

# Influenza

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# Influenza

- ❑ Highly infectious viral illness
- ❑ First pandemic in 1580
- ❑ At least 4 pandemics in 19<sup>th</sup> century
  - Pandemics of 1957 and 1968 of lesser severity
- ❑ Most recent pandemic (H1N1) in 2009-2010
- ❑ Estimated 21 million deaths worldwide in pandemic of 1918-1919
- ❑ Virus first isolated in 1933

# Influenza Virus

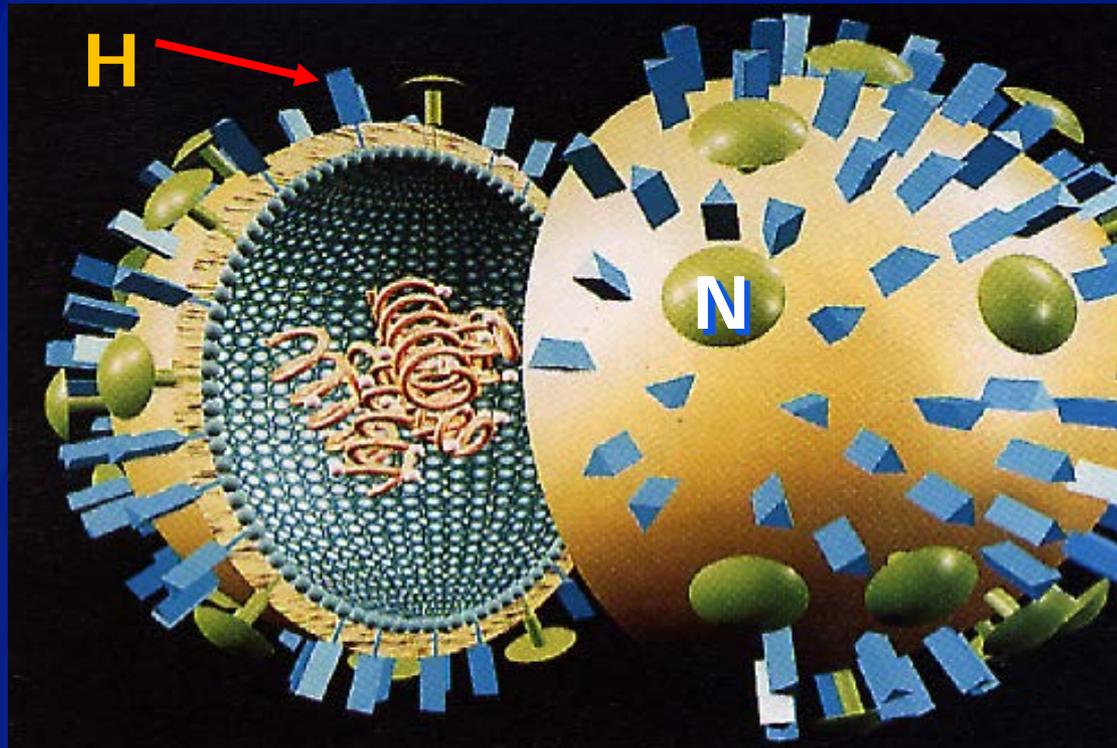
- ❑ Single-stranded RNA virus
- ❑ Orthomyxoviridae family
- ❑ 3 types: A, B, C
- ❑ Subtypes of type A are determined by hemagglutinin and neuraminidase

# Influenza Virus Strains

- **Type A**
  - Moderate to severe illness
  - All age groups
  - Humans and other animals
- **Type B**
  - Milder epidemics
  - Primarily affects children
  - Humans only
- **Type C**
  - Rarely reported in humans
  - No epidemics

# Influenza Type A Subtypes

Subtypes of type A determined by hemagglutinin (H) and neuraminidase (N)



A/California/7/2009 (H1N1)

← Virus type   ← Geographic origin   ← Strain number   ← Year of isolation   ← Virus subtype

# Influenza Antigenic Changes

## □ Antigenic Drift

- minor change, same subtype
- caused by point mutations in gene
- may result in epidemic

## □ Antigenic Shift

- major change, new subtype
- caused by exchange of gene segments
- may result in pandemic

# WHO declares first flu pandemic in 41 years

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By Fabrice Coffrini, AFP/Getty Images

World Health Organization Director General Margaret Chan sits before Assistant Director General Keiji Fukuda at a Geneva news conference announcing that the WHO decided to raise the

By [Steve Sternberg](#), USA TODAY

The World Health Organization scaled up its flu warning to its highest level Thursday, declaring the first global influenza pandemic in 41 years as cases of H1N1 continued to mount in the USA, Europe, Latin America and Australia.

"The scientific criteria for a pandemic have been met," said Margaret Chan, director general of the WHO. "The world is now at the start of the 2009 influenza pandemic."

**PHOTOS:** [Schools closed in Hong Kong, Vermont \(and more\)](#)

**INTERACTIVES:** [World map, how H1N1 strain emerged](#)

**FAQ:** [What you should know about swine flu](#)

**VIDEO:** [Reporters answer your questions](#)

The decision marks the agency's formal recognition of the magnitude of the challenge posed by a novel, H1N1 flu virus now spreading unchecked among people who, because the virus is new, are virtually all susceptible to it.

The WHO is working closely with vaccine makers, who are just wrapping up production of seasonal flu vaccine for fall and gearing up to produce the first doses of an H1N1 vaccine by September. The agency urged member nations to maintain their vigilance to detect ominous changes in the virus's

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## 2009 Influenza A(H1N1)

- ❑ In April 2009 a novel influenza A(H1N1) virus appeared and quickly spread across North America
- ❑ By May 2009 the virus had spread to many areas of the world
- ❑ Cause of the first influenza pandemic since 1968
- ❑ Pandemic monovalent influenza vaccine produced and deployed in nationwide vaccination campaign

# Influenza Pathogenesis

- ❑ Respiratory transmission of virus
- ❑ Replication in respiratory epithelium with subsequent destruction of cells
- ❑ Viremia rarely documented
- ❑ Virus shed in respiratory secretions for 5-10 days

# Influenza Clinical Features

- ❑ Incubation period 2 days (range 1-4 days)
- ❑ 50% of infected persons develop classic symptoms
- ❑ Abrupt onset of fever (usually 101°-102°F), myalgia, sore throat, nonproductive cough, headache

# Influenza Complications

- ❑ Pneumonia
  - Primary influenza pneumonia
  - Secondary bacterial pneumonia
- ❑ Reye's syndrome
- ❑ Myocarditis
- ❑ Death reported in <1 per 1,000 cases

## Impact of Influenza – United States, 1976-2007

- ❑ The number of influenza-associated deaths varies substantially by year, influenza virus type and subtype, and age group
- ❑ Annual influenza-associated deaths ranged from 3,349 (1985-86 season) to 48,614 (2003-04 season), with an average of 23,607 annual deaths
- ❑ Persons 65 years of age and older account for approximately 90% of deaths
- ❑ 2.7 times more deaths occurred during seasons when A(H3N2) viruses were prominent

## Impact of influenza- United States

- ❑ Highest rates of complications and hospitalization among persons 65 years and older, young children, and persons of any age with certain underlying medical conditions
- ❑ Average of more than 200,000 influenza-related excess hospitalizations
- ❑ 37% of hospitalizations among persons younger than 65 years of age
- ❑ Greater number of hospitalizations during years that A(H3N2) is predominant

# Influenza Among School-Aged Children

- School-aged children
  - typically have the highest attack rates during community outbreaks of influenza
  - serve as a major source of transmission of influenza within communities

# Influenza Diagnosis

- ❑ Clinical and epidemiological characteristics
- ❑ Isolation of influenza virus from clinical specimen (e.g., throat, nasopharynx, sputum)
- ❑ Significant rise in influenza IgG by serologic assay

# Influenza Epidemiology

## □ Reservoir

- human, animals (type A only)

## □ Transmission

- respiratory, probably airborne

## □ Temporal pattern

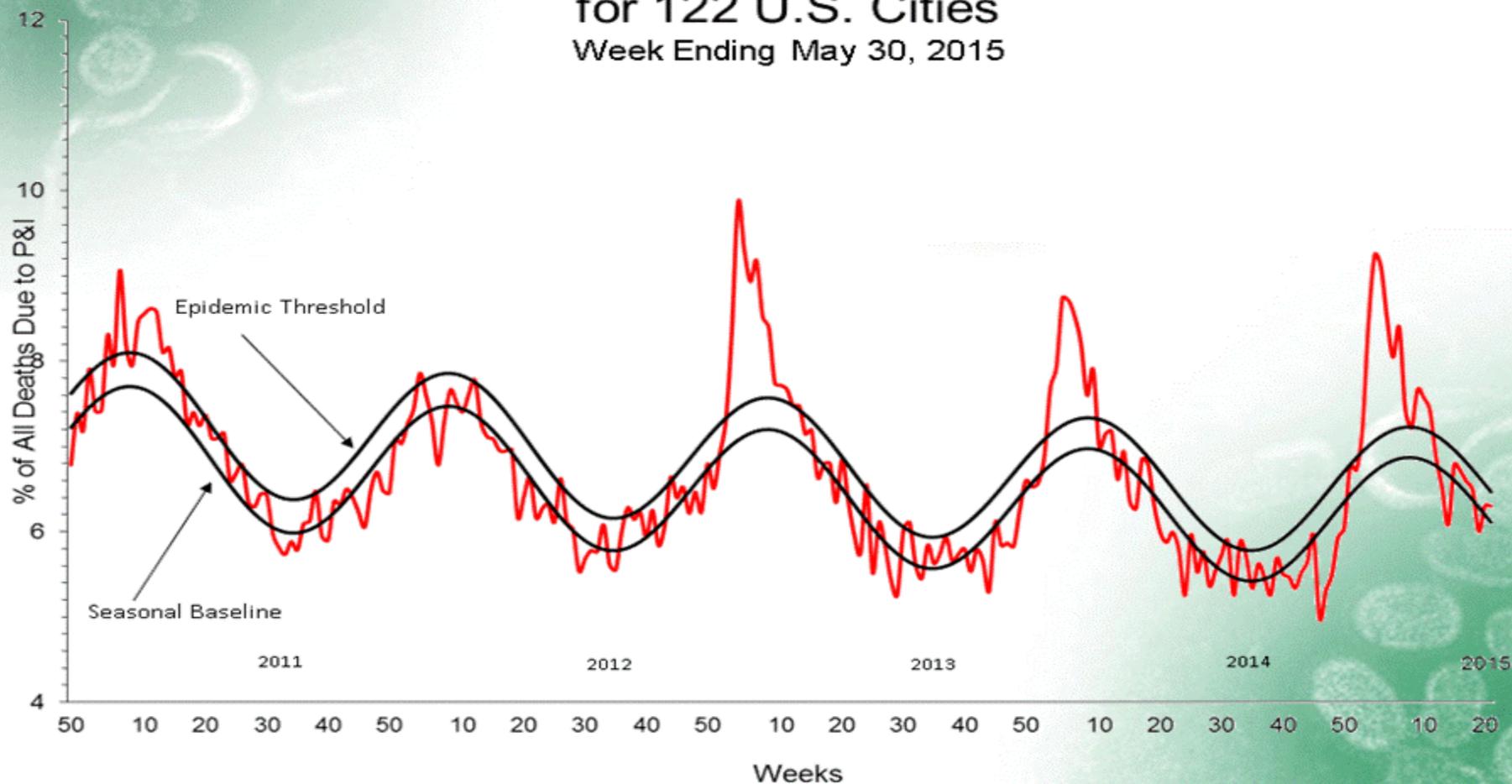
- peak December – March in temperate climate
- may occur earlier or later

## □ Communicability

- 1 day before to 5 days after onset (adults)

A Weekly Influenza Surveillance Report Prepared by the Influenza Division

## Pneumonia and Influenza Mortality for 122 U.S. Cities Week Ending May 30, 2015



# Influenza Vaccines

- ❑ **Inactivated (IIV)**
  - Intramuscular or
  - Intradermal
  
- ❑ **Live attenuated vaccine (LAIV)**
  - Intranasal

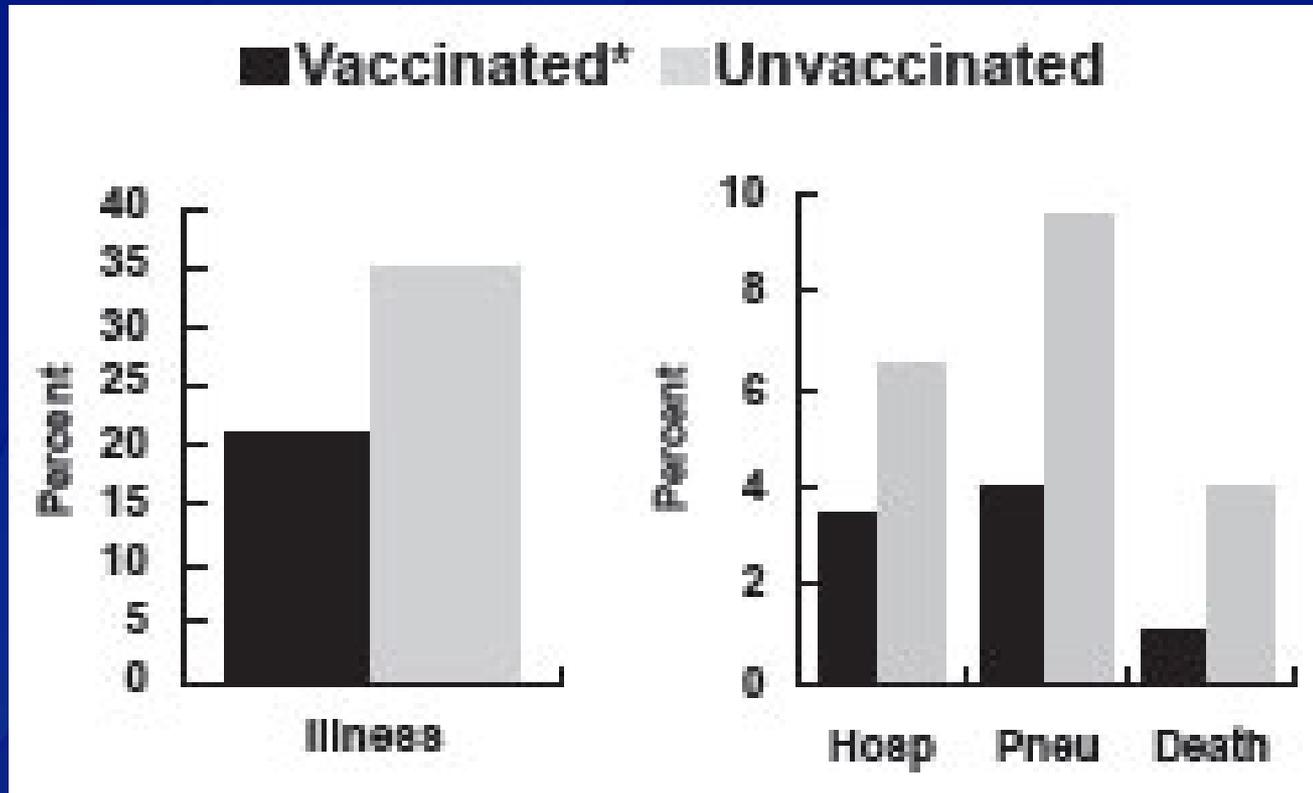
# Transmission of LAIV Virus

- ❑ LAIV replicates in the nasopharyngeal mucosa
- ❑ Vaccinated children can shed vaccine viruses in nasopharyngeal secretions for up to 3 weeks
- ❑ One instance of transmission of vaccine virus to a contact has been documented

## Inactivated Influenza Vaccine Efficacy

- About 60% effective among healthy persons younger than 65 years of age
- 50-60% effective in preventing hospitalization among elderly persons
- 80% effective in preventing death among elderly persons

# Influenza and Complications Among Nursing Home Residents



\*Inactivated influenza vaccine. Genesee county, MI, 1982-1983

## **LAIV Efficacy In Healthy Children**

- ❑ 87% effective against culture-confirmed influenza in children 60 - 84 months old**
- ❑ 27% reduction in febrile otitis media (OM)**
- ❑ 28% reduction in OM with accompanying antibiotic use**
- ❑ Decreased fever and OM in vaccine recipients who developed influenza**

## **Inactivated Influenza Vaccine (IIV) Recommendations (1)**

- ❑ Advisory Committee on Immunization Practices recommends annual influenza vaccination for all persons 6 months of age and older**
- ❑ Protection of persons at higher risk for influenza-related complications should continue to be a focus of vaccination efforts as providers and programs transition to routine vaccination of all persons aged 6 months and older**

## Inactivated Influenza Vaccine (IIV) Recommendations (2)

- ❑ When vaccine supply is limited, vaccination efforts should focus on delivering vaccination to the following groups of persons:
  - Children 6 months through 4 years (59 months) of age
  - Persons 50 years and older
  - Persons with chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders (including diabetes mellitus)
  - Persons who are immunosuppressed (including immunosuppression caused by medications or by human immunodeficiency virus)
  - Women who are or will be pregnant during the influenza season

## **Inactivated Influenza Vaccine (IIV) Recommendations (3)**

- **Children 6 months through 18 years of age and receiving long-term aspirin therapy and who therefore might be at risk for experiencing Reye syndrome after influenza virus infection**
- **Residents of nursing homes and other chronic-care facilities**
- **American Indians/Alaskan natives**
- **Persons who are morbidly obese (body-mass index is 40 or greater)**
- **Healthcare personnel**
- **Household contacts and caregivers of children younger than 5 years of age and adults 50 years of age or older, with particular emphasis on vaccinating contacts of children aged younger than 6 months**
- **Household contacts and caregivers of persons with medical conditions that put them at higher risk for severe complications from influenza**

# Pregnancy and Inactivated Influenza Vaccine (IIV)

- ❑ Risk of hospitalization 4 times higher than nonpregnant women
- ❑ Risk of complications comparable to nonpregnant women with high-risk medical conditions
- ❑ Vaccination (with IIV) recommended if pregnant during influenza season
- ❑ Vaccination can occur during any trimester

# HIV Infection and Inactivated Influenza Vaccine (IIV)

- ❑ Persons with HIV at increased risk of complications from influenza
- ❑ IIV induces protective antibody titers in many HIV-infected persons
- ❑ IIV will benefit many HIV-infected persons



# Simultaneous Administration of LAIV and Other Vaccines

- ❑ Inactivated vaccines can be administered either simultaneously or at any time before or after LAIV
- ❑ Other live vaccines can be administered on the same day as LAIV
- ❑ Live vaccines not administered on the same day should be administered at least 4 weeks apart

# Inactivated Influenza Vaccine (IIV) Contraindications and Precautions

- ❑ Severe allergic reaction (e.g., anaphylaxis) to a vaccine component or following a prior dose of inactivated influenza
- ❑ Moderate or severe acute illness
- ❑ History of Guillian Barré syndrome (GBS) within 6 weeks following a previous dose of influenza vaccine

# Live Attenuated Influenza Vaccine (LAIV) Contraindications

- ❑ Children younger than 2 years of age\*
- ❑ Persons 50 years of age or older\*
- ❑ Children and adolescents receiving long-term aspirin or aspirin-containing therapy\*
- ❑ Immunosuppression from any cause\*
- ❑ Pregnant women\*
- ❑ Children younger than 5 years with recurrent wheezing, or recent wheezing (within last 12 months)\*
- ❑ Severe allergy to egg or other vaccine components

\*These persons should receive inactivated influenza vaccine

# Live Attenuated Influenza Vaccine (LAIV) Precautions

- ❑ Persons with chronic medical conditions
- ❑ Children 5 years or older with asthma
- ❑ Moderate or severe acute illness
- ❑ History of Guillain-Barré syndrome (GBS) within 6 weeks following a previous dose of influenza vaccine

# Influenza Vaccine Adverse Events

## □ IIV

- Local reactions - common
- Guillain-Barré syndrome - expected to be greater among persons with a history of GBS than among persons with no history of GBS

## □ LAIV

- Nonspecific systemic symptoms - common

# Inactivated Influenza Vaccine (IIV) Adverse Reactions

- ❑ Local reactions (soreness, redness)
  - 15% - 20%
  
- ❑ Fever, malaise, myalgia
  - Less than 1%
  
- ❑ Allergic reactions (hives, angioedema, anaphylaxis)
  - Rare

# Live Attenuated Influenza Vaccine (LAIV) Adverse Reactions

## □ Children

- No significant increase in URI symptoms, fever, or other systemic symptoms
- Increased risk of wheezing in children 6-23 months of age

## □ Adults

- Significantly increased rate of cough, runny nose, nasal congestion, sore throat, and chills reported among vaccine recipients
- No increase in the occurrence of fever

## □ No serious adverse reactions identified

# Influenza Antiviral Agents\*

- ❑ Amantadine and rimantadine
  - Not recommended because of documented resistance in U.S. Influenza isolates
  
- ❑ Zanamivir and oseltamivir
  - Neuraminidase inhibitors
  - Effective against influenza A and B
  - Oseltamavir and zanamavir approved for prophylaxis

\*See [influenza ACIP statement](#) or CDC [influenza website](#) for details

# Influenza Surveillance

- Monitor prevalence of circulating strains and detect new strains
- Estimate influenza-related morbidity, mortality and economic loss
- Rapidly detect outbreaks
- Assist disease control through rapid preventive action

# Influenza Vaccines 2015-2016 Season

- ❑ Trivalent influenza vaccines will contain:
  - A/California/7/2009 (H1N1)- like virus
  - A/Switzerland//97152932012 (H3N2)-like virus
  - B/Phuket/3073/2013-like (Yamagata lineage) virus.
  
- ❑ Quadrivalent influenza vaccines will contain these antigens, and also a B/Brisbane/60/2008-like (Victoria lineage) virus.

# Influenza Vaccination Recommendation

- Annual influenza vaccination is now recommended for every person in the United States 6 months of age and older

# Influenza Vaccination Recommendation

- ❑ Providers should make a special effort to vaccinate persons at increased risk of complications of influenza
  - Children 6 months through 4 years
  - Persons 50 years and older
  - Persons with underlying medical conditions
  - Pregnant women
- ❑ Close contacts of high-risk persons
- ❑ Healthcare personnel

**What Do You Think?**



# CDC website on influenza: <http://www.cdc.gov/flu/index.htm>

## FLU BASICS

Symptoms, How Flu Spreads, Higher Risk Groups, Past and Current Flu Season

## HEALTH PROFESSIONALS

Vaccination, Antiviral Drugs, Infection Control, Diagnostic Testing, and Training

## PREVENTION - FLU VACCINE

Vaccine Safety, Vaccination Coverage, Influenza VIS, NIVW, Infection Control

## FREE RESOURCES

Printable Materials, Photos, Podcasts, Videos, PSAs, eCards, Badges & Buttons, Articles

## TREATMENTS

Drugs to Treat Flu Virus, Stay Home When Sick, Caring for Someone Sick With Flu

## INFORMATION FOR PARTNERS

Campaign Highlights, Partner Activity, Media Briefings, Promotional/Educational Tools

## SUPPLY AND DISTRIBUTION

Approved U.S. Flu Vaccines, Total Doses Distributed

## QUESTIONS & ANSWERS

Answers to Flu-Related Questions

## NEWS & HIGHLIGHTS

Flu Spotlights, Press Releases...

## PUBLIC HEALTH IMAGE LIBRARY

Photographs, Illustrations, and Multimedia Files

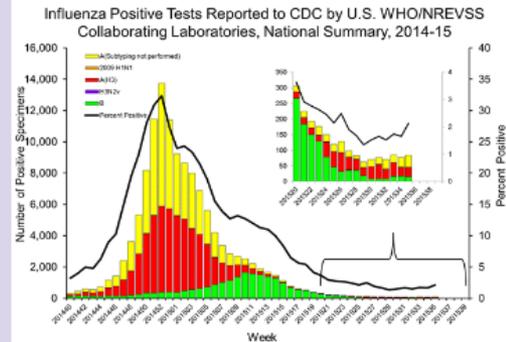
**Flu Vaccine Finder** Find flu clinics near you

Everyone six months of age and older needs a flu vaccine.

Enter Zip Code

powered by HealthMap

## Flu Activity & Surveillance



Check where flu is active near you.

[More >](#)

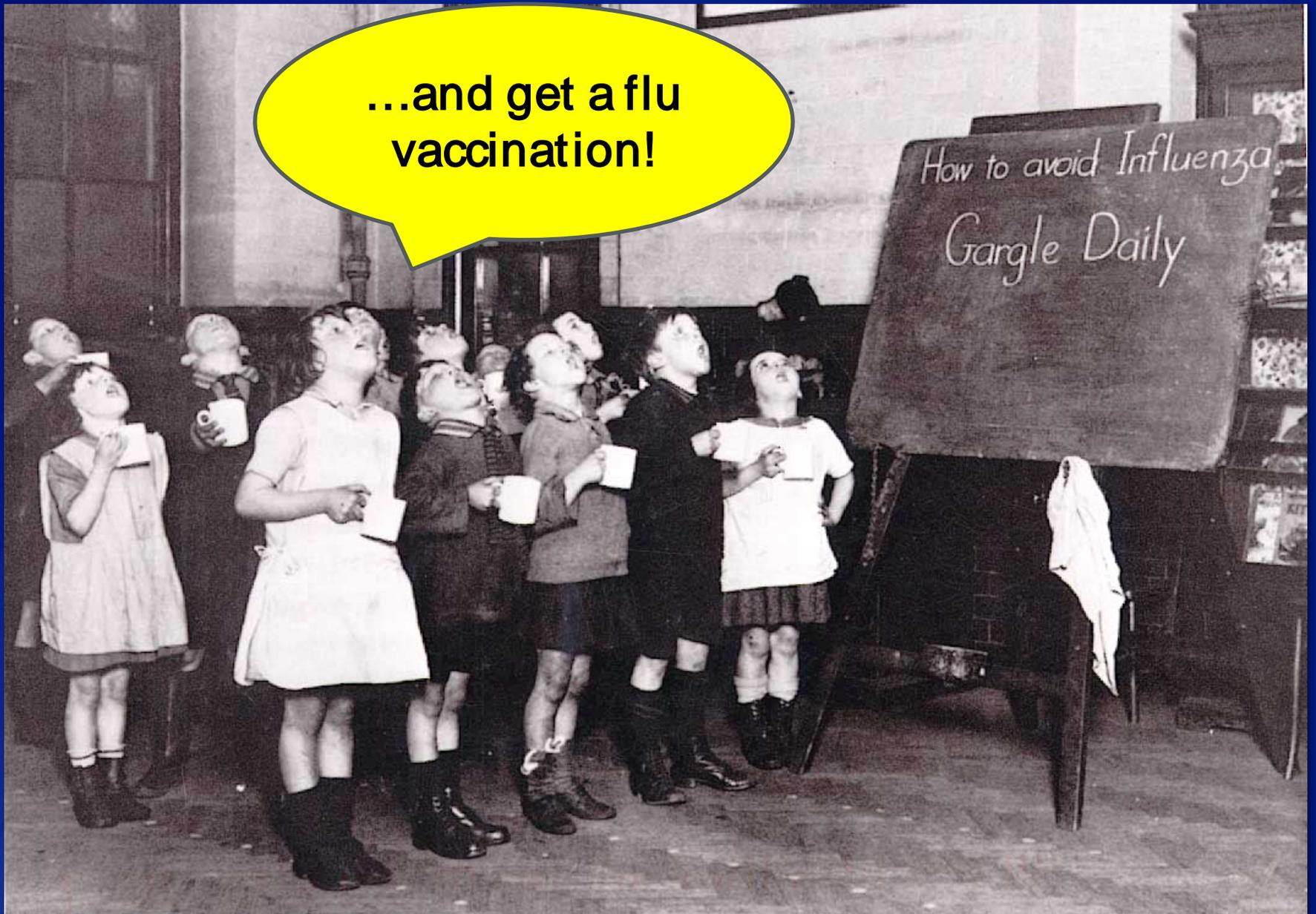


# Influenza Resources

- ❑ ACIP's Influenza Recommendations web page  
[www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/flu.html](http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/flu.html)
- ❑ CDC's Influenza web page  
[www.cdc.gov/flu/index.htm](http://www.cdc.gov/flu/index.htm)
- ❑ Immunization Action Coalition Influenza web page  
[www.immunize.org/influenza/](http://www.immunize.org/influenza/)
- ❑ Children's Hospital of Philadelphia Vaccine Education Center Influenza web page  
<http://www.chop.edu/centers-programs/vaccine-education-center/vaccine-details/influenza-vaccine#.VgHMa3YpCAU>



**...and get a flu  
vaccination!**



# Myths about the Flu Vaccine

- ❑ “Every time I get the vaccine, I get sick”
- ❑ “Flu vaccine can give you the flu”
- ❑ “If I get the vaccine in October, it will not work in February or March of next year”
- ❑ “It’s not safe. It does not even work...”
- ❑ “Why get the vaccine every year? Last year’s vaccine is good enough”

Thank you!