

*“What do I need to know about the new H1N1 flu that everyone is concerned about?”*

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What are the goals of the “talk?”

- Define “the flu.”
- Describe the unique features of viruses in general and influenza viruses specifically
- Describe the illness caused by influenza
- Explain how influenza spreads
- Discuss epidemics vs pandemics and the mechanisms by which they occur
- Discuss emerging knowledge about the novel H1N1 virus



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What is ‘the flu’?

**Answer:** *An illness caused by influenza virus*

- A sudden onset respiratory illness with fever
  - Affects nose, throat, air passages, and lung
  - Yearly epidemics
  - Occurs worldwide causing significant illness and death every year
- NOT the nausea/vomiting/diarrhea that people call “the stomach flu.”



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### Are there different types of flu?

- **Answer:** Yes!
- Type A– moderate to severe illness
  - All age groups
  - Humans and other animals
- Type B– milder epidemics
  - Humans only
  - Primarily affects children
- Type C– rarely reported in humans
  - No epidemics



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### Time out, coach! How are viruses different from other germs?

- Much smaller than animal cells or bacteria
- Viruses need to get a life!
  - Need to be inside our cells to live
- Our cells become virus factories
- Influenza virus kills cells in breathing passages



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### What does an influenza virus look like?

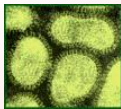
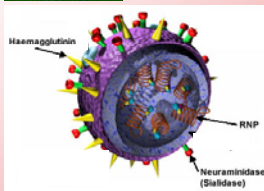


Fig.1 Electron micrograph



- **Hemagglutinin protein**
  - Allows virus to stick to cells of some animals and not others
- **Neuraminidase protein**
  - Helps release new virus from cells
- **Genes (RNP) divided into 8 parts**
  - Allows 2 or more viruses to mix and match genes

Fig.2 Schematic of influenza virus



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### Why are the numbered "H" and "N" designations important?

**Answer:** They stand for different hemagglutinins ("H") and neuraminidases ("N")

- Used to subtype influenza A strains
  - 16 different H's
  - 9 different N's
- Current human subtypes
  - A(H1N1) and A(H3N2) primarily
- Antibodies against H's and N's made by our immune system protect us
- H and N subtypes are basis for flu vaccines




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### What are the symptoms of influenza?

- Sudden fever, muscle aches, headache, lack of energy, dry cough, sore throat, runny nose
- Fever and body aches last 3 to 5 days
- Cough and lack of energy– 2 weeks
- Symptoms similar to other respiratory infections
- Supportive care (avoid aspirin)
  - Rest, fluids, anti-cough, anti-fever meds
  - Antivirals if symptoms for < 48 hours




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### How is influenza spread?

**Answer:** Very quickly due to short incubation!

- 2 days after you catch the virus, you feel sick
- Infected people shed virus; make others sick
  - Shedding can begin 1 day BEFORE you feel sick
  - Peak shedding first 3 days of illness
  - Subsides by 5-7 days
    - Can be 10+ days in children




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### Is flu only spread through the air?

**Answer:** *Mainly spread by large droplets in air.*



- **Large droplet mostly**
  - Generated by coughing, sneezing, talking
  - “spitting distance”
- **Contact with contaminated hands or surfaces, sometimes**
- **Microscopic droplets less common**




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### What is the difference between an epidemic and pandemic?

**Answer:** *They primarily differ in scope and the mechanisms by which they occur.*

- Epidemics occur every year due to **minor** changes in influenza A viruses that circulate
  - Same H and N as previous years
- Pandemics happen only occasionally when a completely new influenza A virus circulates
  - **SUBSTANTIALLY DIFFERENT** H and/or N from previous years




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### How do yearly epidemics occur?

**Answer:** *A process called antigenic DRIFT.*

- Imperfect “manufacturing” of virus
  - Small changes in H and N
  - Partial immunity in population
    - Incomplete protection; still get sick
    - Need new flu vaccine every year




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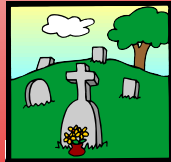
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### What are the consequences of yearly epidemics in U.S.A?

- > 36,000 die and 200,000 are hospitalized
- 5 to 20% of general population infected
- Nursing home attack rates of up to 60%
- 85% of flu-related deaths in ages > 65
- Over \$10 billion lost



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### What drives the occurrence of a pandemic?

**Answer:**

Instead of antigenic *DRIFT* occurring, an antigenic...

# SHIFT

## H?N?

...happens.



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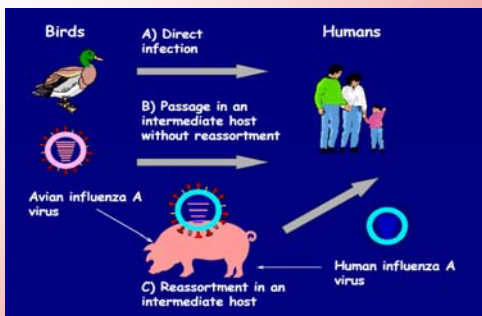
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### How does antigenic shift happen?



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### What about past flu pandemics?



Credit: US National Museum of Health and Medicine

**1918: "Spanish Flu"**  
A(H1N1)

20-40 m deaths  
675,000 US deaths

**1957: "Asian Flu"**  
A(H2N2)

1-4 m deaths  
70,000 US deaths

**1968: "Hong Kong Flu"**  
A(H3N2)

1-4 m deaths  
34,000 US deaths



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### What might happen if we have a pandemic, now?

- Mortality (death) rate of the new H1N1 virus not currently known. The following are estimates:
- Infected: 90 million US, >500,000 NE
  - Based on 30% attack rate
- Hospitalized: 865,000 to 9.9 million US
  - (NE Range 4,928 to 56,472)
- Deaths 209,000 to 1.9 million US
  - (NE Range 1,181 to 10,832)
- \$71-166 billion would be lost

Emerg Inf Dis 1999:5:659-71  
TFAH June 2005  
NE Pandemic Plan 2006



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### What is required for a pandemic to occur?

- **Answer:** A new virus with person-to-person spread.
- ✓ Novel virus to which population has little or no immunity
- ✓ Virus that is pathogenic and virulent in humans
- ✓ Virus must be capable of sustained person-to-person transmission



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### What is Swine-Origin Influenza Virus?

**Answer:** Currently, the term refers primarily to a novel H1N1 influenza virus.

- Pigs can be infected with influenza A subtypes
  - Typically swine catch influenza A from other pigs, but can be infected with strains from birds and humans
  - Swine flu occasionally infects humans but does not usually spread easily
- New strain recognized in Mexico (not in swine)
- New strain has genetic characteristics of swine, human, and bird strains.




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### How does “swine flu” affect swine?

- **Answer:** It is very similar to human illness. Can be asymptomatic to severe.
- Coughing (“barking”)
- Discharge from the nose
- Sneezing
- Breathing difficulties
- Going off feed
- Can result in reduced fertility or elevated spontaneous abortion rates among sows.




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### How does the new H1N1 virus affect humans?

**Answer:** There have been 226 confirmed human cases of H1N1 flu in the U.S. as of 5/03/09.

- 506 confirmed cases in Mexico, and 19 deaths.
- Cases in U.S. have so far been mild; there has been one death (23 month old visiting from Mexico).
- 3 confirmed cases in Nebraska (0 deaths)
- Incubation period of 1-7 days; more commonly 1-4 days.
- Pts. infectious 1 d before to 7 d after symptoms start.
- NOTE: CAN'T CATCH IT FROM EATING PORK!

FOR UPDATES <http://www.cdc.gov/swineflu/index.htm>  
FOR NEBRASKA UPDATES <http://www.dhhs.ne.gov/H1N1flu/cases.htm>




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### What are symptoms of H1N1 flu?

- **Answer:** They are about the same as regular flu symptoms.
- Fever, usually > 101°F, and chills
- Sore throat
- Nasal congestion and runny nose
- Headache
- Body and muscle aches
- Dry cough
- Tiredness and weakness
- *Sometimes* additional symptoms (not typical of seasonal flu) are nausea, vomiting, diarrhea.




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### Who is at risk for severe infection with H1N1 virus?

- Answer:** Pts. who have chronic diseases, weak immune systems, are very old or very young.
- Children <5, adults ≥50, and pregnant women
  - Children and adolescents on long term aspirin
  - People with emphysema, asthma, heart disease, kidney disease, liver disease, blood disorders, diabetes
  - People with weak immune systems (steroids, HIV, lymphoma, etc.)
  - Conditions that interfere with breathing function or handling breathing secretions (e.g. seizures, paralysis, stroke, certain muscle disorders, swallowing problems)
  - Nursing home or other chronic care facility residents




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### When should I call my healthcare provider?

- **Answer:** Call if you get concerned about your symptoms especially if you or a family member are high risk.
- If you have a fever and two or more other flu symptoms especially if symptoms are severe
  - Your provider may recommend tests or treatment with antivirals
- If unable to drink fluids, have dark urine, or feel dizzy when standing (signs of dehydration)
- If you have a fever for more than 3 to 5 days even if you have already been treated
- If you start to recover from the flu symptoms and you get fever again.




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### When does someone with H1N1 flu need emergency care?

**Answer:** Get medical care right away if someone...

- Has difficulty breathing or chest pain
- Has purple or blue discoloration of the lips
- Is vomiting and unable to keep liquids down
- Has seizures (uncontrolled convulsions)
- Is less responsive than normal or becomes confused
- Has signs of dehydration: dizziness when standing, absence of urination, or in infants a lack of tears when crying




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### How is H1N1 influenza treated?

- **Answer:** It can be treated with antivirals that are neuraminidase inhibitors.
- Current strain resistant to older drugs
  - Amantadine and rimantadine
- Sensitive to “N” inhibitors
  - Oseltamivir (Tamiflu®)–
    - capsules and oral liquid
  - Zanamivir (Relenza®)–
    - Inhaled powder
- Can lessen symptoms and speed recovery



For updates see: <http://www.cdc.gov/h1n1flu/recommendations.htm>




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### Will a flu vaccine protect me?

**Answer:** Currently there is no vaccine against the new H1N1 strain.

- CDC has seed stock
  - Can be used to produce vaccine
  - Currently working with manufacturers
  - Could take 4-6 months
- No protection from current flu vaccine
  - ?Older people with lots of immunologic experience
- Acambis universal vaccine
  - Experimental
  - invariant M2 protein




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### What should I do if I'm exposed to someone with H1N1 influenza?

- **Answer:** *Anti-viral prophylaxis is recommended for certain groups of people (subject to change).*
- Household close contacts who are at high-risk of complications of a confirmed or probable case
  - Persons with certain chronic medical conditions, over age 65, < 5 years old, and pregnant women
  - Your healthcare provider can tell you if you need preventative medication
- If you are not in a high-risk group you should:
  - Limit your contact with others in the community
  - Stay home at the earliest sign of flu symptoms

For updates see: <http://www.cdc.gov/h1n1u/recommendations.html>




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### How can I protect others from catching H1N1 from me?

- Answer:** *Take measures to keep them from coming into contact with the virus.*
- Wash hands often especially after coughing or sneezing (or use alcohol hand gel).
  - Cough or sneeze into a tissue or into the crook of your elbow/upper arm if no tissue.
  - Stay home at least 7 days after you first feel sick or until your fever is gone for > 24h whichever is longer
  - Stay at least 6 feet away from others while sick
  - Don't share food, utensils, drinking glasses, or toothbrushes




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### What about household cleaning, laundry, and waste disposal?

- Throw away tissues and other disposable items used by sick person in the trash (wash hands)
- Keep surfaces clean by wiping down with a household disinfectant according to label
  - <http://www.epa.gov/oppad001/influenza-disinfectants.html>
- Eating utensils and dishes of sick person
  - Do not need to be cleaned separately; wash thoroughly in dishwasher or with soap and water
- Linens and towels
  - Household laundry soap and tumble dry on hot
  - Avoid "hugging" laundry prior to washing to prevent contaminating yourself
  - Clean hands with soap and water or alcohol-based hand rub right after handling dirty laundry




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### What response strategies can public health authorities use?

- Enhanced surveillance
- Develop detailed response plans & practice
  - Guidelines for vaccine and antiviral prioritization
- Travel limitations
  - Limit travel to/from countries/continents affected by pandemic (less effective with modern global travel)
- Stockpile antivirals and vaccine
- Non-pharmaceutical Interventions (NPI)
  - See CDC community-mitigation strategy paper: [http://www.pandemicflu.gov/plan/community/community\\_mitigation.pdf](http://www.pandemicflu.gov/plan/community/community_mitigation.pdf)


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### Surveillance...am I being watched?!

- **Answer: Yes!**
- World Health Organization (WHO)
  - 6 regional offices
  - 112 National Influenza Centers in 89 countries (NICs)
  - 4 WHO Collaborating Centers (WHOCCs)
    - Australia, Japan, UK, and USA
- WHO makes recommendations on vaccine composition based on surveillance data.






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### Who's watching in Nebraska?

Influenza Sentinel Provider Surveillance System

- 11 providers (report to CDC)
- LHDs have flu surveillance plans
- Lab test result reporting and strain typing
  - 65 labs report
- School absenteeism survey
  - LHD enter data
- ILI admissions survey
  - 19 district/local health departments
  - 89 acute care hospitals


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### Are stockpiles of antivirals adequate?

**Answer:** *It's debated.*

- U.S. Oseltamivir stockpiles (hard to produce)
  - Current: 75 million courses;
  - Federal 44 million courses; State 31 million
  - IDSA need estimate: minimum 90 million (130 ideal)




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### What has Nebraska done in planning?

- Pan Flu Plan– “Evergreen” document
- Engagement of stakeholders and citizens
  - Governor’s Pan Flu Committee–
    - April 11, 2005
    - November 14, 2005
  - Citizen’s review group– Sept. 24, 2005
  - Strong support of PH by both groups
- Widespread education of providers and guidance on antiviral use
  - To be modified by CDC based on H1N1 epidemiology




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### What are Nebraska’s pandemic flu vaccination goals?

1. Maintain the ability to provide quality health care, implement pandemic response activities and maintain vital community services.
2. Protect persons at highest risk for influenza mortality.
3. Decrease transmission of infection to those at highest risk for influenza mortality.
4. Maintain other important community services.
5. Protect the population at large.




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## Are there federal guidelines for vaccine priority groups?

- Tier 1**
  - A Vaccine Producers direct care medical workers
  - B Persons > 65 with compromising conditions
  - C Pregnant women; Household contacts of compromised persons
  - D Public health emergency responders and key public officials.
- Tier 2**
  - A Healthy 65 and older and children
  - B Emergency response, essential services
- Tier 3** Key government and society leaders
- Tier 4** Healthy Persons




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## What are NPI's?

- **Answer:** *The application of multiple, partially effective measures other than medication.*
- Potential community interventions
  - Isolation and treatment
  - Voluntary home quarantine
  - Dismissal of students from school activity/childcare
  - Social distancing
- Timing and intervention choice depends on how good the pandemic virus is at causing illness and death
- In 1918, cities that instituted NPI's early had reductions in death rate compared to cities that had more delay




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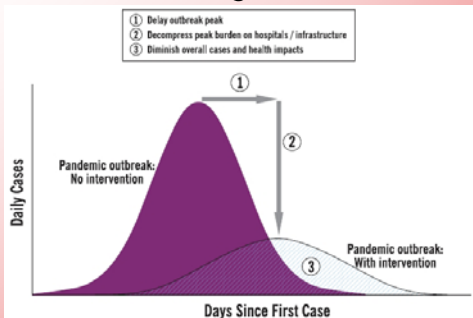
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## What are the goals of NPI's?




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### How can I get ready?

- Practice coughing/sneezing into tissue and throwing it in trash or use upper arm if no tissue available
- Practice handwashing for 15 seconds or use alcohol-based hand gel often
- Keep hands away from eyes and mouth unless hands were washed
- Get a pneumonia shot if in high risk group: prevents secondary infections after the flu
- Avoid others if you are sick or if they are sick
- Develop an Individual/family plan
  - Checklists available at: <http://www.pandemicflu.gov/plan/>
- **DO NOT STOCKPILE TAMIFLU OR RELENZA**




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### What about masks in a pandemic?

**Answer:** *Masks outside a healthcare setting can be considered in some circumstances.*

- Does not reduce need for other NPI's
- Facemasks considered for crowded settings (avoid if possible and minimize time)
  - Protect wearer from others' cough and protect others from wearer's cough
  - Single use
- Respirators (N95) considered when close contact with infected person is unavoidable
  - Care of sick person at home
  - Requires fit-testing to be effective
  - Single use

For more see: <http://www.cdc.gov/h1n1flu/masks.htm>




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### What should I do if I want to travel to countries that have H1N1 flu?



- No travel restrictions currently
- CDC recommends cancelling non-essential travel to Mexico
- Currently the US is the second most affected country




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*The only thing more difficult than planning would be explaining why you did not do it!*

-- Marja Esveld  
Healthcare Inspectorate, The Netherlands



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### Acknowledgements

- This presentation was developed from a variety of resources including but not limited to:
  - The Infectious Diseases Society of America
  - Centers for Disease Control and Prevention
  - World Health Organization
  - Joann Schaefer, MD; Chief Medical Officer, Nebraska Health and Human Services System



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