Pandemic Preparedness in the Era of Novel H1N1 (Swine) Flu

Steven Lawrence, MD, MSc

Associate Director-Emergency Response Planning, MRCE
Division of Infectious Diseases
Washington University School of Medicine

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Disclosure Statement

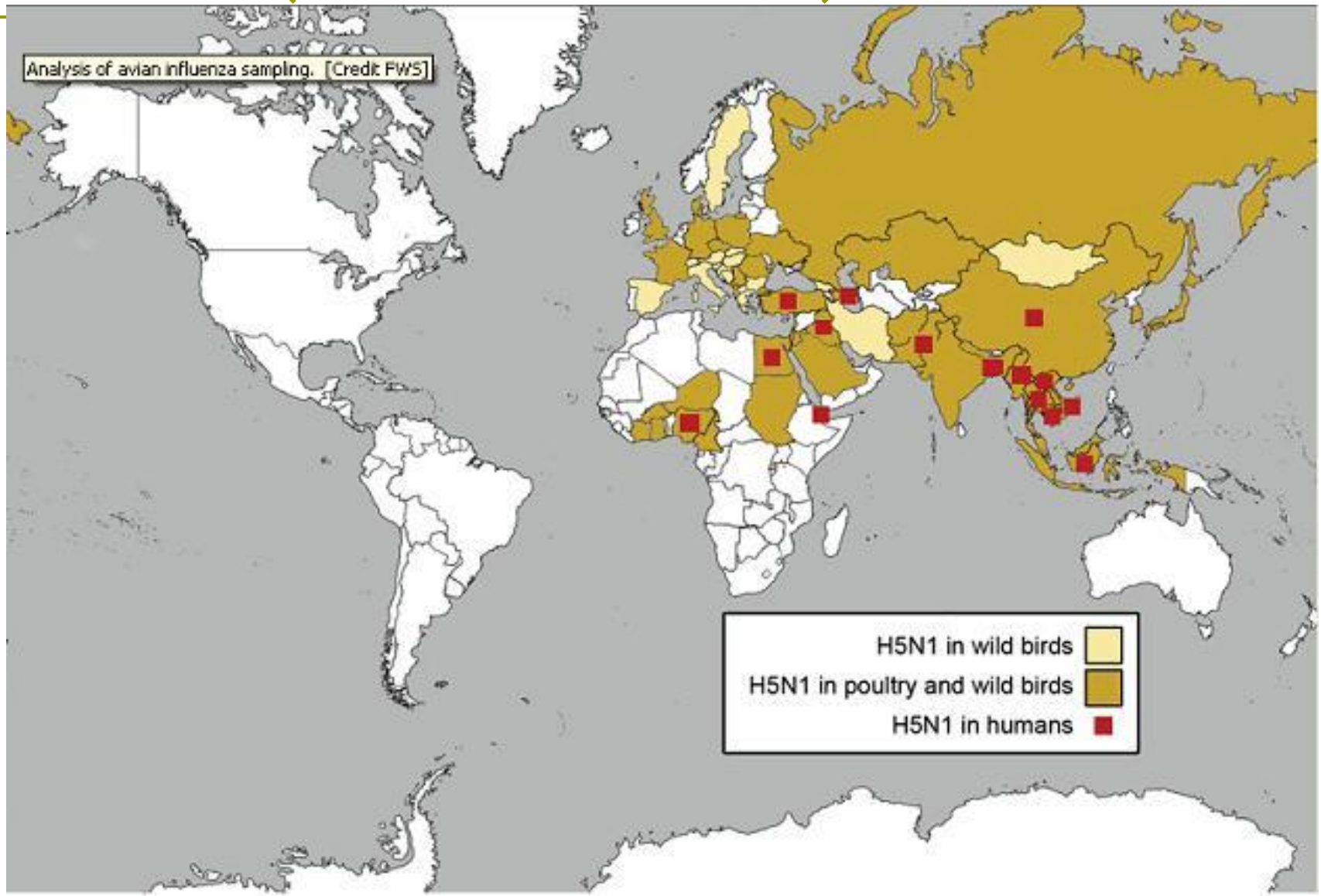
No Conflicts of Interest

Outline

- H5N1/Novel H1N1 influenza update
- Pandemic risk assessment
- Employee protection strategies
  - Non-pharmaceutical interventions
  - Antiviral stockpiling: pros and cons

H5N1 Update

H5N1 (as of 5/22/09)



H5N1 Human Cases – 5/22/09

Country	2003		2004		2005		2006		2007		2008		Total	
	case	death	case	death	case	death	case	death	case	death	case	death	case	death
Azerbaijan	0	0	0	0	0	0	8	5	0	0	0	0	8	5
Bangladesh	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Cambodia	0	0	0	0	4	4	2	2	1	1	1	0	8	7
China	1	1	0	0	8	5	13	8	5	3	4	4	38	25
Djibouti	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Egypt	0	0	0	0	0	0	18	10	25	9	8	4	74	27
Indonesia	0	0	0	0	20	13	55	45	42	37	24	20	141	115
Iraq	0	0	0	0	0	0	3	2	0	0	0	0	3	2
Laos	0	0	0	0	0	0	0	0	2	2	0	0	2	2
Myanmar	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Nigeria	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Pakistan	0	0	0	0	0	0	0	0	3	1	0	0	3	1
Thailand	0	0	17	12	5	2	3	3	0	0	0	0	25	17
Turkey	0	0	0	0	0	0	12	4	0	0	0	0	12	4
Viet Nam	3	3	29	20	61	19	0	0	8	5	6	5	111	56
Total	**4**	**4**	**46**	**32**	**98**	**43**	**115**	**79**	**88**	**59**	**44**	**33**	**429**	**262**

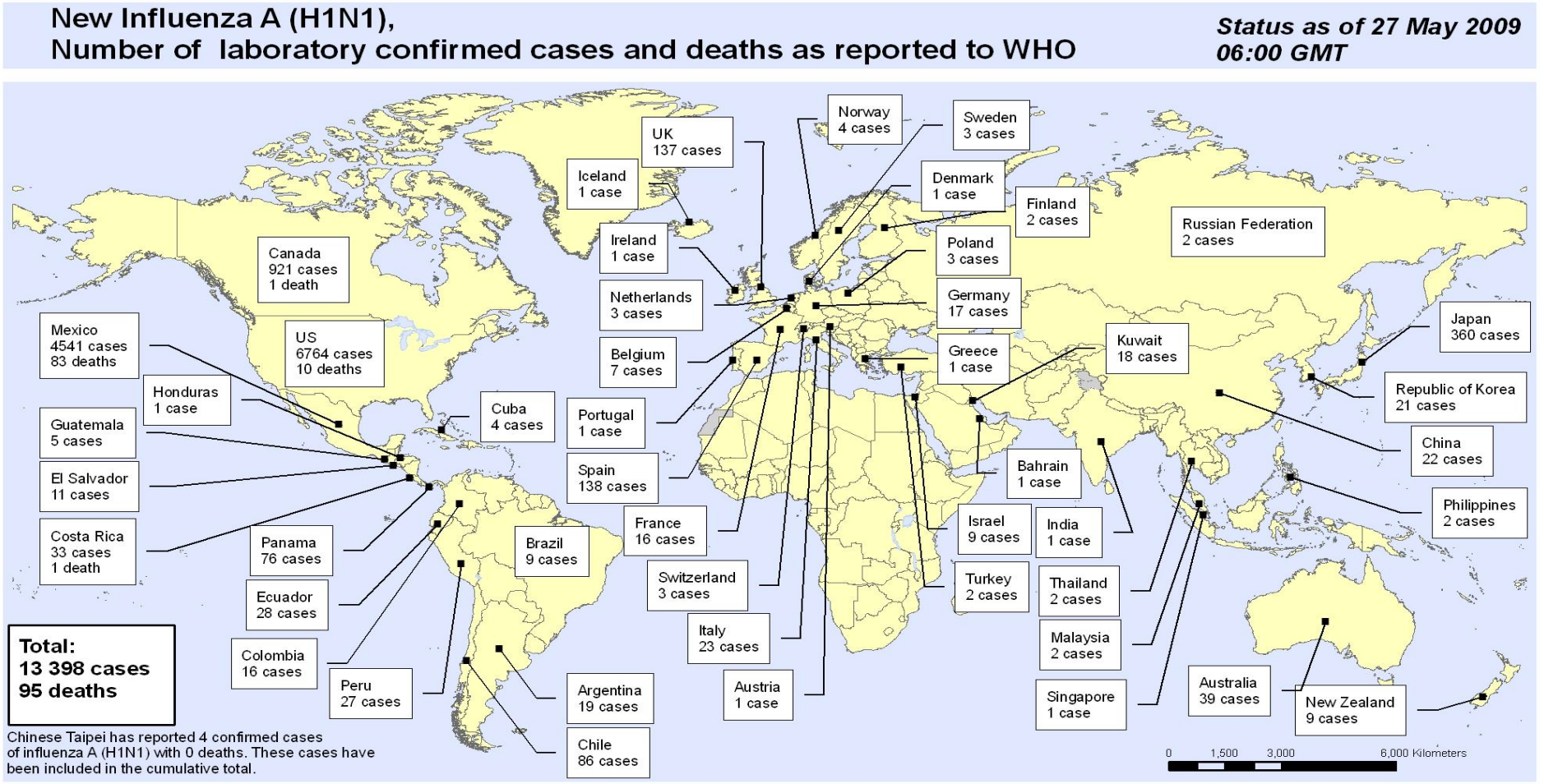
H5N1 Human Disease

- Different from seasonal influenza (*)
- Symptoms
  - 100% Fever
  - 90% Cough, shortness of breath
  - 50% Diarrhea*
  - <50% Muscle aches, headache
- Complications
  - **90% develop pneumonia***
  - **~60% case fatality rate***

WHO. *NEJM* 2005;353:1374

H1N1 (Swine) Flu Summary

Novel H1N1 (as of 5/27/09)



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization

Map produced: 27 May 2009 06:30 GMT

Influenza Viruses

- Influenza Nomenclature

Influenza Viruses

- Influenza Nomenclature
  - Influenza A (Type)
    - Humans
    - Birds
    - Swine
    - Pandemigenic
  - Influenza B
    - Human only
    - Pediatric

Influenza Viruses

- Influenza Nomenclature
  - Influenza A (Type)
    - H3N2 (Sub-type)
    - H1N1 (Sub-type)
    - H5N1 (Sub-type)

    - 144 sub-types
      - 16H x 9N

Flu Viruses Currently in Play

- Current seasonal
  - Influenza A/H1N1
  - Influenza A/H3N2
  - Influenza B
- Avian influenza H5N1
- Novel H1N1 (swine)

Novel H1N1 (Swine) Origins

- All 8 genes came from swine viruses
  - 6 genes from N. America
  - 2 genes from Europe/Asia
- Has probably been circulating for ~10 years in swine
- Unknown why/how suddenly emerged in people

Novel H1N1 Clinical Features

- Very similar to seasonal flu
  - Children/adolescents are reservoir
    - 60% of cases <18y.o.
  - Symptoms
    - Fever – may be less universal
    - Sore throat
    - Runny nose, cough
    - Headache, muscle aches
  - Severity
    - Mortality ~0.15% upper range of normal
    - Risk factors for hospitalization
      - Underlying medical conditions
      - Pregnancy

Novel H1N1 Clinical Features

- Key potential differences from seasonal flu
  - Persons >60yo have lower than expected risk
    - 33% with residual immunity
  - Symptoms – more likely GI (25%)
  - Somewhat more infectious
    - Secondary attack rate 20-25% vs. 10-15%
  - Somewhat more severe in young people
    - ~2% hospitalized, especially age 30-44
    - Might be increased risk flu pneumonia
  - Secondary bacterial infections rare
  - Obesity may be a risk factor

Novel H1N1 Transmission

- Just like seasonal flu
  - Person-to-person
- Has now become a human pathogen
- Still has potential to infect pigs
- Pork products not at risk

Novel H1N1

- Antivirals work
  - Neuraminidase inhibitors
    - In vitro
    - Appears to be clinical benefit
- Vaccine situation unfolding
  - Seed stock available next week
  - Using existing egg technology
  - Plans for bulk antigen and adjuvant
  - Clinical trials this summer – safety, dose, adjuvant
  - TIV and LAIV expected
  - Production start when seasonal vaccine complete
  - Tentative distribution ~November

DHHS, medicalcountermeasures.gov

H1N1 Lessons Learned

- Disease
  - Spread more rapidly than anticipated
  - Spreading during warmer weather
  - Flu surveillance in pigs has been inadequate
- Pandemic plan implications
  - Plans must be flexible, guidance changed rapidly
  - WHO phases may not be best triggers Planning works- much better response than 5 years ago
- Health departments, hospitals may become easily overwhelmed
- Guidance
  - School closure policies need to be clearer
  - Need better ways to communicate uncertainty?

Pandemic Risk Assessment

- Pandemic definition
  - Current WHO phases based on spread
  - Revised version may account for severity
- How do pandemics occur?
  - Susceptible population
  - New virus
    - Easily transmits between humans
    - Usually more virulent

H5N1 Pandemic Potential

- "Perfect Storm"
  - 1918 virus of avian origin
  - Humans susceptible
  - Virulence
  - Spreading continuously
  - Becoming endemic in some countries
  - Genetic mutations
  - Continuous drift or reassortment could impart human transmission

Novel H1N1 Pandemic Potential

- Worrisome factors
  - Young people seem to do worse
  - 1918 started mild and returned severe
    - Have we dodged a bullet, or a boomerang…?
  - Current vaccines give no protection
  - Easily transmits between humans
  - Swine origin may more easily allow infection and subsequent reassortment in pigs
  - Increased attack rate but same mortality could still double or triple total deaths

Novel H1N1 Pandemic Potential

- Reassuring factors
  - Relatively mild disease so far
  - Low mutation rate thus far
    - Virulence, vaccine efficacy, antiviral resistance
  - Vaccine should be available
  - All prior pandemics caused by novel subtype
  - Neuraminidase inhibitors work
- Will need to watch Southern Hemisphere

Pandemic Influenza Impact

- "Moderate" pandemic
  - 90 million Infections
  - 865,000 Hospitalizations
  - 100,000 ICU care
  - 65,000 Ventilators
  - >200,000 Deaths
  - ??? $B Cost
  - 40% workforce out >10 days

The Summer of Opportunity…

- Start a plan
  - At least address the basics
- Work on communications
- Decide on triggers
- Address HR policies
  - Sick leave, work from home, flex time
- Decide on stockpiles
  - Daily operating supplies (JIT supply chain)
  - PPE
  - Antivirals
- Use upcoming flu season to exercise plans

Pandemic Plans

- Business continuity
  - Defining essential functions/employees
  - Supply chain issues
- Employee protection
  - Education/training/messaging
    - Identify trusted information sources – CDC, local PH
  - Family support/encourage personal preparedness – Ready in 3, American Red Cross
  - Non-pharmaceutical interventions
  - Antivirals
  - Vaccines – encourage employees and families to be vaccinated with available flu vaccines

MO DHSS Ready in 3

1 Create a **Plan**

- Prepare Contact Lists
- Avoid Sick People
- Cough Etiquette
- Hand-washing

2 Prepare a **Kit**

- Food/Water for 2 weeks, pets too!
- Medications, medical equipment

3 Listen for **Information**

http://www.pandemicflu.gov/, www.dhss.mo.gov

Non-Pharmaceutical Measures

How Does Flu Spread?

- Direct Person-to-Person
  - Droplets
  - Aerosol
- Indirect Person-to-Person
  - Fomites

How Does Flu Spread?

- Direct Person-to-Person
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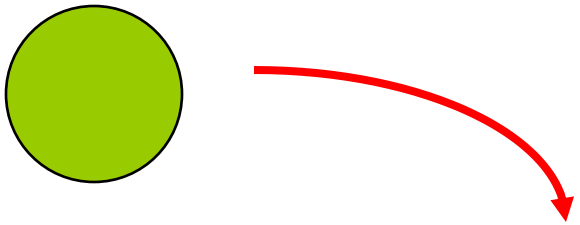
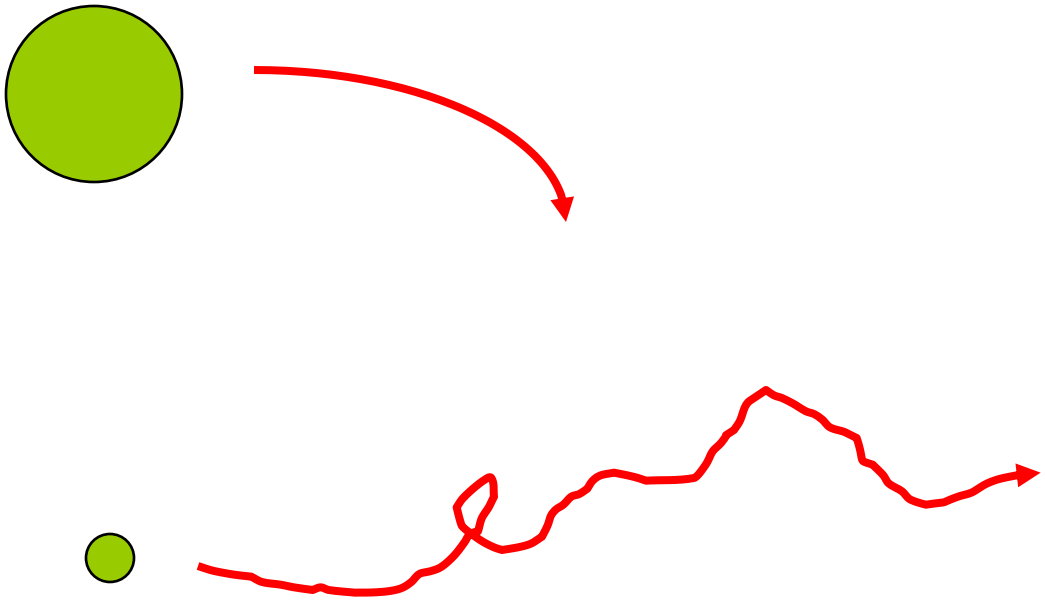


How Does Flu Spread?

- Direct Person-to-Person
  - Droplets
    (common)
  - Aerosol
    (rare)



Non-Pharmaceutical Measures

- Basic strategy = avoid contact with virus
  - Keep sick people away
  - Personal hygiene/etiquette
  - Personal Protective Equipment (PPE)
  - Environmental cleaning
  - Social distancing measures

Keeping Sick People Away

- Sick policies
  - Exclude sick employees from coming to work
  - Rationale
    - Most contagious when feeling ill
    - Good policy for all times
  - Implement before local cases
  - Implementation options
    - Education
    - Extra time off during emergencies
  - Requires buy-in from senior managers

Keeping Sick People Away

- Travel restrictions
  - Usually only useful in beginning to delay onset
  - WHO, CDC guidance important
- Monitor exposed workers
  - Returning travelers, close contact with case
  - Educate on flu symptoms, mask & leave if sick
  - Quarantine generally not recommended

Personal Hygiene/Etiquette

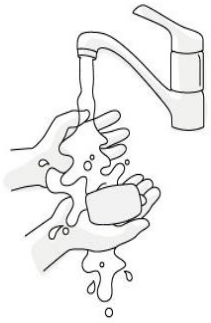
- Common sense measures
- Among the most effective
- Cough etiquette
  - Cover cough with tissue
  - Discard tissues into waste can
- Hand hygiene
  - Soap and water
  - Hand sanitizers
- Signage is useful

Examples of Signage

Cover your cough

- When coughing or sneezing, use a tissue to cover your nose and mouth
- Consider wearing a surgical mask, if practicable
- Dispose of the tissue afterwards

Wash your hands



- After coughing, sneezing or blowing your nose, wash your hands with soap and water
- Use alcohol-based liquids, gels or wipes if you do not have access to soap and water

Personal Protective Equipment (PPE)

- Most useful masking those with symptoms
- Some instances where PPE recommended for employees
- Necessity dictated by several factors
  - Severity of virus
  - Job type - proximity to likely cases
  - Underlying risk of individual
- Recommend guidance given by CDC
- Types
  - Surgical mask
    - Easy to wear, cheap, disposable
  - N95 respirators
    - Enhanced protection, can't wear long periods, requires fit testing, expensive, disposable

Environmental Cleaning

- Fomite spread is important
- Virus can live hours-days
  - Lives longest in cool, moist conditions
- Inactivated by standard cleaners
- Focus on high-use objects
  - Common doors, handles, etc.
- Not as important as hand hygiene
  - Can’t get all surfaces
- Deploy hand hygiene stations

Social Distancing

- Limit number of people in office
  - Work from home
  - Flex scheduling
- Cancel public gatherings
  - Substitute conference calls or video conferencing for face-to-face meetings
  - Cancel events
- Encourage avoidance of small spaces
  - Encourage stair use over elevators
  - Limit number of people on elevator

Antiviral Stockpiling: Pros and Cons

Antiviral Medications

- Adamantanes
  - **Amantidine**
  - **Rimantidine**

- Neuraminidase inhibitors
  - **Zanamavir (Relenza®)**
  - **Oseltamivir (Tamiflu®)**

Moscona, *N Engl J Med 2005;353:1363*

Antiviral Issues

- Do they work?
  - Modest effects for treatment
    - Must give soon after symptom onset
    - 1 day reduction in illness
    - Reduce mortality in hospitalized patients
  - Modest effects for prophylaxis
    - Reduction in attack rates in closed settings
    - Only effective while taking drug – no lasting effects
  - Resistance
    - H3N2 - adamantanes
    - Seasonal H1N1 – oseltamivir
    - H5N1 – variable adamantanes, oseltamivir
    - Novel H1N1 - adamantanes

Antiviral Issues

- Are they safe enough?
  - Adamantanes
    - Neuropsychiatric side effects
  - Oseltamivir (Tamiflu)
    - Neuropsychiatric side effects
      - Strange adolescent behaviors
  - Zanamavir
    - Challenging to use
    - Airway spasms – can't use with asthma/COPD
  - Both pregnancy category C
    - Oseltamivir recommended by CDC

Antiviral Issues

- Should businesses/individuals stockpile?
  - In most medical circumstances a bad idea
    - Safety concerns
    - Inappropriate usage breeds more resistance
  - Personal supplies being considered
    - Home MedKit
- State/Federal stockpile (SNS)
  - Approximately 25% population
  - Earmarked for treatment only
    - Cannot be used for prophylaxis

Employer Antiviral Stockpiling

- Pros
  - May actually protect employees (and families)
    - Can be used for prophylaxis
      - High-risk job with likely exposure to sick people
      - High-risk employees (e.g. immunocompromised)
    - Can be used for treatment if SNS depleted
  - Psychological impact of showing good faith efforts to protect employees
  - Decrease absenteeism
  - Product may be difficult to obtain or more expensive when pandemic starts

Employer Antiviral Stockpiling

- Cons
  - Unknown efficacy
    - If resistance occurs or new strain emerges
  - May not be better than PPE at preventing illness
    - PPE and social distancing measures work
  - Cost
    - In vicinity of $80 for 10 day prophy course
  - How long to provide prophylaxis?
    - Only provides protection while taking
    - 10 day course
    - Entire duration of community transmission (8-12 wks)

Employer Antiviral Stockpiling

- Cons
  - Limited shelf life for stock bought outright
    - Shelf-life extension program
  - Safety (and liability) of long-term use unknown
    - Very little experience on long-term use
  - Storage/prescribing/dispensing logistic details
    - Storage must be temperature/humidity controlled
    - May need 24 hour security
    - Who can/will prescribe and dispense

Employer Antiviral Stockpiling

- Cons
  - Risk of government seizure (eminent domain)
    - Probably unlikely but can’t predict with certainty
  - Who to prophylaxe?
    - High-risk employees only
    - All employees
    - All employees families

Summary

- An influenza pandemic will occur again
- H1N1 (swine) may return in the fall
- H5N1 AI remains a worrisome candidate
- Use the summer as opportunity to advance pandemic planning efforts
- Preparedness efforts will mitigate severity
  - Business continuity measures
  - Employee protection policies
    - Non-pharmaceutical interventions
    - Antiviral stockpiling requires careful consideration

Questions???