

Influenza and Pneumonia Basics

Facts and Fiction

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Community Acquired Pneumonia

- Epidemiology
- Microbiology
- Exposure & Relevant History
- Diagnosis
- Prognosis
- Prevention



What Is Pneumonia?

Pneumonia is an infection of the lungs that can cause mild to severe illness in people of all ages. It can be caused by various bacteria or viruses.

Signs/ symptoms include:

- coughing,
- fever,
- fatigue,
- Nausea and or vomiting,
- rapid breathing or shortness of breath,
- chills, or
- chest pain.



What Is Pneumonia?



- Risk factors include:
- Adults 65 years of age or older
- Children younger than 5 years of age
- People up through 64 years of age who have underlying medical conditions (like diabetes or HIV/AIDS)
- People 19 through 64 who smoke cigarettes or have asthma are also at increased risk for getting pneumonia

Pneumonia

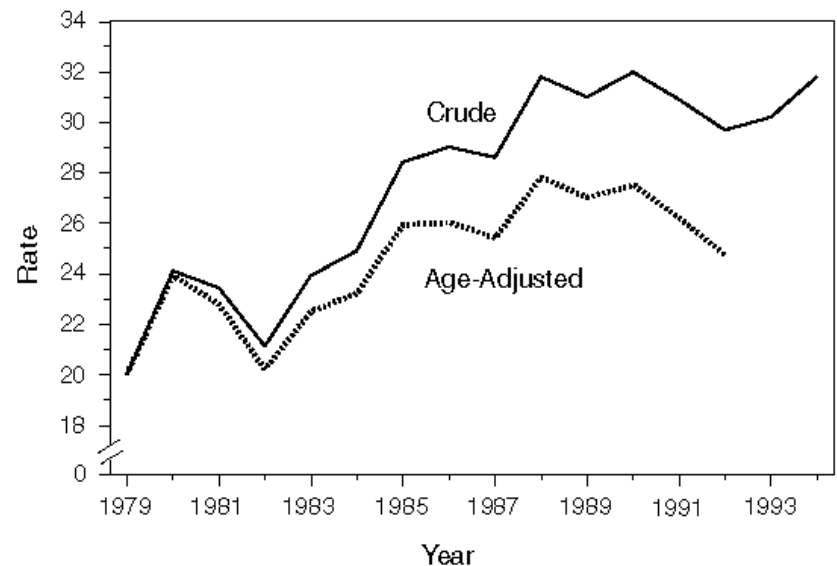
- HAP: Hospital-acquired pneumonia
 - ≥ 48 h from admission
- VAP: Ventilator-associated pneumonia
 - ≥ 48 h from endotracheal intubation
- HCAP: Healthcare-associated pneumonia
 - Long-term care facility (NH), hemodialysis, outpatient chemo, wound care, etc.
- CAP: Community-acquired pneumonia
 - Outside of hospital or extended-care facility



Epidemiology

- Flu and Pneumonia are the 8th leading cause of death in US in 2007
- 4-5 million cases per year in US
 - 25% require hospitalization
 - Almost 916,000 cases annually in pts >65 yo
- Case fatality rate has not changed substantially since penicillin

FIGURE 1. Crude and age-adjusted rates* of pneumonia and influenza deaths by underlying cause of death, by year — United States, 1979–1994†



*Per 100,000 population.

†Data for 1993 and 1994 are provisional and are for a 12-month period ending with November.

National and Global Impact



- In 2009, 1.1 million people in the United States were hospitalized with pneumonia and more than 50,000 people died from the disease.
- Globally, pneumonia kills more than 1.5 million children younger than 5 years of age each year. This is greater than the number of deaths from any other infectious disease, such as AIDS, malaria or tuberculosis.
- Access to vaccines and treatment (like antibiotics and antivirals) can help prevent many pneumonia-related deaths.
- Pneumonia experts are also working to prevent pneumonia in developing countries by reducing indoor air pollution and encouraging good hygiene practices.

Impact in the United States

Vaccination

- Percent of adults 65 years and over who had ever received a pneumococcal vaccination: 62.3%

Health Care Use: Hospital inpatient care

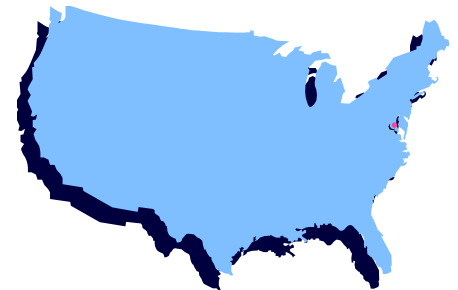
- Number of discharges: 1.1 million
- Average length of stay: 5.2 days

Nursing home care

- Number of residents with pneumonia: 33,700
- Percent of residents with pneumonia: 2.3%

Mortality

- Number of deaths: 49,597
- Deaths per 100,000 population: 16.1
- Percent of hospital inpatient deaths from pneumonia: 3.4%



Microbiology

Most common organisms causing pneumonia in over 60% of cases:

S. pneumoniae, *Haemophilus influenzae*,
Staphylococcus aureus, Group A streptococci,
Moraxella catarrhalis, anaerobes, and aerobic gram-negative bacteria

Uncommon organisms accounting for 20-28% of cases

Legionella spp, *Mycoplasma pneumoniae*, *Chlamydochila*
(formerly *Chlamydia*) *pneumoniae*, and *C. psittaci*

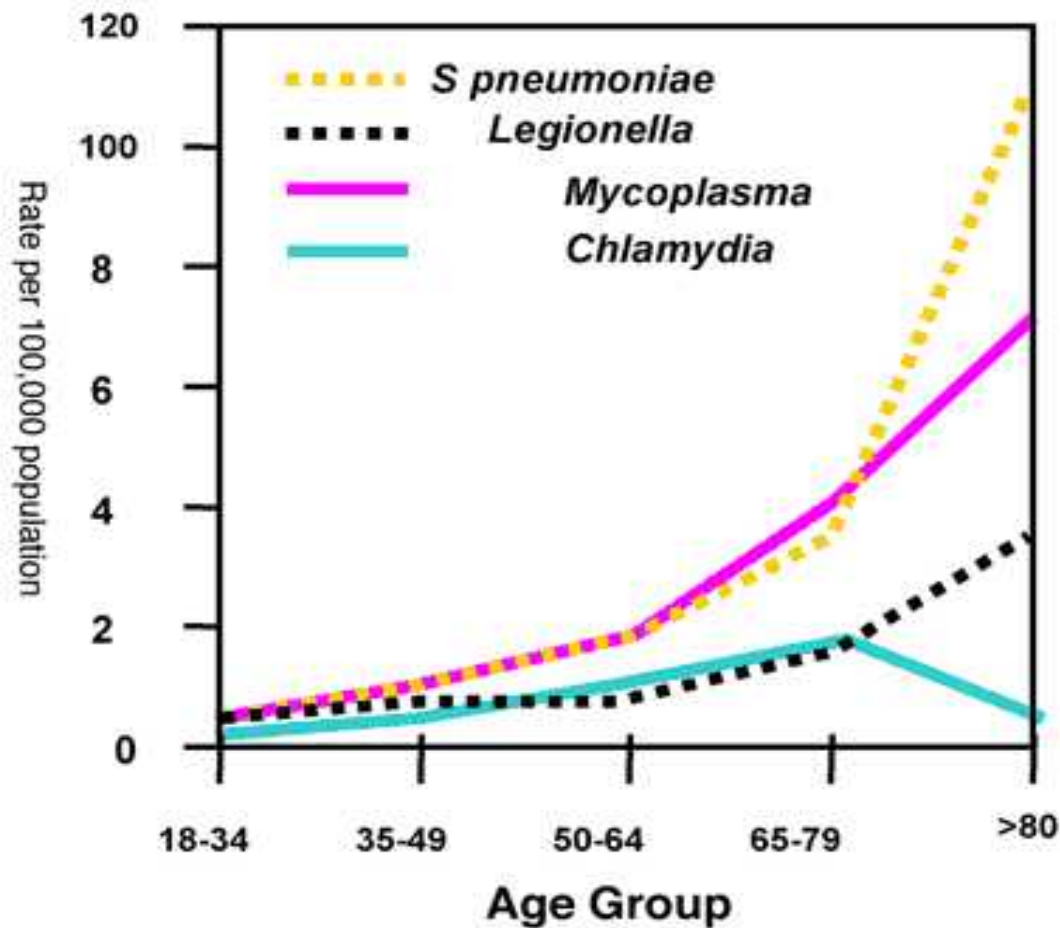


Microbiology of Community Acquired Pneumonia

Outpatient	<i>Streptococcus pneumoniae</i> <i>Mycoplasma pneumoniae</i> <i>Haemophilus influenzae</i> <i>Chlamydia pneumoniae</i> Respiratory viruses
Inpatient	<i>S. pneumoniae</i> <i>M. pneumoniae</i> <i>H. influenzae</i> <i>C. Pneumoniae</i> <i>Legionella</i> species Respiratory viruses Aspiration
Intensive Care Units	<i>S. pneumoniae</i> <i>Legionella</i> spp. <i>Staphylococcus aureus</i> Gram-negative bacilli



Age-specific Rates of Hospital Admission by Pathogen



Rates of infection for each organism are calculated based on criteria for definite diagnosis. Rates of infection with *Legionella* spp., *M pneumoniae*, and *C pneumoniae* are adjusted for incomplete testing.



Comorbidities and Associated Pathogens

Alcoholism	<ul style="list-style-type: none">❖ <i>Strep pneumoniae</i>❖ Oral anaerobes❖ <i>Klebsiella pneumoniae</i>❖ <i>Acinetobacter</i> spp❖ <i>M. tuberculosis</i>
COPD/Smoking	<ul style="list-style-type: none">❖ <i>Haemophilus influenzae</i>❖ <i>Pseudomonas aeruginosa</i>❖ <i>Legionella</i> spp❖ <i>S. pneumoniae</i>❖ <i>Moraxella catarrhalis</i>❖ <i>Chlamydophila pneumoniae</i>



Aspiration	<ul style="list-style-type: none">❖ Oral Gram-negative enteric pathogens❖ anaerobes
Lung Abscess	<ul style="list-style-type: none">❖ CA-MRSA❖ Oral anaerobes❖ Endemic fungi❖ <i>M. tuberculosis</i>❖ Atypical mycobacteria
Structural lung disease (e.g. bronchiectasis)	<ul style="list-style-type: none">❖ <i>P. aeruginosa</i>❖ <i>Burkholderia cepacia</i>❖ <i>S. aureus</i>
Advanced HIV	<ul style="list-style-type: none">❖ <i>Pneumocystis jirovecii</i>❖ <i>Cryptococcus</i>❖ <i>Histoplasma</i>❖ <i>Aspergillus</i>❖ <i>P. aeruginosa</i>



Animal Exposures & Associated Pathogens

Bat or bird droppings	❖ <i>Histoplasma capsulatum</i>
Birds	❖ <i>Chalmydophila psittaci</i> ❖ Poultry: avian influenza
Rabbits	❖ <i>Francisella tularensis</i>
Farm animals	❖ <i>Coxiella burnetti</i> (Q fever)

Exposures and Associated Pathogens

Hotel or cruise ship	❖ <i>Legionella</i> species
Travel or residence in SW US	❖ <i>Coccidioides</i> species ❖ <i>Hantavirus</i>
Travel or residence in SE or E Asia	❖ <i>Burkholderia pseudomallei</i> ❖ <i>Staph aureus</i> ❖ <i>H. influenzae</i> ❖ Avian influenza A (H5N1)
Influenza active in community	❖ Influenza ❖ <i>S. pneumoniae</i> ❖ <i>Staph aureus</i> (MRSA) ❖ <i>H. influenzae</i>
Cough >2 wks with whoop or posttussive vomiting	❖ <i>Bordetella pertussis</i>



MRSA

Community Associated Pneumonia

- 51 *Staphylococcus aureus* CAP cases in 19 states reported 2006-2007
- 79% MRSA
- Median age 16 yrs (range <1 to 81)
- 47% antecedent viral illness
- 33% tested had lab-confirmed influenza

MRSA is a real consideration with CAP, especially during flu season!



Influenza Pneumonia

- Administer antiviral treatment within 48 hrs
 - Reduce likelihood of lower tract complications & antibacterial use in outpatients
- Possible exceptions to <48 h rule
 - Immunocompromised patients



Signs of Improvement

- Clinical improvement w/ effective antibiotics often begins within 48-72 hrs
- Fever can last 2-5 days with Pneumococcus, longer with other etiologies (e.g. *S. aureus*)
- CXR clearing (if one is done)

Patient not improving

- May need to consider *S. aureus*, virus, MDRO, TB, endemic fungi, *Pneumocystis*
- More unusual pathogens, atypical Mycobacteria, (e.g Nocardia, actinomycetes), fungi

OR

- Noninfectious illness:
 - Lung neoplasms with bronchial obstruction
 - Lymphoma
 - Systemic autoimmune disorders
 - Pulmonary Emboli w/ infarct, pulmonary edema, ARDS



Care for the patient with CAP

- Medications as directed by provider
- Rest, rest, rest
- Educate to proper respiratory etiquette
- Hand Hygiene
- Spatial separation if appropriate

Reduce Your Risk: Vaccinate

Pneumonia can be prevented with vaccines. Following good hygiene practices can also help prevent respiratory infections. This includes regularly:

- Cleaning hard surfaces that are touched often
- Coughing or sneezing into a tissue or into your elbow or sleeve
- Limiting exposure to cigarette smoke and treating and preventing conditions like diabetes and HIV/AIDS.

Reduce Your Risk: Vaccinate

In the United States, there are several vaccines that prevent infection by bacteria or viruses that may cause pneumonia. These vaccines include:

- Pneumococcal,
- *Haemophilus influenzae* type b (Hib),
- Pertussis (whooping cough),
- Varicella (chickenpox),
- Measles, and
- Influenza (flu) vaccine.



Pneumococcal vaccine

Disease is caused by *Streptococcus pneumoniae* bacteria. It is a leading cause of vaccine preventable illness and death in the United States. Those most at risk include:

- People 65 years and older
- The very young
- People with chronic health conditions
- People with a weakened immune system
- Smokers

Pneumococcal disease can lead to serious infections of the:

- Lungs (pneumonia),
- Blood (bacteremia), and
- Covering of the brain (meningitis).
- Pneumococcal pneumonia kills about 1 out of 20 people who get it. Bacteremia kills about 1 person in 5, and meningitis about 3 people in 10.

Haemophilus influenzae type b (Hib)

- Serious disease caused by a bacteria. It usually strikes children under 5 years old.
- You can get Hib disease by being around other children or adults who may have the bacteria and not know it. The germs spread from person to person. If the germs spread into the lungs or the bloodstream, and then Hib can cause serious problems.
- Before Hib vaccine, Hib disease was the leading cause of bacterial meningitis among children under 5 years old in the United States. Hib disease can also cause:
 - pneumonia
 - severe swelling in the throat, making it hard to breathe
 - infections of the blood, joints, bones, and covering of the heart
 - death
 - Before Hib vaccine, about 20,000 children in the United States under 5 years old got severe Hib disease each year and nearly 1,000 people died

Pertussis (Whooping Cough)

- Causes severe coughing spells which can lead to difficulty breathing, vomiting, and disturbed sleep.
- Up to 2 in 100 adolescents and 5 in 100 adults with pertussis are hospitalized or have complications, including pneumonia and death.
- Tdap vaccine was licensed in 2005. It is the first vaccine for adolescents and adults that protects against pertussis as well as tetanus and diphtheria.

Varicella (also called chickenpox)

- Common childhood disease, usually mild, but it can be serious and cause pneumonia, especially in young infants and older adults.
- Causes a rash, itching, fever, and tiredness.
- Can lead to severe skin infection, scars, pneumonia, brain damage, or death.
- Varicella can be spread from person to person through the air, or by contact with fluid from chickenpox blisters.
- A person who has had varicella can get a painful rash called shingles years later.
- Before the vaccine, about 11,000 people were hospitalized for chickenpox each year in the United States, and about 100 people died each year.
- Varicella vaccine can prevent chickenpox.
- Most people who get varicella vaccine will not get chickenpox, but if they do, it is usually very mild case.

Measles, Mumps, and Rubella

Measles

Measles virus causes rash, cough, runny nose, eye irritation, and fever. It can lead to ear infection, pneumonia, seizures, brain damage, and death.

Mumps

Mumps virus causes fever, headache, muscle pain, loss of appetite, and swollen glands. It can lead to deafness, meningitis, painful swelling of the testicles or ovaries, and rarely sterility.

Rubella (German Measles)

Rubella virus causes rash, arthritis (mostly in women), and mild fever. If a woman gets rubella while she is pregnant, she could have a miscarriage or her baby could be born with serious birth defects.

These diseases spread from person to person through the air. You can easily catch them by being around someone who is already infected.

Measles, mumps, and rubella (MMR) vaccine can protect from all three of these diseases.

Influenza

- Influenza Basics
- Spread and Transmission
- Clinical Signs and Symptoms
- Prevention and Vaccination
- Debunking Common Myths

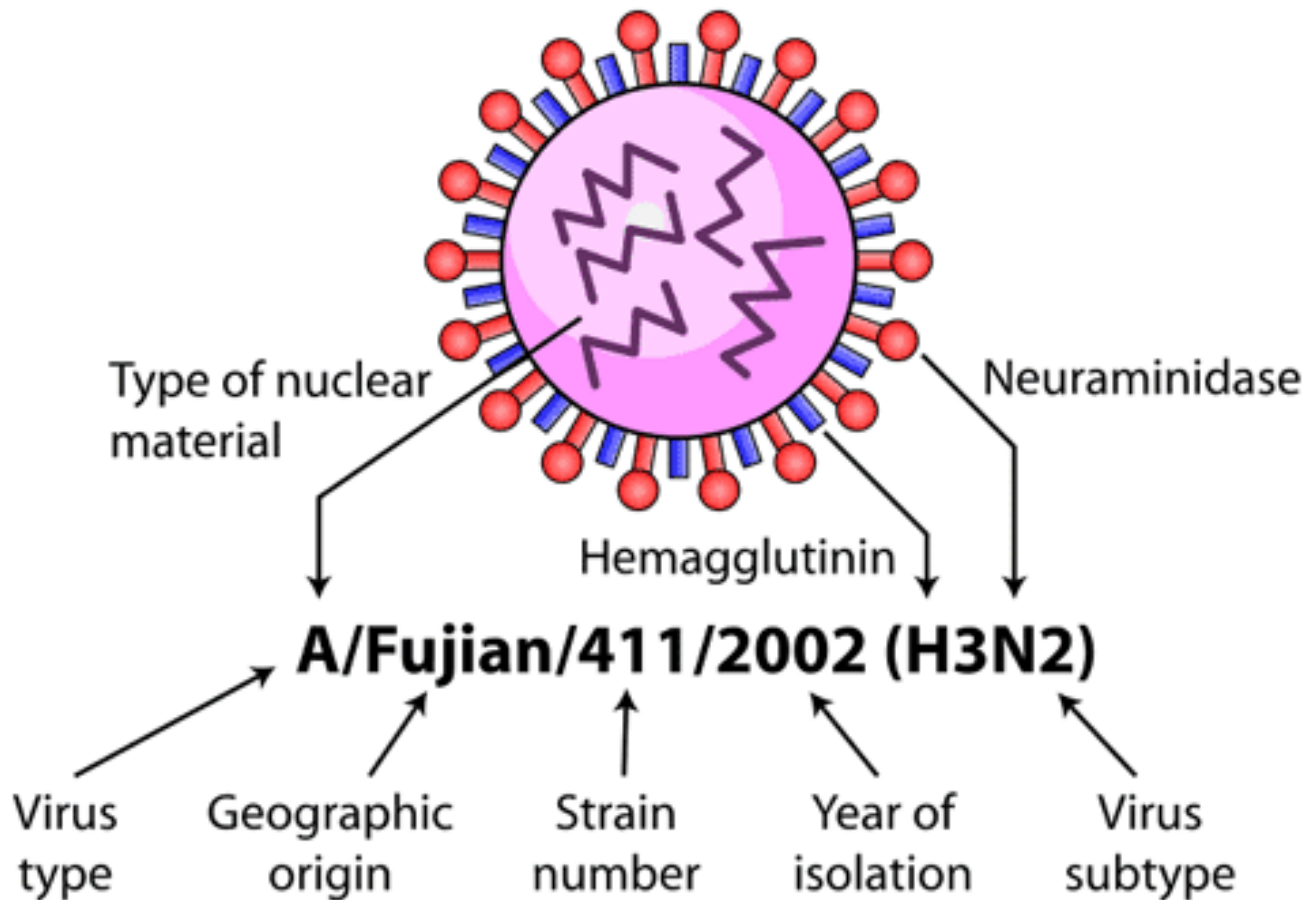


Lets talk more about the Flu

- Orthomyxoviridae
- 2 distinct types
 - Influenza A
 - Influenza B
- Subtypes based on surface glycoprotiens
 - Hemagglutinin (HA) – viral attachment/entry
 - Neuroaminidase (NA) – enable virus to be released from the host cell



What's in a Name?



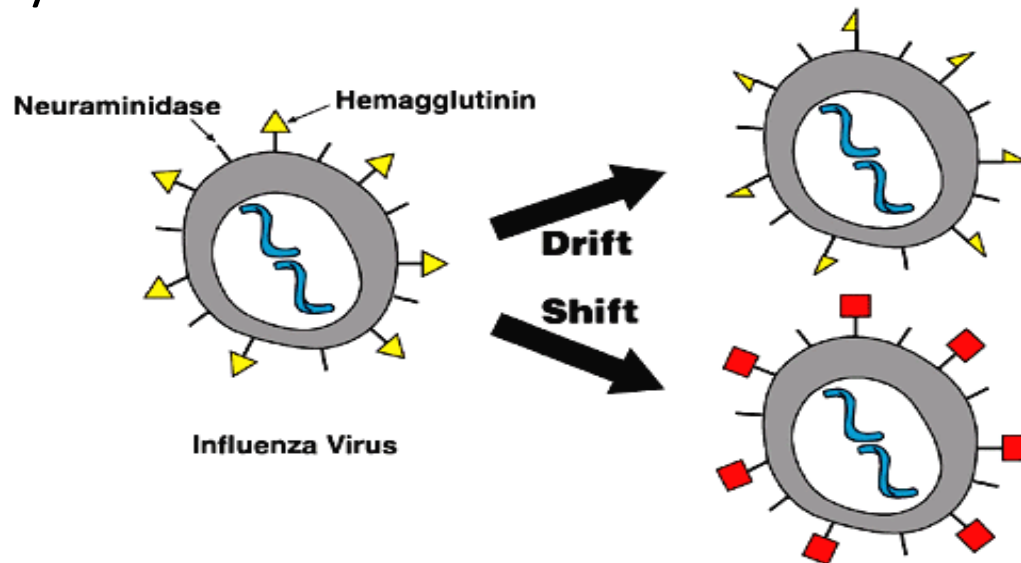
Antigenic Variation

Antigenic Drift

- Small variation
- Occurs frequently (1-2 yr)
- Epidemics/Seasonal Flu

Antigenic Shift

- Large variation
- No immunity in population
- Pandemics



Influenza Viruses

Influenza A

- Multiple Hosts
 - Human, swine, avian, equine
- Antigenic Drift
- Epidemics/Seasonal Flu

- Antigenic Shift
- Pandemics

Influenza B

- Humans only

- Antigenic Drift ONLY
- Epidemics/Seasonal Flu

- No Antigenic SHIFT

Influenza

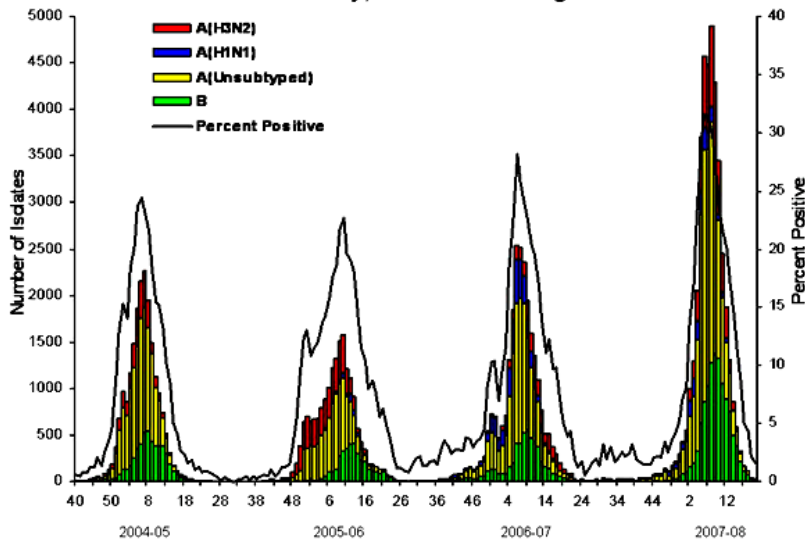
Epidemic “Seasonal Flu”

- Regional Outbreaks
- Antigenic Drift
- Winter months

Pandemic

- Concurrent global outbreaks
- Antigenic Shift
- Outside usual seasonality

U.S. WHO/NREVSS Collaborating Laboratories
National Summary, 2004-05 through 2007-08

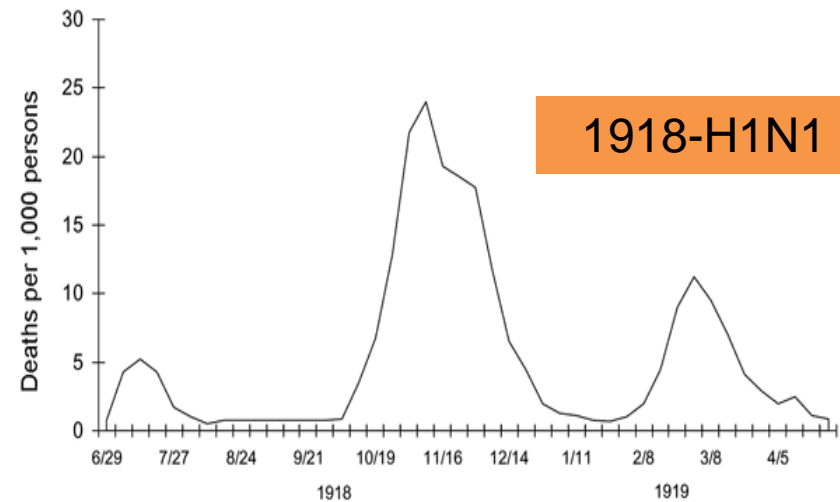


2004

2005

2006

2007



1918

1919



Pandemics

Pandemic	Date	Deaths
Asiatic Flu	1889-1890	1 million
Spanish Flu	1918-1920	50 million
Asian Flu	1957-1958	1.5 - 2 million
Hong Kong Flu	1968-1969	1 million
2009 H1N1	2009-2010	>18,209

Pandemics

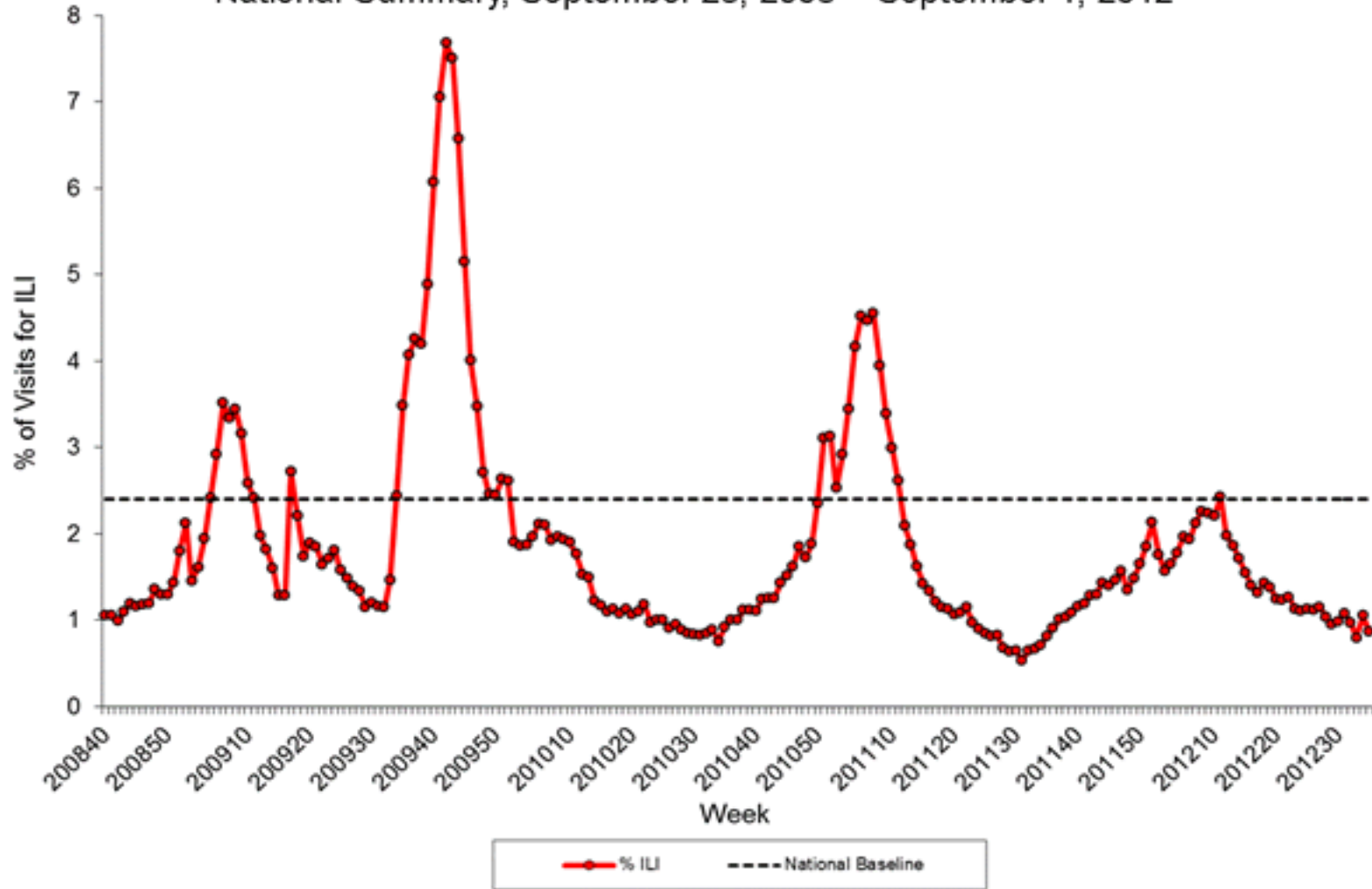
Pandemic	Date	Deaths
Asiatic Flu	1889-1890	1 million
Spanish Flu	1918-1920	50 million
Asian Flu	1957-1958	1.5 - 2 million
Hong Kong Flu	1968-1969	1 million
2009 H1N1	2009-2010	>18,209

Each Year, Seasonal Influenza

- Affects up to 20% of the Population (60 mil)
- Results in 200,000 hospitalizations
- Results in 30,000 deaths



Percentage of Visits for Influenza-like Illness (ILI) Reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), Weekly National Summary, September 28, 2008 – September 1, 2012



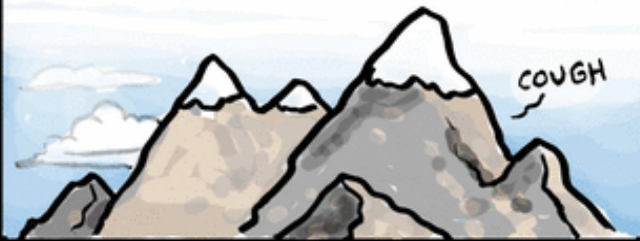
Transmission

STAR TRIBUNE
S&K

Q. DO PORK PRODUCTS CAUSE SWINE FLU?



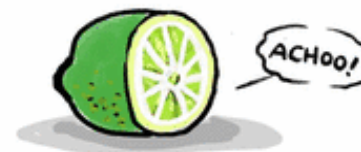
A. YES, JUST AS THE ROCKY MOUNTAINS CAUSE ROCKY MOUNTAIN FEVER...



LEGIONNAIRES CAUSE LEGIONNAIRES' DISEASE...



AND LIMES CAUSE LYME DISEASE!



Influenza Transmission

- Spread from person-to-person
- Infectious 24 hours BEFORE symptoms
- Infectious 5-7 days after symptoms onset
 - Longer for kids, immune suppressed
- Droplet and Contact Transmitted

Transmission

- Droplet Transmission
- Large Respiratory Droplets
- 3-6 feet



Transmission

- Contact Transmission
- Flu virus can live on surfaces, 2-8 hours
- Direct contact with contaminated surfaces
- Then touching eyes, nose, mouth

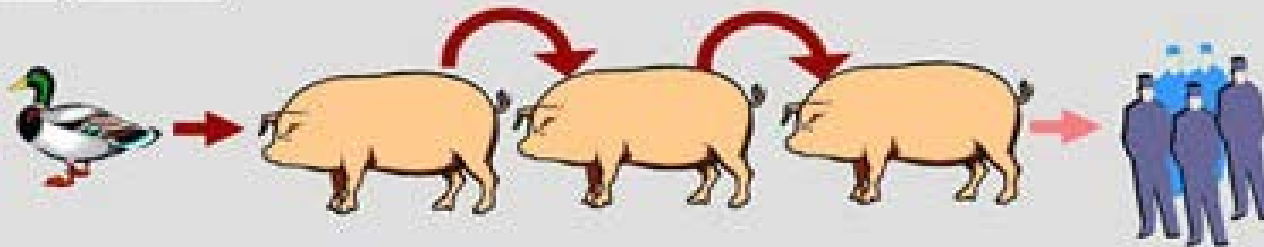


“Bird Flu” and “Swine Flu”

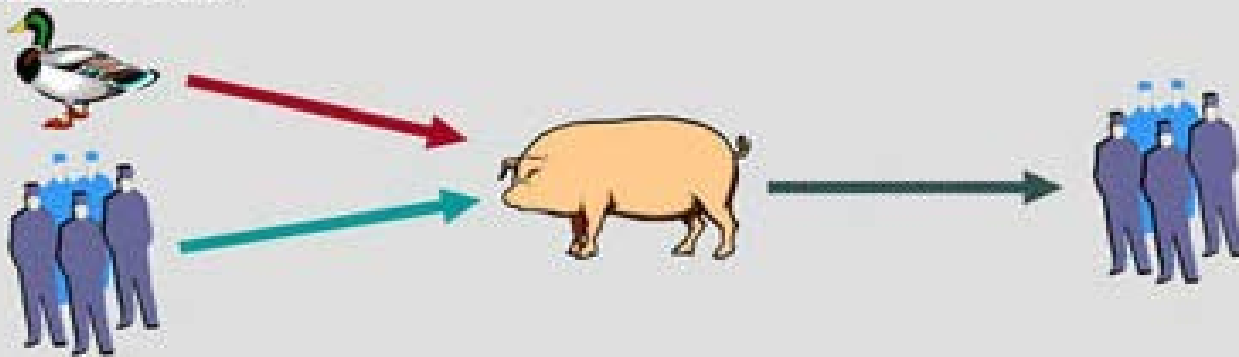
Direct Transmission



Adaptation



Reassortment



Avian Flu



Signs and Symptoms

- Influenza, AKA “The Flu”
 - Fever ($>100^{\circ}\text{F}$) PLUS **Respiratory** Symptoms
- Primary viral pneumonia
- Secondary bacterial pneumonia
- Children may have unusual presentations
 - Febrile seizures, transverse myelitis, myocarditis, encephalopathy

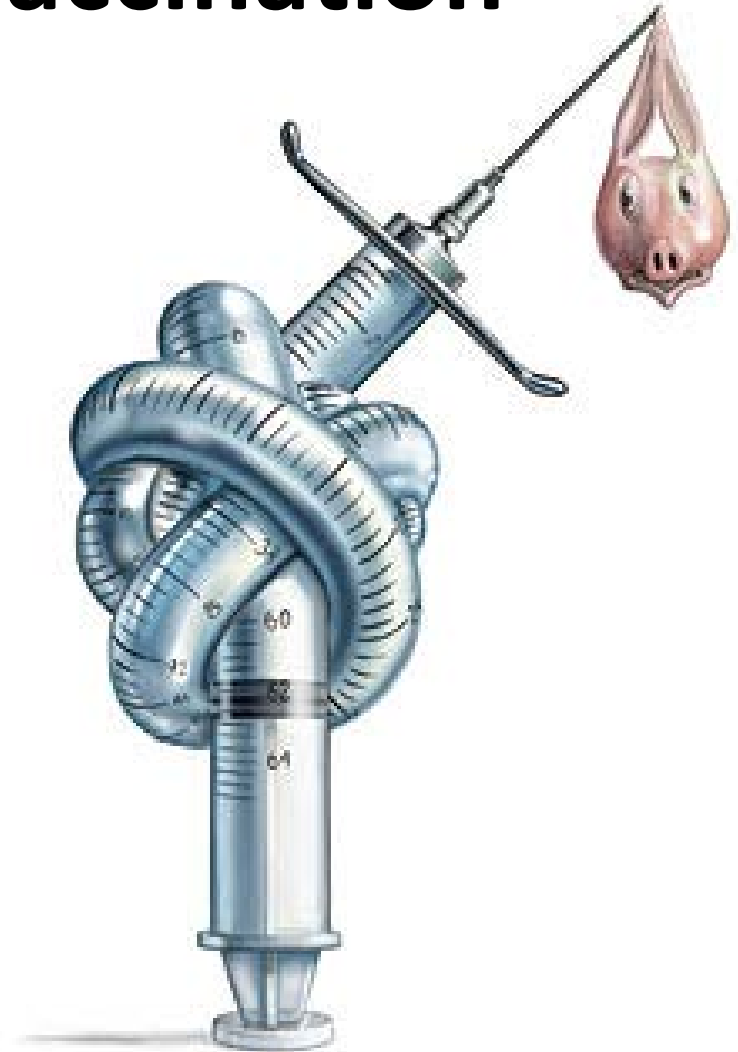
Consequences

- Misery
- Absenteeism
- Doctor visits
- Antibiotic use*
- Hospitalizations
- Deaths



Prevention: **Vaccination**

- **Single most important prevention measure!!**
- 2012 Vaccine now available (coming to a hospital near you!)





Vaccination

- Made anew each year
- Requires growth of virus in eggs
- Takes at least 6 months to develop
- Includes 3 Antigenic Types
 - 2 Influenza A; 1 Influenza B
 - “Best Guess” of circulating viruses for season



Prevention: Wash Your Hands

off the mark.com by Mark Parisi



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Wash 'em!



www.cdc.gov/h1n1flu »



UNIVERSITY of MARYLAND

Prevention: Respiratory Etiquette



Cover Your Cough!!

Prevention: Social Distancing



Stay away from sick contacts

Prevention: Social Distancing



If your sick stay home!

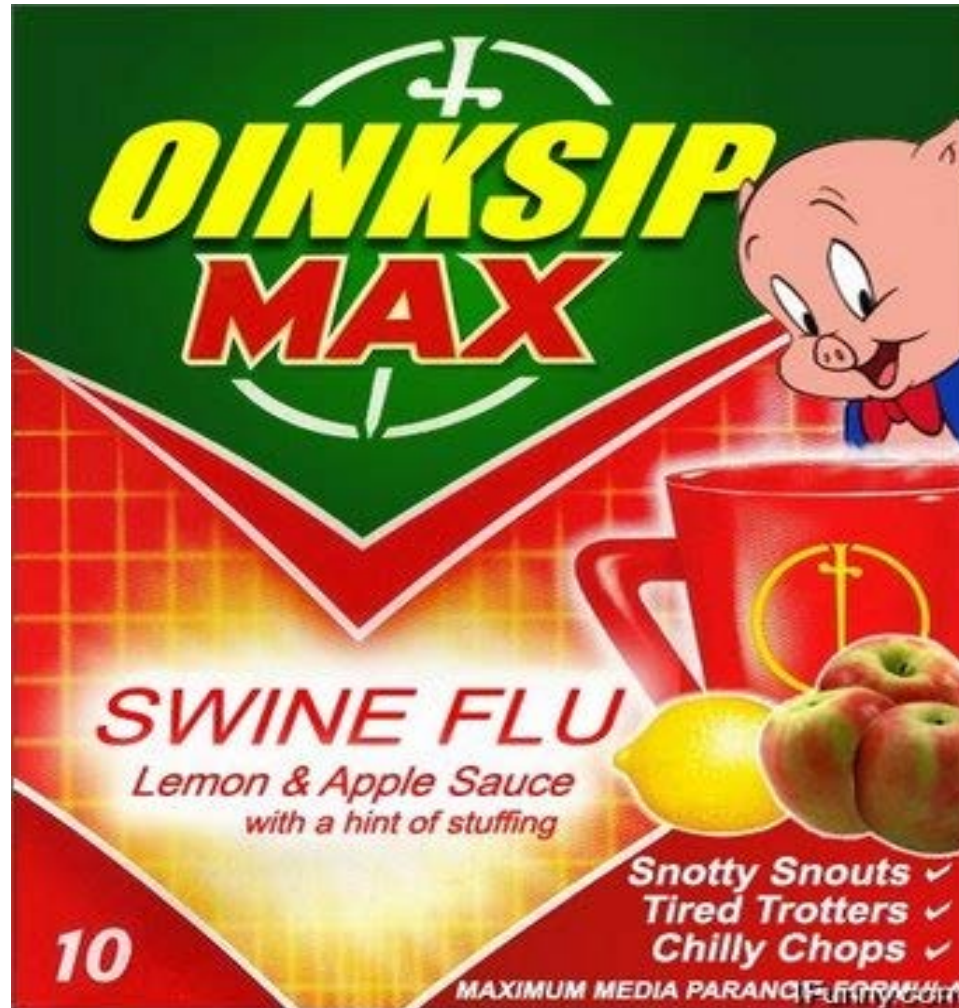


Prevention

- Good Infection Control
- Isolation of Patients
- Droplet Precautions
- Contact Precautions



Treatment



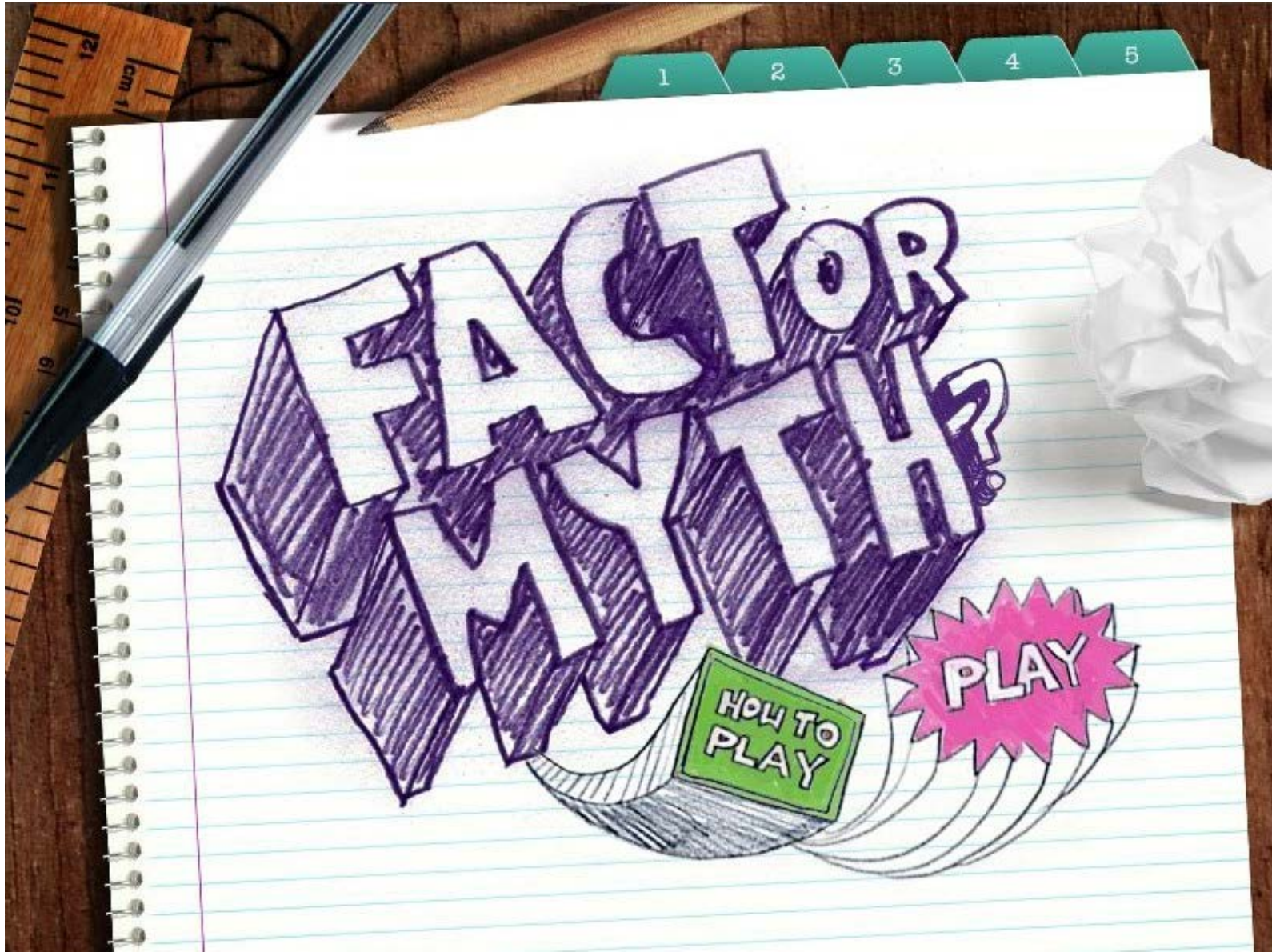
Treatment

Who should get Treatment?

- Hospitalized patients
- High-risk patients
 - < 5 years, > 65 years
 - Pregnant women
 - Chronic medical conditions
 - Weakened immune systems
- <19 years receiving long-term aspirin

Chemoprophylaxis

- Not routinely encouraged
- Increases risk of antiviral drug resistance
- Reserved for high risk persons
- Versus education, close monitoring of symptoms PLUS early treatment



Myths

“The flu is annoying, but harmless”

“If you're young and healthy,
you don't need the flu shot”

Myths

“The flu is annoying, but harmless”

“If your young and healthy,
you don’t need the flu shot”

**Protect
Yourself**



**Protect
Your Patients**



Myths

“I don't need the flu shot,
I can just take Tamiflu (or antibiotics)”



Myths

“I don’t need the flu shot,
I can just take Tamiflu (or antibiotics)”

- Still at risk for spreading virus
 - Resistance is a concern
- Rx shortens duration of Sx 1 day

Myths

“I had the flu shot last year;
I don’t need it again”



Myths

“I had the flu shot last year;
I don’t need it again”



The components of
the vaccine are
different each year



Vaccination

- Made anew each year
- Requires growth of virus in eggs
- Takes at least 6 months to develop
- Includes 3 Antigenic Types
 - 2 Influenza A; 1 Influenza B
 - “Best Guess” of circulating viruses for season



Myths

“I had the flu shot last year but it didn’t work;
I still had the stomach flu”



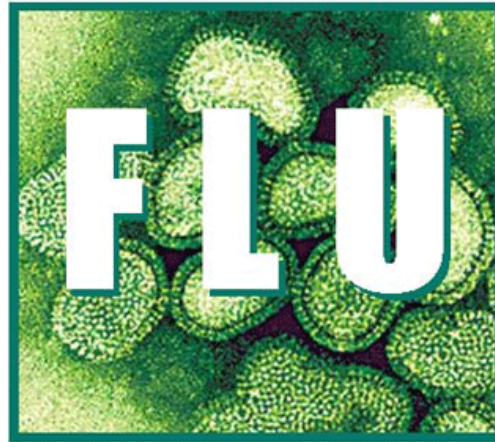
Myths

“I had the flu shot last year but it didn’t work;
I still had the stomach flu”

**Influenza is NOT a cause of gastroenteritis
And therefore, the “flu shot”
does not protect against it**

Myths

“Last year I got the flu shot and
I got the flu anyway”



Myths

“Last year I got the flu shot and I got the flu anyway”

- You may have had a common cold or other respiratory virus
- There may have been a “mismatch”

Myths

“I already had the flu this year
so I don’t need the shot”

“If you get the flu, you can’t get it again”

Myths

“Vaccines are dangerous”



Myths

“Vaccines are dangerous”

**Vaccines have saved more lives than any
other public health intervention**

Myths

“I don’t want to get the flu shot, the side effects of the shot are worse than getting the flu”



“This probably won’t work, but we do have medications that will take care of the side effects.”



Myths

“I don’t want to get the flu shot, the side effects of the shot are worse than getting the flu”



Local reactions are the most common side effects



Vaccine Side Effects

Inactivated “Shot”

- Soreness, redness or swelling at site
- Fever
- Aches
- Allergic reaction

Intranasal “Flu Mist”

- Runny nose
- Headache
- Sore throat
- Cough



Myths

“The flu shot gives you the flu”



Myths

“The flu shot gives you the flu”

**The “flu shot” is an inactivated vaccine
It cannot cause the “flu”**

Myths

“The nasal mist causes the flu”



Myths

“The nasal mist causes the flu”

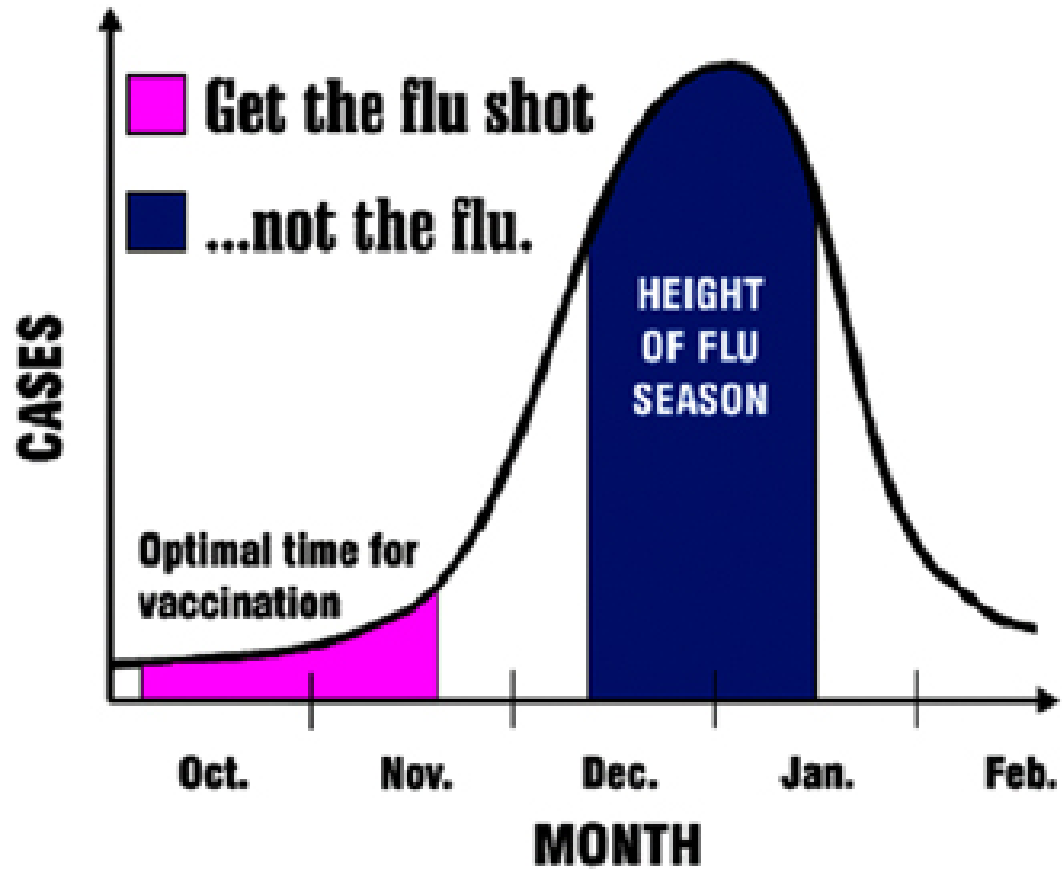
**The “mist” is a weakened virus
It cannot replicate at body temperature
And thus cannot cause the flu**

Myths

“It’s December and I haven’t gotten the vaccine yet, so there is no point in getting it now”



Myths



What kinds of flu vaccines are available?

Trivalent flu vaccine protects against two influenza A viruses and an influenza B virus

The following trivalent flu vaccines are available:

- **Standard dose** trivalent that are manufactured using virus grown in eggs. These are approved for people ages 6 months and older
- **Egg free** standard dose trivalent vaccine approved for people 18 through 49 years of age
- **High dose** trivalent vaccine approved for people 65 and older
- **Intradermal** trivalent vaccine injected into the skin instead of the muscle and uses a much smaller needle than the regular flu shot approved for people 18 through 64 years of age.

Quadrivalent flu vaccine will protect against two influenza A viruses and two influenza B viruses

The following quadrivalent flu vaccines will be available:

- A **standard dose** quadrivalent shot These are approved for people ages 6 months and older.
- Quadrivalent vaccine given as a **nasal spray** approved for healthy* people 2 through 49 years of age

Prevention

Tried & true...



Prevention

Tried & true...

