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What have we learned from the H1N1 Pandemic?

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Agenda

1. Swine flu – historical perspective.
2. H1N1 emerges: April 2009 – January 2010.
3. What have we learned?
4. Going forward.

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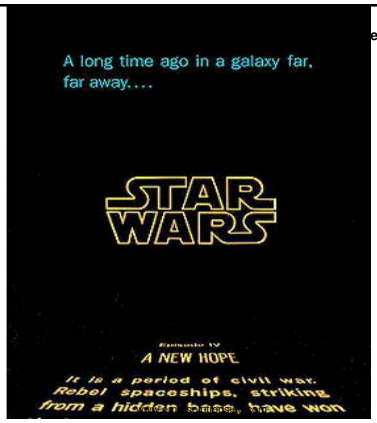
Historical Perspective



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Historical Perspective

- An estimated 58% of the 1,407 known human pathogens are zoonotic, which means that they normally occur in animals and also can infect humans.
- Illness with influenza in pigs was first recognized during the influenza pandemic of 1918.
- A swine influenza virus was first isolated from a human in 1974.
- In 1976, swine influenza virus caused a respiratory illness with one fatality among 13 soldiers in Fort Dix, NJ.
- Between 1958 and 2005, 37 cases of swine influenza were reported.
  - 6 cases (17 %) resulted in death.
  - 44% of infected individuals had known exposure to pigs.
  - Cases were reported in the United States, former Czechoslovakia, the Netherlands, Russia, Switzerland, and Hong Kong.

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H1N1 Emerges

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Mexico Reports Outbreak

- March 18, 2009. Surveillance systems in Mexico reported unusual numbers of influenza-like illness.
  - The event was an outbreak of acute respiratory illness in the states of Veracruz and Oaxaca, Mexico.

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Imperial County

- On March 28, 2009, a 9-year-old girl had onset of cough and fever (104.3F). *By chance*, she was taken to an outpatient clinic that was participating in a influenza study:
  - April 17, CDC received sample of an unsubtypable A virus.
  - CDC identified it as "novel H1N1."
  - ***No*** *"smoking pig."*

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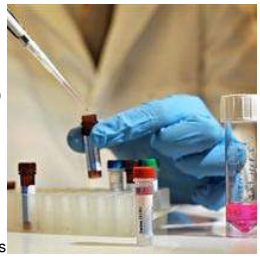
San Diego

- On March 30, 2009, a 10-year-old boy had onset of fever, cough, and vomiting.
  - ***No*** *exposure to pigs.*
- *By chance*, he was taken to an outpatient clinic which just happen to be doing a clinical study on influenza:
  - Initial test revealed Influenza A, unable to type.
  - CDC notified on April 13.
  - Turns out later to be the same as the girl in Imperial.



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Fast Forward

- Week of April 17 – 23, 2009:
  - Mexico outbreak continues.
  - Two cases confirmed in California.
  - One case also confirmed in Texas.
  - Additional cases reported in California; first hospitalization on April 23, 2009.
  - ***No*** epidemiological link to any of the cases.
    - Geographically distinct /isolated.
  - ***No*** *"smoking pig"* (no pig exposure in the cases).
- Net-net = It was probably a ***much*** bigger problem and could be…
- CDC opens its EOC April 20, 2009.

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April 24, 2009

- A mysterious illness is reported in the national news – a respiratory illness in Mexico, spreading quickly…
  - People in the streets with masks. Fear spreading like wildfire.
  - "*Hey, wait a minute.*. This is 'next door' to us. Wasn't this supposed to start in Asia?"

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Flights from Mexico

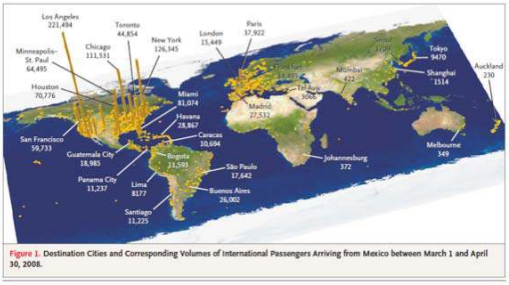

Figure 1. Destination Cities and Corresponding Volumes of International Passengers Arriving from Mexico between March 1 and April 30, 2008.

March and April, 2008, a total of 2.35 million passengers flew from Mexico to 1,018 cities in 164 countries – New England Journal

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How Quickly Things Changed

- WHO 3: 1997 – April 26, 2009
- WHO 4: April 27, 2009
- WHO 5: April 29, 2009
- WHO 6: June 11, 2009 – a *global* pandemic* was declared

World Health Organization

* "Epidemic over a wide geographic area and affecting a large proportion of the population"

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H1N1 Status

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WHO Confirmed Cases

- World Health Organization (WHO) stopped reporting case numbers globally, July 16, 2009.
- As of March 14, 2010, 213 countries and overseas territories or communities have reported *laboratory confirmed cases* of 2009 pandemic influenza H1N1 including at least 16,813 deaths.
- Numbers vary greatly by different agencies around the world. Due to the change in testing, they are no longer meaningful.

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US Statistics

- August 30, 2009 – January 16, 2010
  - 38,988 *laboratory-confirmed* influenza-associated hospitalizations.
  - 1,805 laboratory-confirmed influenza-associated deaths.
- As of March 16, 2010, 267 pediatric deaths (331 pediatric deaths since April 2009).

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US Estimates

CDC Estimates of 2009 H1N1 Cases and Related Hospitalizations and Deaths from April-December 12, 2009, By Age Group

2009 H1N1	Mid-Level Range*	Estimated Range *
Cases		
0-17 years	~18 million	~12 million to ~26 million
18-64 years	~32 million	~23 million to ~47 million
65 years and older	~5 million	~4 million to ~7 million
Cases Total	~55 million	~39 million to ~80 million
Hospitalizations		
0-17 years	~78,000	~55,000 to ~115,000
18-64 years	~145,000	~102,000 to ~213,000
65 years and older	~23,000	~16,000 to ~34,000
Hospitalizations Total	~246,000	~173,000 to ~362,000
Deaths		
0-17 years	~1,180	~830 to ~1,730
18-64 years	~8,620	~6,090 to ~12, 720
65 years and older	~1,360	~960 to ~2,010
Deaths Total	~11,160	~7,880 to ~16,460

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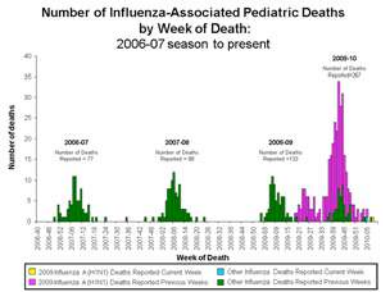
Pediatric Deaths



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Out of Danger Comes Opportunity

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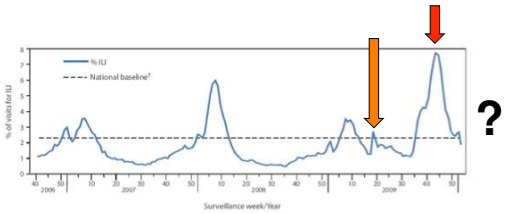
Influenza Waves



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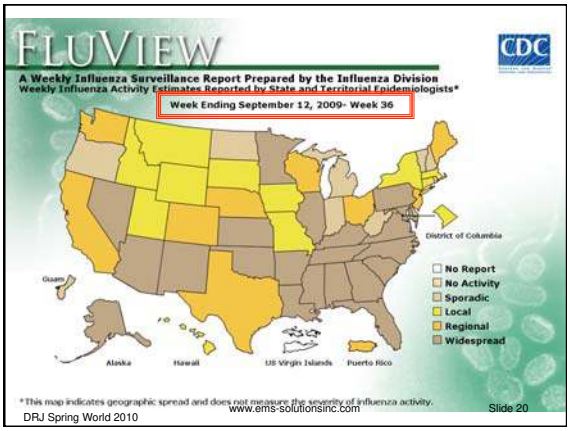

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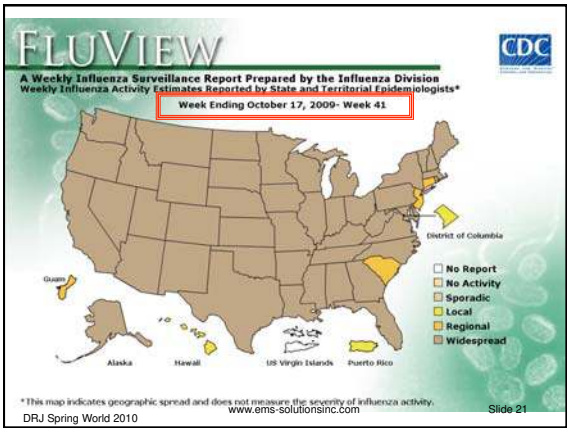

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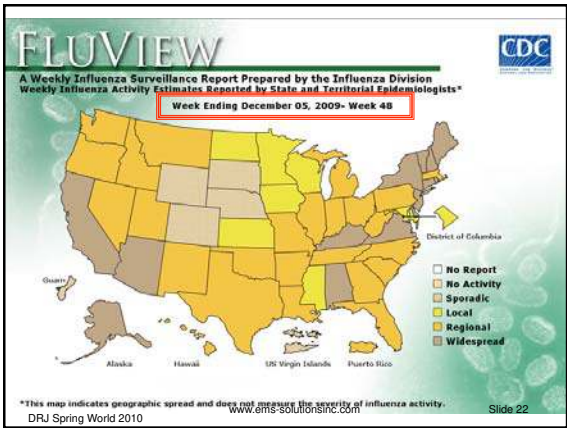

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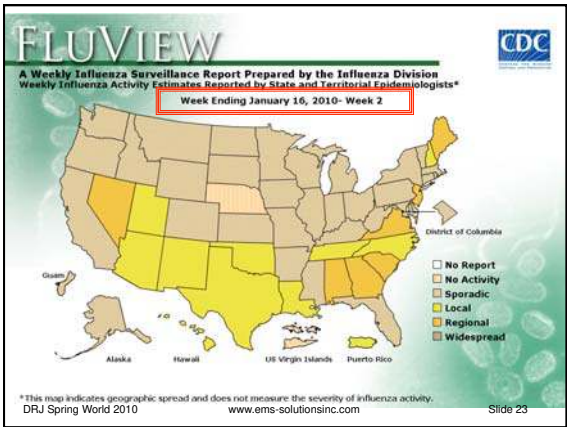

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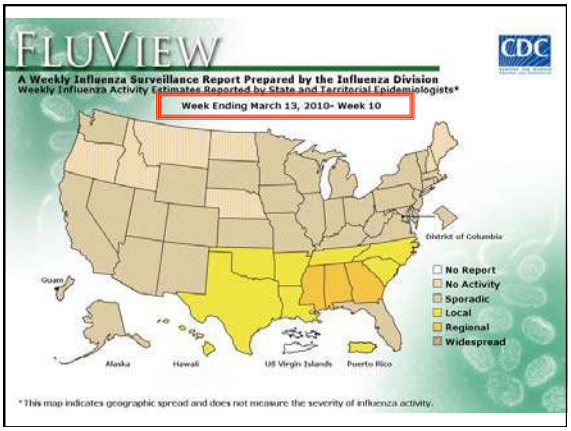

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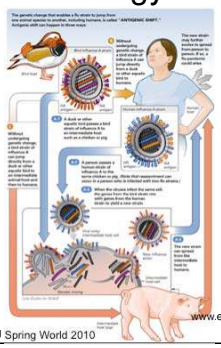
H1N1 Clinical Overview

Virology - Novel H1N1 Virus

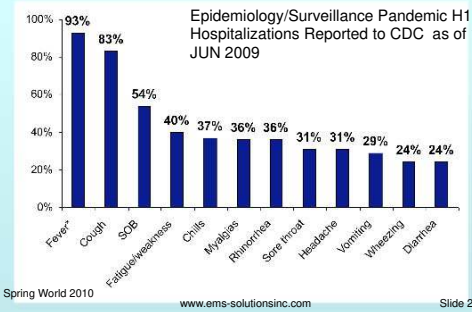


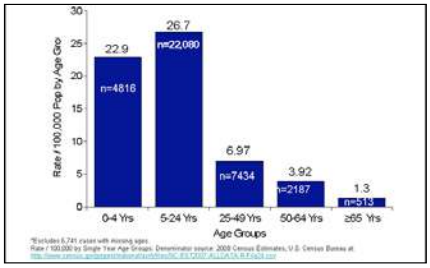
- A quadruple reassortment of influenza A viruses:
  - 34.4% – North American avian influenza.
  - 17.5% – Human influenza.
  - 30.6% – Swine influenza virus, North American.
  - 17.5% – Swine influenza virus, Eurasian.

Transmission

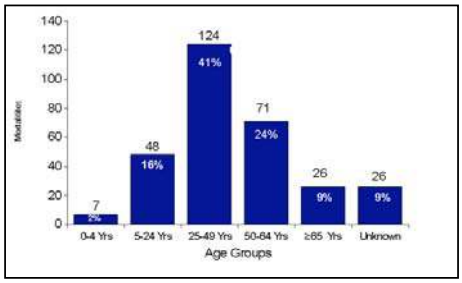
- Person-to-person: Large droplets (sneezing, coughing), other bodily fluids possible.
- Viral shedding: 5 – 7 days. Longer periods of shedding may occur in children (especially young infants), elderly adults, patients with chronic illnesses, and immuno-compromised hosts.
  - Virus shed is greatest during the first two to three days of illness.
- Incubation: Median incubation period appears to be approximately two days.

Clinical Characteristics





Novel H1N1 confirmed and probable case rate in the U.S.



Novel H1N1 U.S. hospitalization rate per 100,000 population, by age

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Complications

- Rapidly progressive pneumonia, respiratory failure, acute respiratory distress syndrome, severe hypoxia, and multi-system organ failure.
  - Autopsies revealed edema, hemorrhage, or necrosis in the upper respiratory tract and diffuse alveolar damage.
- Bacterial super-infections of the lung.
- Neurological complications such as encephalopathy.

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Risk Groups

- Patients with co-morbidities: Among patients requiring hospitalization in the U.S., approximately 70% have had at least one underlying condition:
  - Chronic lung disease (37%).
  - Immunosuppressive conditions (17%).
  - Cardiac disease (17%).
  - Pregnancy (17%).
  - Diabetes (13%).
  - Obesity (13%).

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Risk Groups

- Pregnant women represent 6% of deaths.
  - 1% of population is pregnant at any given time.
- Indigenous populations – Four-fold increase in mortality compared to the general population.
- Obesity – Connection unclear.
- Older hospitalized patients – May have been the result of co-morbidities, since 80% of patients over 50 had underlying medical conditions.

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A Bit of Perspective

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Major Public Health Crisis

- The last major public health crisis was in the 1940s and early 1950s:
  - Polio.
  - Tuberculosis.
- No one working in public health had any common experience to draw from:
  - Plans were built from research and planning assumptions as what "could happen."

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Instant Communication

Aol. digg facebook twitter CNN WordPress myspace.com a place for friends

- The 1968 pandemic was discovered when large numbers of children were absent from school in Florida.
- This pandemic was broadcast 24x7 from the moment people started wearing masks on the street in Mexico.
  - How to do you tell between fact, speculation, and fiction?

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Everyone Is A Medical Expert

October 2009 http://www.youtube.com/watch?v=TeKb710KikM

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What Have We Learned?

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Lessons Learned

- Can be divided into three categories:
  1. General pandemic planning learnings.
  2. Business continuity learnings.
  3. Health care learnings.

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General Pandemic Planning Learnings

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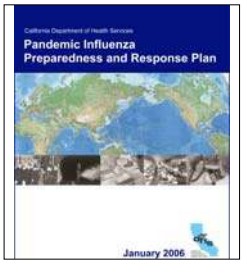
Preparation Paid Off

- The preparation for "bird flu" (H5N1) from 2003 – 2009 paid off.
  - Federal government and state/local DPHs revised plans (from 1968).
  - Companies had plans.
  - Antivirals had been stockpiled.



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Need Better Surveillance

- Analysis of the H1N1 virus suggests that this new strain had been circulating in pigs for ***almost a decade***, and probably jumped to humans months before it was detected in Mexico.
  - Public and animal-health communities need to help increase surveillance for emerging diseases with pandemic potential.
  - We need to build disease surveillance and response capacity in developing countries.

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Containment is NOT Possible

- We quickly learned that country containment in the age of jet travel is NOT possible.
  - Border closures did not occur because the "bug" was already out of the bag.

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WHO Alerts Caused Confusion

- There was confusion that the alert levels dictated *severity* – rather than *degree* – of spread.
  - Most built plans using WHO levels "assumed" a severe pandemic.

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Need New Vaccine Technology

- Fighting the 2009 H1N1 flu with 1950s vaccine technology was challenging.
  - Vaccine production began rapidly, but when the virus grew slowly in eggs, there was nothing that could be done.
- Very few vaccine producers in the US.

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Don't Over-Promise

- The response from the Feds and the states, for the most part has been good.
  - The one major error was HHS's over-optimistic prediction of plenty of vaccine by late September.

HHS Secretary Kathleen Sebelius

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International Complications

- International coordination was more complicated than expected.
  - Despite advice from the WHO, some countries chose to close their borders to Mexican citizens or banned pork products from the United States and Mexico.
  - Irrational pig slaughter in Egypt resulted in a disease issue later – turns out that pigs had been the garbage consumer champions.

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Don't Underestimate Anti-Vaccine Sentiment

Swine Flu FEMA Preparing for Massive Innoculating with Dangerous Vaccine

- There was very strong anti-vaccine sentiment in the US and Europe. Issues include:
  - Immune adjuvants.
  - General belief that vaccines do "no good": Dr. Mercola, "There is virtually no science to support the safety of vaccine injections on your long-term health or the health of your children." *www.mercola.com*

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Business Continuity Learnings

Expect The Unexpected

- It can start ***anywhere.*** Don't assume anything.
  - After all, wasn't this supposed to come from Asia?
  - What happened to the weeks of advance notice that we had expected?

Plan Flexibility is Essential

- Build plans with flexibility:
  - Designing plans around the worse-case scenario left companies scrambling to develop other strategies when it was less severe than that.
  - Flexibility is the key!

Lack of Medical Knowledge Is Problematic

- Many companies no longer have on-site medical staff or access to professional medical information.
  - This proved challenging for many companies who didn't know what to do about medical concerns.

Revisit Plans as Events Unfold

- Yesterday's plans may be unworkable today because of new circumstances:
  - Availability of needed staff, supplies, or equipment, or changes in protocols or recommendations.

Details Are Important

- Details are important. Tell people what you expect and what they need to do.
  - For example, instructions for workers to wear masks must be accompanied by instructions about which mask, what size, under what circumstances, when to change, and how to receive new ones.
  - Be clear on HR policies: Specify leave, pay, and benefit issues.

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"Media" May Provide Conflicting Information

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Social Distancing is Effective

- Social distancing helped in situations like college dorms, prisons, and family settings.
  - In general, avoiding large crowds was good.
- Awaiting more research and scientific papers to determine if broader social distancing options – like closing schools – was effective.

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Social Distancing Has Costs

- Social distancing has a downside as well:
  - School closings have major ramifications for students, parents, and employers.
  - Sick leave and policies for limiting mass gatherings were also problematic.

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Personal Behavior Matters

- One's behavior absolutely affects how fast the H1N1 and other flu viruses will spread.
  - Wash your hands correctly and often.
  - Use alcohol-based hand sanitizer.
  - Cough and sneeze into your elbow rather than your hand.
  - Stay home when sick.

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Communication is Essential

- Get in front of the story.
  - CDC did this rather successfully.
  - WHO less so.
  - Individual companies received mixed evaluations – some good, others not so much.

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Networking and Benchmarking Paid Off

- Many professional organizations did surveys and benchmarking that helped companies see what others were doing, which gave them information to adjust plans accordingly.

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Health Care Learnings

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H1N1 Affected Different Population

- Unlike the usual 'seasonal' flu, which impacts the elderly and those with severe co-existing medical conditions, the H1N1 virus affected a different profile.
- Critical illness due to swine flu was most common in infants, middle-aged people, pregnant woman, the overweight, and indigenous patients.
- However, about 1/3 of flu patients admitted to an ICU because had no underlying health problems.

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H1N1 = Unpredictable

- Lessons learned from the first 13 children at Johns Hopkins Children's Center to become critically ill from the H1N1 virus show that although all patients survived:
  - Serious complications developed quickly, unpredictably, and with great variations from patient to patient.
  - Serious need for vigilant monitoring and quick treatment adjustments.

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Hospitals Were Strained

- Even with a mild outbreak, the health care delivery system was overwhelmed.
  - The surge of patients with H1N1 placed substantial strain on staff and resources.
  - The number of patients admitted to ICUs with this complication represented a 600 % increase compared to previous year. (Australia/New Zealand)

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Public Health Is Under-funded

- 27 states cut funding for public health from FY 2007-09.
- 13 states have purchased less than 50 percent of their share of federally subsidized antiviral drugs to stockpile for use during an influenza pandemic.
- 14 states do not have the capacity in place to assure the timely pick-up and delivery of laboratory samples on a 24/7 basis to the Laboratory Response Network (LRN).
- 11 states and D.C report not having enough laboratory staffing capacity to work five 12-hour days for six to eight weeks in response to an infectious disease outbreak, such as H1N1.

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Communication/Coordination Between Health Providers

- Communication and coordination between the public health system and health care providers was not well coordinated:
  - During the outbreak, many private medical practitioners reported that they did not receive CDC guidance documents in a timely fashion.
  - Other practitioners noted that CDC guidance lacked clinically relevant information and was difficult to translate into practical instructions.
  - Strategy for distribution of vaccine left to states.

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Going Forward

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The Biggest Danger?
"Ho Hum"

- The danger now is that last year's relatively mild pandemic will create a false sense of security and complacency.
  - The reality is that next time we might not be so lucky — especially given that this time most of the world's population living in developing countries had no access to either vaccines or antiviral drugs.

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Ready or Not?

Trust for America's Health
Preventing Epidemics. Protecting People.

- This report contains state-by-state health preparedness scores based on 10 key indicators to assess health emergency preparedness capabilities.
  - http://healthyamericans.org/reports/bioterror09/

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Going Forward - Third Wave?

- Your challenge?
  - Be ready for anything: No one knows what is going to happen in the next few months.

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Thank you

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