMWR Early Release on the MMWR website (http://www.cdc.gov/mmwr). On April 17, 2009, CDC determined that two cases of febrile respiratory illness occurring in children who resided in adjacent counties in southern California were caused by infection with a swine influenza A (H1N1) virus. The viruses from the two cases are closely related genetically, resistant to amantadine and rimantadine, and contain a unique combination of gene segments that previously has not been reported among swine or human influenza viruses in the United States or elsewhere. Neither child had contact with pigs; the source of the infection is unknown. Investigations to identify the source of infection and to determine whether additional persons have been ill from infection with similar swine influenza viruses are ongoing. This report briefly describes the two cases and the investigations.

“Fighting Deadly Flu, Mexico Shuts Schools”
- The New York Times, April 2009
2009 H1N1 Outbreak: Surveillance

- Anticipated initial emergence overseas
- Did not anticipate local emergence
  - Surveillance not designed to rapidly identify and characterize disease severity, new risk factors, transmission dynamics
  - Challenges obtaining and communicating surveillance data to decision makers rapidly
Surveillance Data Needs During Outbreaks

- **Pre-event**
  - Minimal data for detection

- **Early Event**
  - Enhanced collection and analysis for detection

- **Sustained Event**
  - Specific surveillance data for situation awareness

- **Recovery**
  - Targeted studies

**Special Investigations**

**“Response” Surveillance**

**Enhanced Surveillance**

Modified from Sosin, CDC
Pre-outbreak

- Virus not detected in animal reservoir
- Detection in humans was serendipitous, but confirmation was rapid
Post-outbreak

- Challenges with non-specific and evolving case definition
- Lack of rapid point of care diagnostic test
- Limited PHL capacity
- Lack of clinical surveillance systems to characterize severity/features of illness
- Situational awareness
- Absenteeism surveillance
During spring outbreak epidemiologists (and healthcare providers) overwhelmed with case reporting and requests for testing

Subsequently limited reporting to hospitalized cases
2009 H1N1 Outbreak: Surveillance

Syndromic surveillance and school-based absenteeism reporting

• Value for situational awareness

• Identified opportunities for improvement: what data and what views?

• Limitation: de-identified data, difficult follow-up

• Strengths and weaknesses of absenteeism reporting not well understood
2009 H1N1 Outbreak: Surveillance

• Case reporting
  • Manual reporting & follow-up labor intensive
  • Hospital ICN too overwhelmed to provide details
  • Not enough PH staff to provide on-site support
  • Can automated electronic systems capture necessary data more efficiently?

• Lack of public health lab (PHL) surge capacity
2009 H1N1 Outbreak: Antivirals

- Spring: Inadequate supply in private sector
  - Many met criteria, but could not access drug promptly
  - Grossly inadequate supply of pediatric formulation
  - Increased demand due to school closures, scary headlines, public anxiety

- Injudicious use ("Just can’t say no")
  - Increased demand among persons not meeting criteria for treatment (including HCW)
  - Potential inequities in application of guidance
  - Implications of infection control guidance on demand for PEP among HCW
• Unequal antiviral drug stockpiles across jurisdictions (counties, states)

• Some counties provided public access to oseltamivir from county stockpile, most did not
...it will be necessary for...medical providers...to triage and treat patients in a manner that affords each the best chance of survival and recovery within the limits of available resources.

In all cases, the goal should be to provide care and allocate scarce equipment, supplies, and personnel in a way that saves the largest number of lives.

Planning should therefore include thresholds for altering triage algorithms and otherwise optimizing the allocation of scarce resources.
"Surge Incapacity"

- Healthcare facilities overloaded with mild cases
  - ICUs stressed: Increase in critically ill patients requiring complex and resource intensive therapies
- Demand for testing, treatment drove up visits
- Need standardized triage tools for public & healthcare providers
- Need uniform approach for allocation of scarce resources
- Lack of medical home exacerbates crisis
Preparing Workplaces for an Influenza Pandemic

By the Occupational Safety & Health Administration (OSHA)

2007 Guidance

Occupational Risk Pyramid for Pandemic Influenza

From Preparing Workplaces for an Influenza Pandemic

Preparation Workplaces for an Influenza Pandemic

Occupational Risk Pyramid for Pandemic Influenza

- Protect employees through:
  - Work practice and engineering controls
  - Administrative controls
  - Personal protective equipment (PPE)
Preparation Workplaces for an Influenza Pandemic

Occupational Risk Pyramid for Pandemic Influenza

• PPE for Very High and High Exposure Risk
  • N95 or higher rated filter for most situations
  • Supplied air respirator (SAR) or powered air purifying respirator (PAPR) for procedures likely to generate bio-aerosols
  • Face shields worn on top of respirator to prevent bulk contamination of respirator
  • Gowns and gloves
  • Eye protection if splashes anticipated
2009 H1N1: Healthcare System

Infection Control

• Conflicting guidelines
  • CDC-OSHA vs. SHEA, IDSA, HICPAC, PHAC, WHO
  • N95 recommendation difficult to implement
  • Implications for PEP for HCW after unprotected exposure

• Outpatient sector: referred cases to ED

• Shortages of masks, respirators

• Challenges with exclusion of exposed HCW
What Worked

• Overall improvements since SARS
• Facilities that planned said it helped
• “Tamiflu clinics”
• Public flu telephone call line

• Regional healthcare coalition (Early mobilization, good communication, management of scarce resources (N95), coordination with public health response)
Schools

• Confusion regarding rationale for initial closures
  • Reactive vs. proactive
  • Rationale not clear initially
  • Conflicting messages about severity among children
Schools

- Not prepared for widespread or sustained closures
  - communication to parents and staff
  - “distance” education after closure
  - non-English speaking families
  - lack of sequestration (kids in library, sports, etc)
  - economic consequences (single parent)
  - no federal school breakfast and lunch program
  - public perception of mild disease ≠ compliance
2009 H1N1: Community Mitigation

Schools

• Subsequent decision not to close additional schools based on severity of disease and cost-benefit

• Difficulty complying with “7-days or longer” exclusion guideline for ILI, especially after outbreak peaked
  • Especially problematic at child day care centers
  • Current “24-hour rule” more feasible to implement, but likely less effective
2009 H1N1: Community Mitigation

Schools

• Communication issues

  • Distinguish closure vs. dismissal of classes
  
  • Rapid communication to schools, parents

  • Re-opening schools

  • Rational/criteria for closures
2009 H1N1: Communication

Swine flu rages at WSU

BY KYUNG M. SONG
AND JACOBIETTE FEDERIS
Seattle Times staff reporters

Washington State University has reported the first large-scale return of swine flu in the three-times-spring's pandemic, with the latest outbreak striking almost as soon as students returned to school Aug. 24.

About 2,000 WSU students and residents of Pullman have been stricken by flu-like symptoms in the past two weeks, said Fran Martin, director of Whitman County Public Health.

Most suffered only mild illnesses, but two non-students — an adult and a teen — were briefly hospitalized, Martin said.

Samples from the first several dozen cases were sent to the state laboratory in Shoreline and tested positive for H1N1. Public-health officials halted further tests when more probable cases came in, but Martin said odds are about 90 percent that they, too, are swine flu.

The virus "somehow got on that campus," Martin said. "This is what we had been expecting would happen."
# WHO Phases of Pandemic Alert

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
<th>Phase Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter-pandemic phase</td>
<td>Low risk of human cases</td>
<td>1</td>
</tr>
<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></td>
<td>Evidence of significant human-to-human transmission</td>
<td>5</td>
</tr>
<tr>
<td>Pandemic</td>
<td>Efficient and sustained human-to-human transmission</td>
<td>6</td>
</tr>
</tbody>
</table>

**Communication challenge:**
Mild pandemic, severe outbreak
2009 H1N1: Communication

Challenges

• Mixed message: mild pandemic, extraordinary precautions
• Anxiety exacerbated by school closures, media coverage
• Failed to prevent surge of mildly ill persons to healthcare facilities
• Need improved risk communication
  • When to seek health care, treatment
  • Vaccination
2009 H1N1: Communication

- Hard to get public health message out after media lose interest
  - Need for compliance with isolation/exclusion
  - Early treatment of high risk patients
  - Vaccine messages

- CDC: Unprecedented outreach to states and locals
Allocating & Targeting Pandemic Influenza Vaccine

- Priority objectives
  - Protecting those who are essential to the pandemic response and provide care for persons who are ill
  - Protecting those who maintain essential community services
  - Protecting children, and
  - Protecting workers who are at greater risk of infection due to their job

Vaccination tiers and target groups for a severe pandemic

(http://www.pandemicflu.gov/vaccine/allocationguidance.pdf)
Enough vaccine for 75% of target population by end of October
Vaccine received for 17% of ACIP target population when outbreak peaked 10/31
Challenges *Managing (Great) Expectations*

• Local vaccination strategy based on robust supply forecast
  • Because projections estimated supply adequate for 75% of ACIP target population by late October, 2009, prioritization of subgroups of target population not stressed
  • Contracts with mass immunizers, clinics planned
  • Public and healthcare providers primed to expect vaccine early
2009 H1N1: Vaccination Program

Challenges *Managing (Great) Expectations*

- Unexpected delay in vaccine availability complicated distribution and implementation strategy
  - Variability in strategy $\rightarrow$ confusion
  - Damaged relationships with healthcare community
    - Healthcare workers and the public were irate
2009 H1N1: Vaccination Program

Challenges - *Planning and Logistics*

- Strategies to reach target populations depend on specific vaccine formulations available
- Uncertainty regarding timing of availability of vaccine and quantities of specific formulations
- Limitations on use of certain formulations
  - Age and dose indications
  - Acceptability of thimerosal-containing vaccine for infants and pregnant women
  - LAIV
  - Should injectable vaccine be restricted to those not eligible for LAIV?
2009 H1N1: Vaccination Program

Challenges - *Planning and Logistics*

- No standard criteria to predict demand or measure supply to demand ratio
- Poor compliance with requirement to report doses administered
Challenges - *Planning and Logistics*

- Inadequate public health capacity for mass vaccination clinics and administration of “instant” large scale vaccination program
  - Surge staff needed
  - Trained staff with appropriate expertise
  - Minimal clinical public health infrastructure
# Influenza A (H1N1) 2009 Monovalent Vaccine Dosage Chart

## Inactivated, Injectable Influenza Vaccine

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Age</th>
<th>Dose—Presentation</th>
<th>Number of Doses</th>
<th>Route—Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>sanofi pasteur</td>
<td>6 through 35 months¹</td>
<td>0.25 mL—prefilled syringe¹</td>
<td>2²</td>
<td>Intramuscular³</td>
</tr>
<tr>
<td></td>
<td>36 months and older</td>
<td>0.5 mL—prefilled syringe</td>
<td>1 or 2²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 months and older</td>
<td>Dose per age—multidose vial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novartis Vaccine</td>
<td>4 years and older</td>
<td>0.5 mL—multidose vial</td>
<td>1 or 2²</td>
<td>Intramuscular³</td>
</tr>
<tr>
<td>CSL</td>
<td>18 years and older</td>
<td>0.5 mL—prefilled syringe</td>
<td>1</td>
<td>Intramuscular³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.5 mL—multidose vial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Children age 6 through 35 months should receive 0.25 mL vaccine per dose. Children age 36 months through adults should receive 0.5 mL vaccine per dose. See footnote 2 to determine number of doses.

² Based on currently available information, children 6 months through 9 years who are receiving injectable influenza A (H1N1) 2009 Monovalent vaccine should receive two doses of vaccine separated by approximately 4 weeks.

³ Children 6 months through 2 years of age should be vaccinated in the anterolateral aspect of the thigh. Older children and adults should be vaccinated in the deltid muscle if muscle mass is adequate. The anterolateral aspect of the thigh may be used as an alternate.

## Live Attenuated Nasal Spray Influenza Vaccine (LAIV)

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Age</th>
<th>Dose—Presentation</th>
<th>Number of Doses</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>MedImmune</td>
<td>2 through 49 years if healthy and non-pregnant</td>
<td>0.2 mL—Spray ½ of dose into each nostril as indicated on the syringe.</td>
<td>1 or 2⁴</td>
<td>Intranasal</td>
</tr>
</tbody>
</table>

⁴ Based on currently available information, healthy children 2 through 9 years of age who are receiving live attenuated influenza A (H1N1) 2009 Monovalent vaccine should receive two doses separated by approximately 4 weeks.

For more information call [800-CDC-INFO](tel:800-232-4636) (800-232-4636) Website [www.cdc.gov/flu](http://www.cdc.gov/flu)
2009 H1N1: Vaccination Program

Challenges – *Adult Immunization Program*

- No adult vaccine program analogous to VFC
  - VFC system is the backbone of vaccine distribution
  - Adult vaccinators unfamiliar with process
- 300% increase in provider/sites enrolled to administer H1N1 vaccine from existing program
- Challenges reaching certain target populations
  - Pregnant women
  - Persons without a medical home (un/underinsured)
  - Family members of infants
  - School children
Challenges - *Implementation of ACIP Recommendations*

- Variability in interpretation and application of:
  - Target population vs. subgroups
  - Populations with first access to vaccine
  - Sequential vs. simultaneous vaccination of priority groups
    - HCW vaccinated first, but many declined LAIV
    - Healthcare staff before patients
  - Group with highest mortality (adults 50-64) not included in initial “limited supply” priority subgroups (healthy children/adults vaccinated before this group)
  - Expanding vaccine eligibility beyond target populations
Death Rate per 100,000 Population by Age Group (n=1,642*)
2009-H1N1 April 2009 – Week 45

Not in ACIP subgroups to consider for vaccination first in shortage

Deaths per 100,000 Population

0-4 Yrs: 0.29
5-24 Yrs: 0.31
25-49 Yrs: 0.60
50-64 Yrs: 0.88
≥65 Yrs: 0.49

Hospitalizations with unknown ages are included (n=14) in All Ages rate.

Courtesy of Lyn Finelli, CDC
2009 H1N1: Vaccination Program

Challenges – *Weak Public Health Infrastructure*

- Insufficient local immunization program capacity
  - Needed to double immunization program staff to manage program administration (distribution and allocation, not including vaccination)
  - Difficulty hiring staff with necessary expertise: Not a “just-in-time” commodity
  - Inadequate clinical capacity for mass vaccination clinics
Challenges - *Weak Public Health Infrastructure*

How many vaccinators are available to provide routine immunizations on a typical day in Washington State’s 36 local health jurisdictions?

- 4 vaccinators (N=1)
- 2-4 vaccinators (N=5)
- At least 1 vaccinator (N=31)

Courtesy of John Erickson, WA DOH
Challenges - Resources

• Spring outbreak exposed gaps in local public health response capacity
  • Over 200 staff and 40 volunteers assigned to H1N1 response in our Department
  • Significant unbudgeted expenses
Challenges - *Shrinking Local Public Health Capacity*

- **Public Health Seattle & King County**
  - Immunization clinic nurses reduced by 70% between 2004-2009 (10.3 to 3.0 FTE)
  - In 2009, positions cut included:
    - Child Care Health (6 PHN, nutritionist, educator, admin)
    - Children with Special Health Care Needs team (3.5 FTE PHN)
    - Medical Examiner’s Office (3 FTE death investigators)
  - More cuts pending for 2010 including closure of remaining stand alone immunization clinics

*2009 H1N1: Vaccination Program*
Challenges – Resources

- Epidemiology team required an extra 10.6 FTE daily for 29 days (through June 12) (surge staff for 2468 hours)
- Epidemiology team received 1615 calls from health care providers over first 6 weeks, 100+ calls per day initially
- Not enough staff to allow shift work = worker stress
- Some staff working on response subsequently received layoff notices due to budget cuts
2009 H1N1: Vaccination Program

National Association of County & City Health Officials

• 2008 report:
  • 27% of local health departments had budget cuts
  • 53% had layoffs (7000 jobs lost)

• 2009 report:
  • 44% of local health departments had budget cuts
  • 32% had layoffs (approximately 8,000 jobs lost and 12,000 local health department employees reduced hours or mandatory furloughs)
2009 H1N1 Response: Summary

• The H1N1 pandemic highlighted many important gaps in the medical and public health response to large scale health emergencies

• Provides opportunities for improvement across the response spectrum before the next, inevitable challenge

• Need to create “culture of preparedness” to improve and sustain health emergency response capacity both in the medical system and among the community at-large, including schools, businesses, individuals, families, etc.
"Any community that fails to prepare with the expectation the federal government will come to the rescue will be tragically wrong . . ."

*Health and Human Services (HHS) Secretary Michael O. Leavitt*
Poll Question

Which of the following was most problematic for your jurisdiction as it addressed the current influenza season?

A. Surveillance
B. Vaccination
C. Coordination of the health care system (medical) response
D. Community mitigation/communication