

Influenza Pandemic: Are You Ready?

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Public Health Works

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Key Points

- **Flu is Bad**
- **The Next Great Pandemic
is Coming**
- **Flu Can be Prevented**

How many Canadians suffer from influenza in an average year?

A. 1 out of 3

B. 1 out of 6

C. 1 out of 9

D. 1 out of 12

E. 1 out of 25

Influenza

- **Viral Respiratory illness with systemic effects**
- **Usually self-limited (but can be complicated)**
- **Occurs in outbreaks of variable severity
every winter (Northern Hemisphere)**
- **attack rates of 10-40% over 5-6 weeks**

Influenza

- **Sudden Onset (Acute!)**
- **Systemic Symptoms**
 - Fever (38-40°C); Chills/rigors
 - Headache; Myalgia
 - Malaise (fatigue, weakness);
 - Prostration (extreme exhaustion)
- **Respiratory Symptoms**
 - Sore throat
 - Dry non-productive cough
 - Nasal Congestion

Clinical Symptoms

Symptoms	Cold	Influenza
Fever	Rare	Characteristic, high fever (39-40°C, last 3-4 days)
Headache	Rare	Prominent
General aches, pains	Slight	Usual; often severe
Fatigue, weakness	Quite mild	Can last up to 2-3 weeks
Extreme exhaustion	Never	Early and prominent
Stuffy nose	Common	Sometimes
Sneezing	Usual	Sometimes
Chest discomfort, coughing	Mild to moderate; hacking cough	Common; can become severe
Sore throat	Common	Sometimes

Outbreak of Influenza On a Commercial Airliner

**37/53 = 70% of contacts
developed Influenza A
after 4.5 hour delay in
an airplane with
ventilation turned off.**

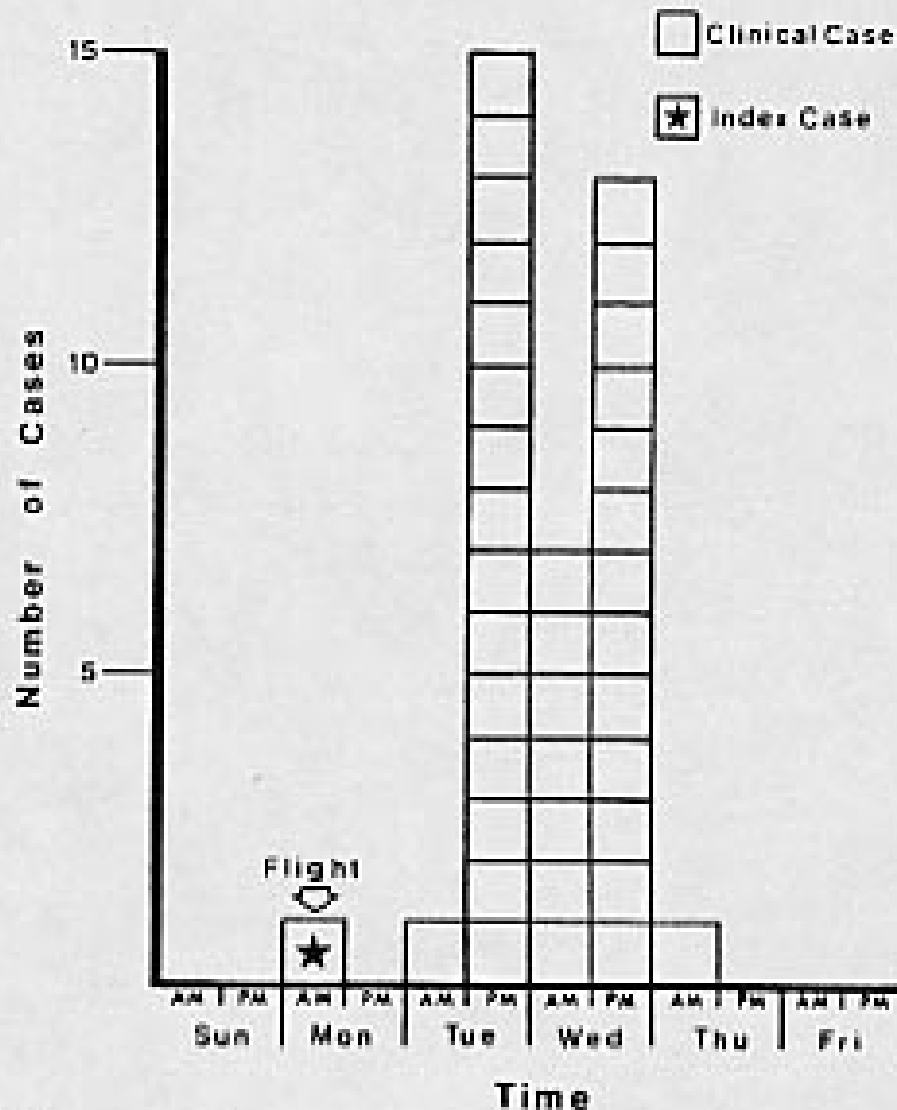


FIGURE 1. Onset of clinical influenza among 37 persons following exposure to an index case aboard a delayed airliner, Homer, Alaska, March, 1977.

Moser, et al.
Am J Epidemiol.
1979;110:1-6.

**How many working days are lost in
Canada each year due to influenza?**

A. < 500,000 days

B. 650,000 days

C. 1 million days

D. 1.5 million days

E. Close to 2 million days

Uncomplicated Influenza: Impact on the Individual

- **3-4 days of bed disability**
- **3 days of missed work/school**
- **5-6 days of reduced activity**

Influenza - Complications

- Primary Viral Pneumonia (young adults)
- **Secondary Bacterial Pneumonia (chronic heart & lung disease)**
- Croup; Exacerbation of COPD or CHF
- **Myositis and Myocarditis**
- Toxic - Shock Syndrome (2° Staph. colonization)
- **CNS: GBS; Encephalitis; Transverse Myelitis**
- Reye's Syndrome

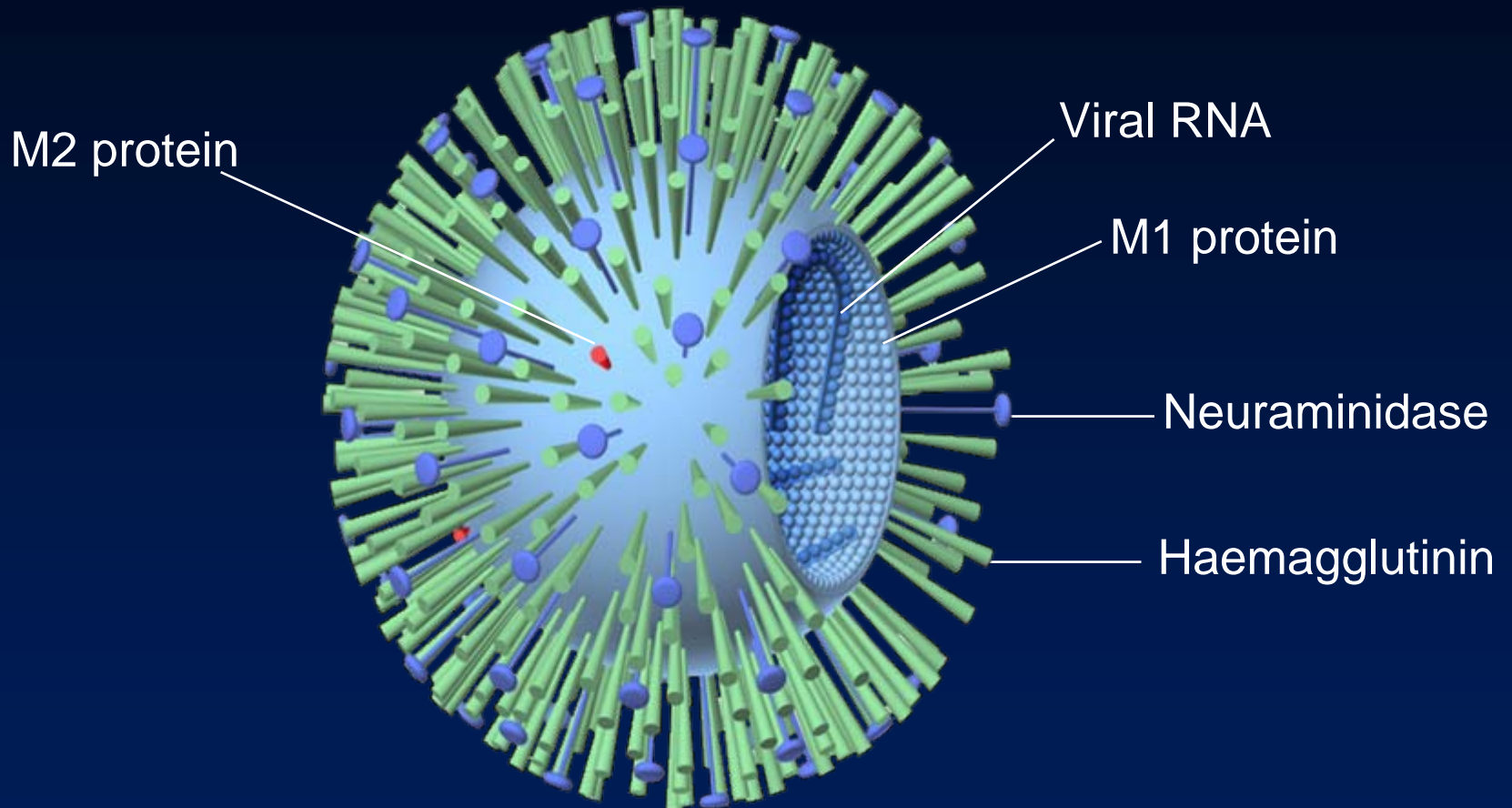
Influenza:

2 Important Features

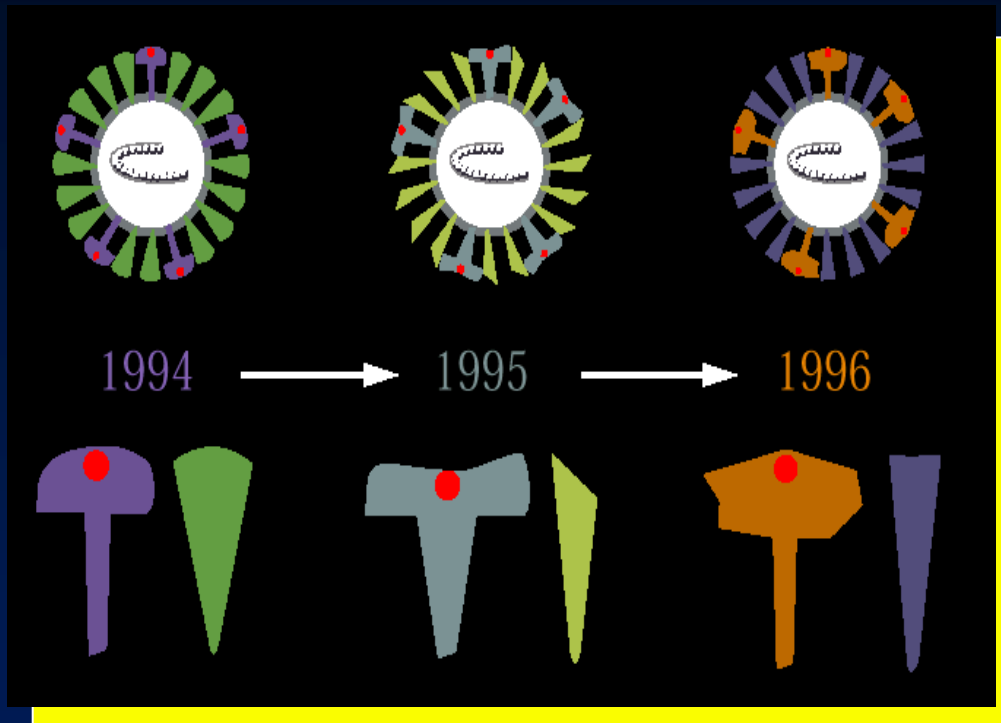
- **Epidemic nature**
- **Complications and Mortality**

(resulting in part from
pulmonary complications)

Influenza Surface Proteins



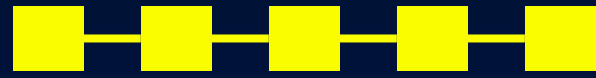
Antigenic Drift



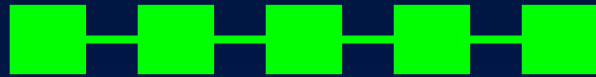
↑ ↑ Haemagglutinin
Neuraminidase

Relatively minor changes in NA or HA or both that occur frequently from gradual accumulation of amino acid changes

Where Do New Viruses Come From?



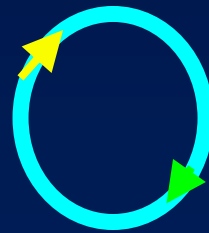
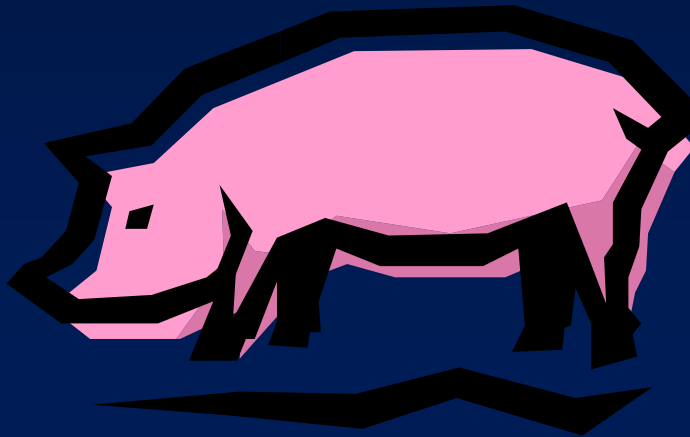
Influenza A
Segmented
Genome



SHIFT



Reassortment



Influenza - History

- **Great Plague of Athens (430-427 BC) - first good description of influenza**
- **At least 10 pandemics of influenza-like illness have occurred since 1580**
- **4 pandemics in 20th century: 1918-1920; 1957-58; 1968-70; 1977-78**

Spanish Influenza 1918-1920

- “the last great plague”
- High case - fatality rate with at least
20-40 million deaths over 10 months
- Extraordinarily high death rate in healthy
young adults including soldiers in WWI
- 25-40 yr-olds had case fatality rates =
extreme elderly

**The plague took off
in September of 1918,
and when it was over,
half a million Americans
would lie dead.**

**Kolata, G. Flu: The Story of the Great Influenza Pandemic
of 1918 and the Search for the Virus that Caused It.**

Camp Devens Massachusetts

“Camp Devens is near Boston, and has about 50,000 men, or did have before this epidemic broke loose.

This epidemic started about four weeks ago, and has developed so rapidly that the camp is demoralized and all ordinary work is held up till it has passed.”

(Sgd) Roy

Camp Devens, Mass.

Surgical Ward No 16

29 September 1918

(Br. Med J. 22-29 Dec. 1918. pp1632-3.)

Camp Devens Massachusetts

“These men start with what appears to be an ordinary attack of ...Influenza...they very rapidly develop the most viscous type of Pneumonia that has ever been seen. Two hours after admission they have the Mahogany spots over the cheek bones, and a few hours later you can begin to see the Cyanosis extending from their ears and spreading all over the face, until it is hard to distinguish the colored men from the white.”

(Sgd) Roy

Camp Devens, Mass.

29 September 1918

(Br. Med J. 22-29 Dec. 1979. pp1632-3.)

Camp Devens Massachusetts

“It is only a matter of a few hours then until death comes, and it is simply a struggle for air until they suffocate. It is horrible. One can stand it to see one, two or twenty men die, but to see these poor devils dropping out like flies sort of gets on your nerves. We have been averaging about 100 deaths per day...”

(Sgd) Roy

Camp Devens, Mass.

Surgical Ward No 16

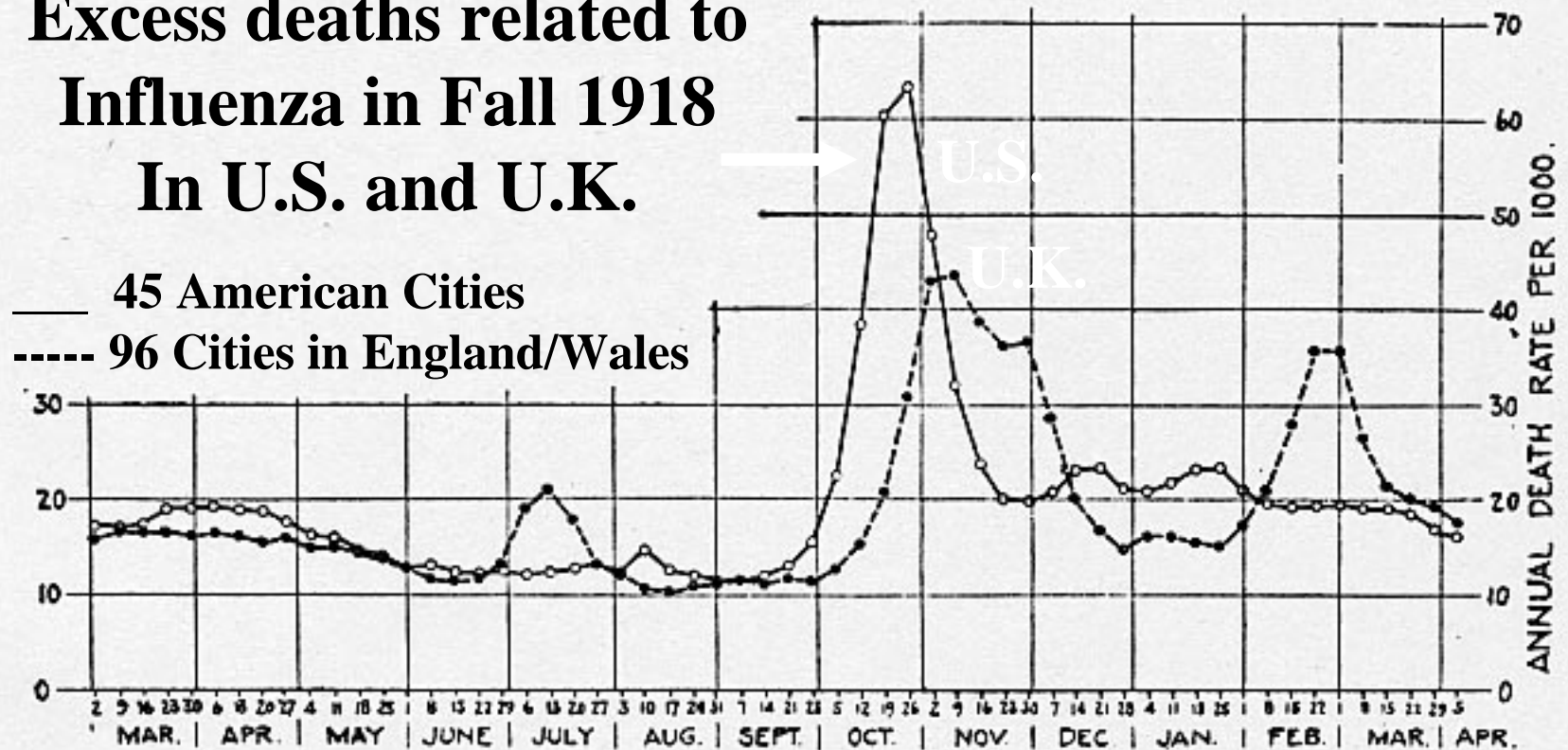
29 September 1918

(Br. Med J. 22-29 Dec. 1979. pp1632-3.)

Annual Death Rates/1000 (All Causes) March 1918 - April 1919

Excess deaths related to
Influenza in Fall 1918
In U.S. and U.K.

— 45 American Cities
- - - 96 Cities in England/Wales

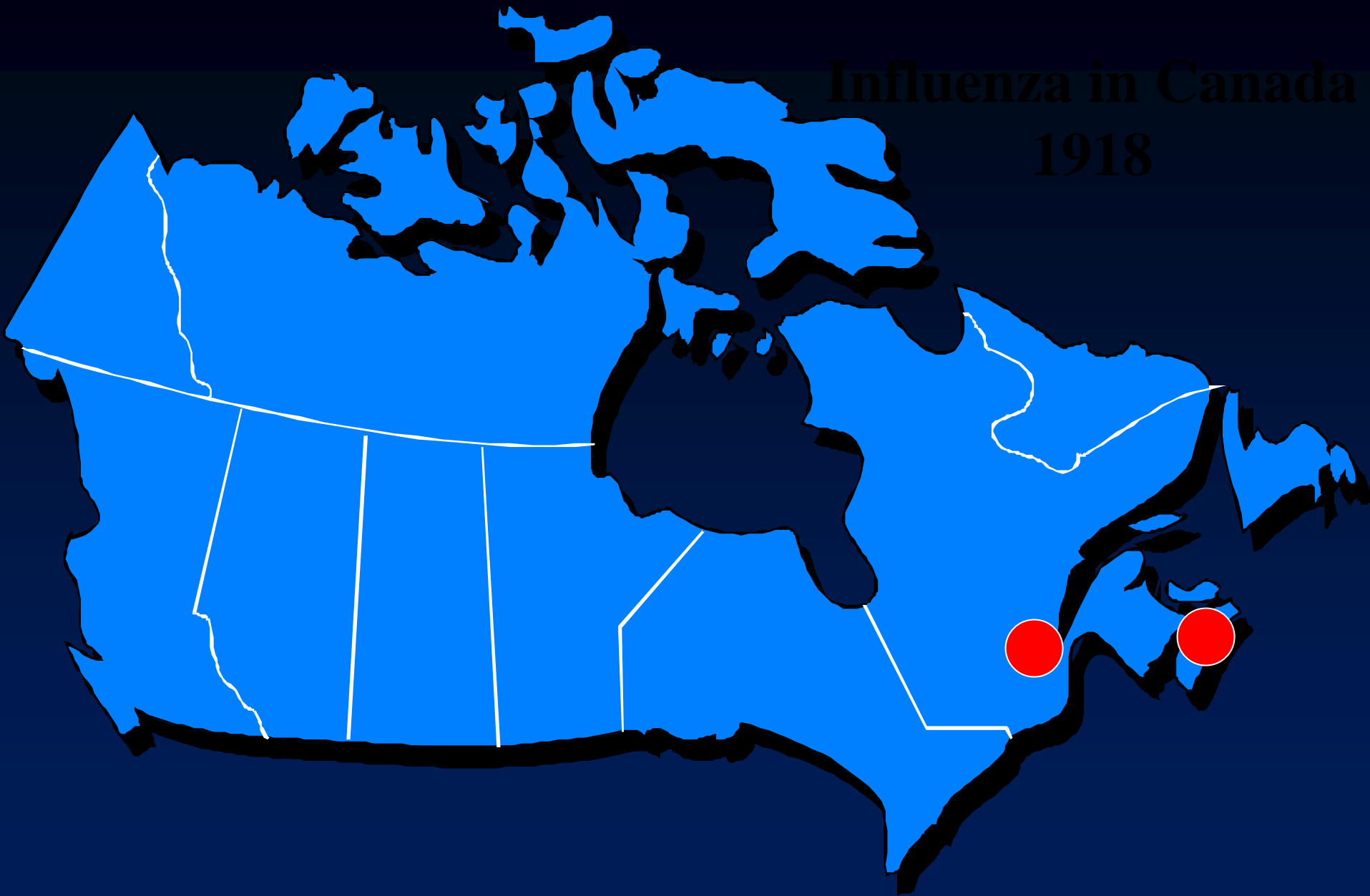


Frost, W.H. JAMA. 1919:73:313.

U.S. Life Expectancy 1917-18



Influenza in Canada 1918



Canada

Fall 1918

- **1:6 Canadians afflicted with Influenza**
- **30 - 50,000 Deaths**

Influenza in Alberta

“The flu had reached the West. Everywhere families were down. Schools, churches and places of entertainment were closed. In Alberta we were compelled by law to wear masks over our mouths when we went in public. No nurses were to be had, the doctors were overworked, and it looked pretty blue. One by one our little flock took sick...”

Memoirs of Roland Michener's Mother

In Pettigrew, E. The Silent Enemy: Canada and the Deadly Flu of 1918. 1983.

Edmonton 1918

Oct. 19, 1918 (Day 1) - 41 cases

- Schools were already closed
- **Churches and other gathering places followed**
- Masks were compulsory in public (after Oct. 1)
- **Spitting on the streets was strictly forbidden**

In Pettigrew, E. The Silent Enemy: Canada and the Deadly Flu of 1918.

Edmonton 1918

“You could be talking to a man on the street, turn around and walk down the street. You’d look back and he had fallen over.”

In Pettigrew, E. The Silent Enemy: Canada and the Deadly Flu of 1918. 1983.

“Spanish Flu” 1918 -19



**20 - 40
(100?)
million
deaths**

The 1918 flu was a plague so deadly that if a similar virus were to strike today, it would kill more people in a single year than heart disease, cancers, strokes, chronic pulmonary disease, AIDS, and Alzheimer's disease combined.

Kolata, G. Flu: The Story of the Great Influenza Pandemic of 1918 and the Search for the Virus that Caused It.

“Asian Flu” 1957 - 58



More than
1 million
people died
worldwide
(70,000 in US)

“Hong Kong Flu” 1968 -69



More than
1 million
people died
worldwide,
(56,000 in
US)

“It’s Just the Flu”

- **‘Typical’ Influenza Year (CDC)**
 - 10-20% of population affected; 100,000 hospitalized
 - 20,000+ excess deaths from flu-related complications
 - 5-12 Billion Dollars/year in direct and indirect costs
- **1994 U.S. Influenza Epidemic (CDC)**
 - 90 million people affected (35% of population)
 - 170 million days in bed
 - 69.3 million days of work missed

Influenza

Highly contagious systemic and acute respiratory illness of global importance with substantial social, medical and economic costs

Key Points

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- **The Next Great
Pandemic is Coming**
- **Flu Can be Prevented**

Hong Kong Bird Flu (H5N1) 1997

- **First appeared in 3 year old boy in '97**
- **18 confirmed cases - 6 deaths (33%)**
- **Associated with Avian species (chickens)**
- **Human-to-human spread = potential for death of 30% of the world's population**
- **Worldwide pandemonium & health care crisis**

Flu pandemics: Then and Now

1918	Year	2000+
What Happened		What Could Happen
1.8 billion	World Population	6.0 Billion
Troop ships, railroad	Primary mode of transportation	Jets
4 months	Time for virus to circle globe	4 days
Gauze masks, disinfectants	Preventative measures	Vaccines
Bed rest, aspirin	Treatments	Some antiviral drugs
20 + million	Deaths	60 Million?

Pandemic FLU Planning

- **Surveillance**
- **Vaccines and Anti-Virals**
- **Health Services**
- **Communications**
- **Emergency Preparedness**

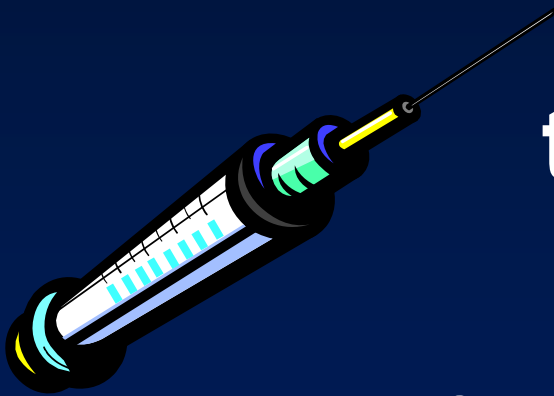


Influenza - Prevention

Influenza vaccine remains

the cornerstone of the

Influenza control strategy.



Flu Vaccine - Overview

- **Flu Vaccine in the Elderly**
 - Reduces illness, hospitalization, deaths and saves money
- **Flu Vaccine in Healthy Working Adults**
 - Reduces illness, sick time, physician visits & saves money
- **Flu Vaccine in Health Care Workers**
 - Prevents Influenza
 - Reduces mortality in elderly patients

Flu Vaccine in the Elderly

- **Reduces serological/clinical Flu by 50%**
- **Reduces hospitalizations and deaths**
- **Saves Money (direct & indirect costs)**

Govaert, et al. JAMA. 1994;272:1661-1665.

Nichol et al. NEJM. 1994;331:778-84.

Mullooly, et al. Ann. Intern Med. 1994;121:947-952.

Flu Vaccine in Healthy Working Adults

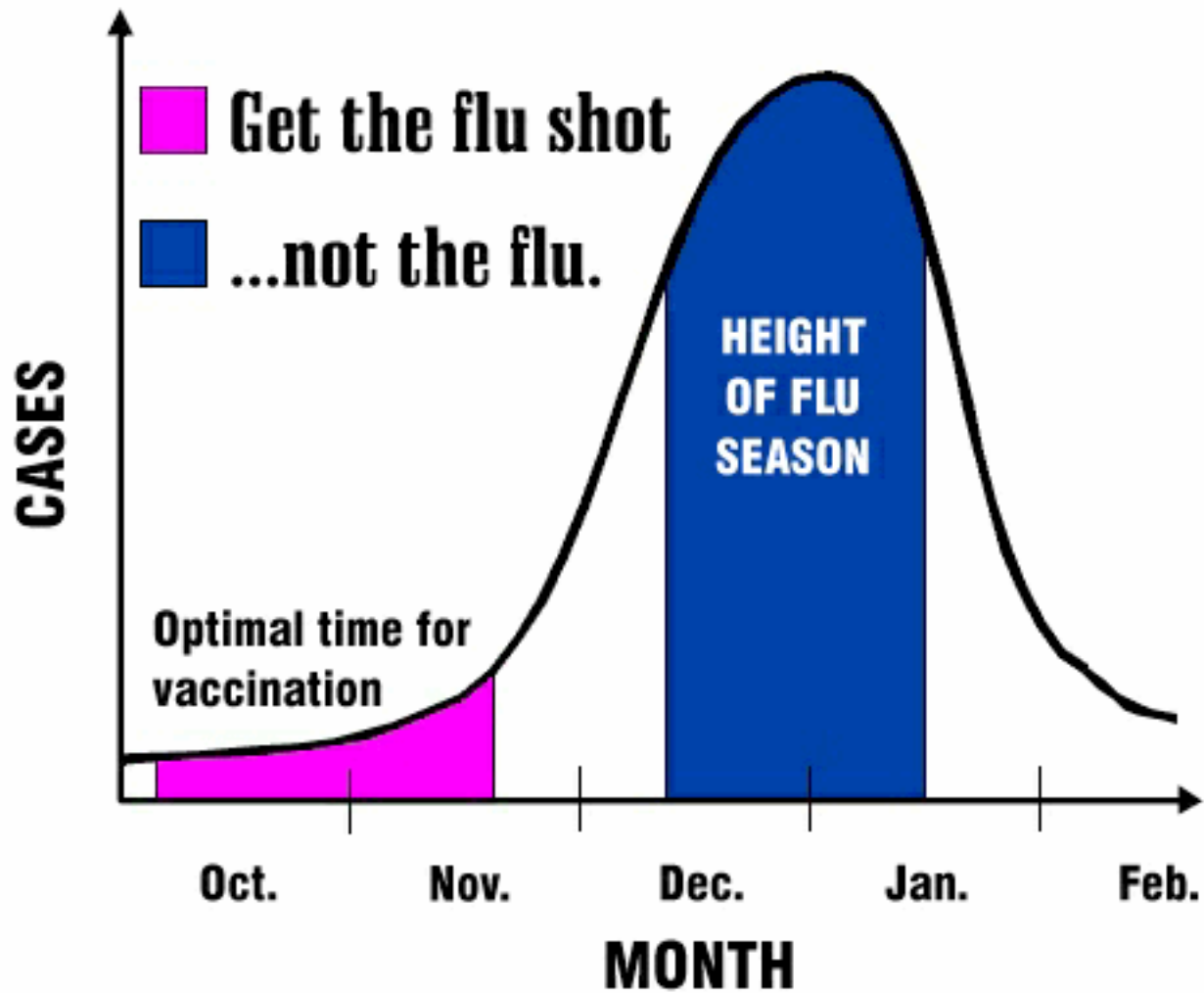
Nichol, et al. NEJM. 1995; 333:889-93

- **Healthy adults receiving vaccine have:**
 - 25% fewer respiratory illnesses
 - 43% fewer days of sick leave for RTI's
 - 44% fewer physician visits for RTI's
- **Vaccinating healthy working adults has huge health-related and economic benefits**

Flu Vaccine in Health Care Workers

Wilde, et al. JAMA 1999;281:908-913. Potter, et al. JID 1997;175:1-6.

- **Vaccination prevents infection with influenza in HCW's (vaccine efficacy 87%)**
- **Vaccination may reduce work absence**
- **Vaccination of HCW's reduces total mortality and influenza-like illness in elderly long-term-care patients**



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