Swine Flu, Seasonal Flu, Avian Flu & the Flu Pandemic

Health & Safety Seminar, 18th May 2009

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What is Swine Flu?

- Swine Flu is an infectious respiratory disease that occurs commonly in pigs but sometimes infect humans
- In this present international swine flu outbreak, human-to-human transmission has occurred.

Mode of transmission

- infected people cough or sneeze
- infected droplets get on their hands, drop onto surfaces, or are dispersed into the air
- Another person can breathe in contaminated air, or touch infected hands or surfaces, and be exposed

How to break the chain of transmission

- **To prevent spread:** people should cover their mouth and nose with a tissue when coughing, and wash their hands regularly.
- **To prevent catching it:** avoid close contact with people who appear unwell and have fever and cough; and wash your hands with soap and water thoroughly and often

Symptoms of Swine Flu, A/H1N1

- Early signs of influenza A(H1N1) are flu-like
- including fever, cough, headache, muscle and joint pain, sore throat and runny nose
- sometimes vomiting or diarrhoea.

Why are we worried about about Swine Flu, A/H1N1

- Unlike seasonal epidemics occurring every year for which we have effective vaccines.
- It is a new virus and one to which the populations will have no immunity and hence it has pandemic potential
- It kills young healthy adults.

Is there a vaccine for Swine Flu, A/H1N1

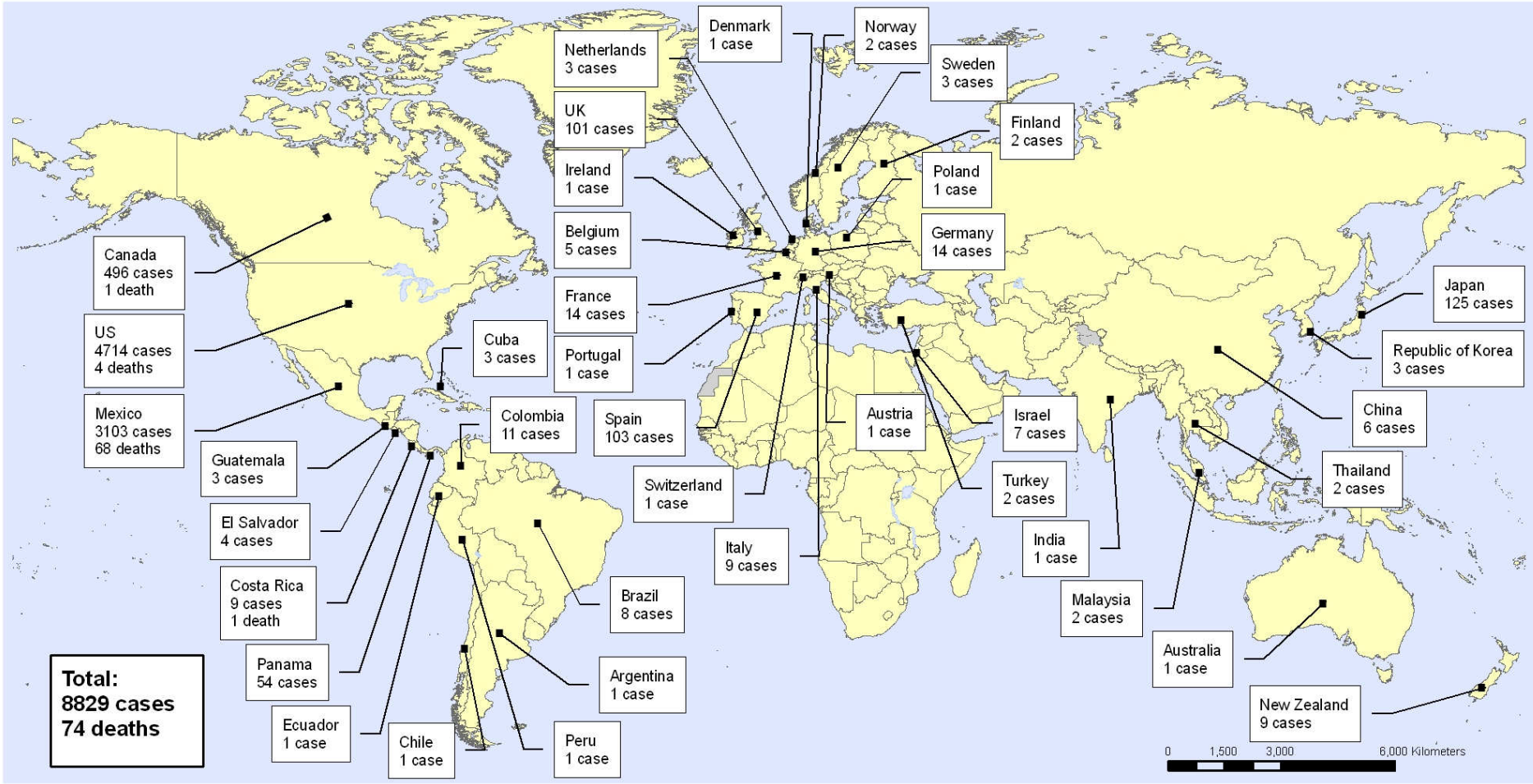
- At present there is no effective vaccine for this outbreak
- A new effective vaccine is about 6 months away

Current situation

- 18 May 2009 -- As of 06:00 GMT, 18 May 2009, 40 countries have officially reported 8829 cases of influenza A(H1N1) infection, including 74 deaths. (=0.8%)
- Mexico has reported 3,103 laboratory confirmed human cases of infection, including 68 deaths (=2%). For the USA 4 died out of 4,714 laboratory confirmed human cases; Canada reported 1 death out of 496 and Costa Rica has reported 1 death out of 9 confirmed cases.

New Influenza A (H1N1),
Number of laboratory confirmed cases and deaths as reported to WHO

Status as of 18 May 2009
6:00 GMT



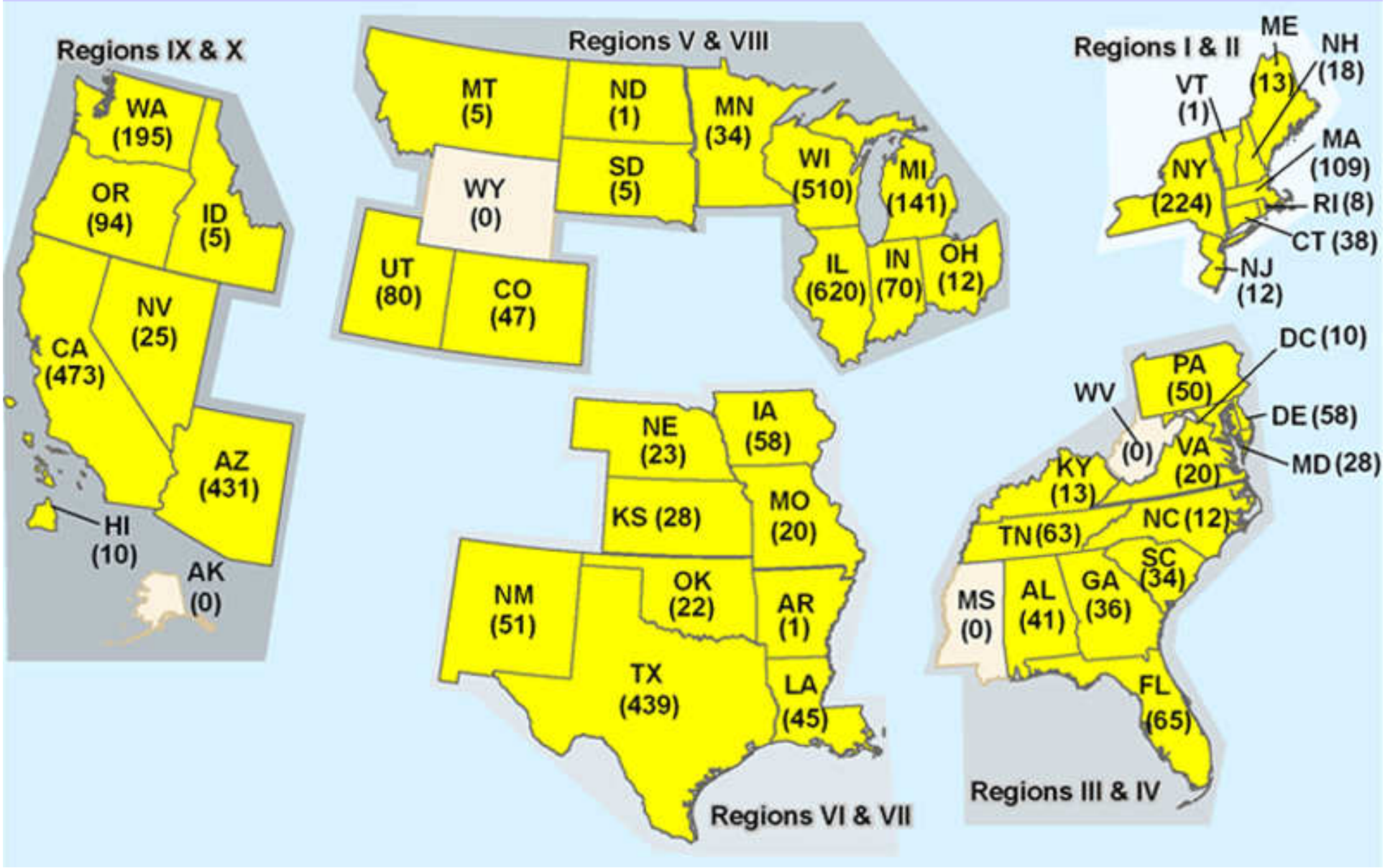
The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers 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: 18 May 2009 6:10 GMT

As of 14th May, confirmed and probable H1N1 cases
(About half of all influenza viruses being detected are novel H1N1 viruses)
from: http://www.cdc.gov/h1n1flu/update.htm



Current profile of this A/H1N1 virus

- A/H1N1 appears to be more contagious than seasonal influenza.
- The secondary attack rate of seasonal influenza ranges from 5% to 15%. Current estimates of the secondary attack rate of A/H1N1 range from 22% to 33%.

Travel guidelines

- It is prudent for people who are ill to delay international travel and for people developing symptoms following international travel to seek medical attention.
- People should seek medical attention if they develop any symptoms of influenza-like illness.
- WHO advises no restriction of regular travel or closure of borders.

What is Seasonal Influenza?

- Influenza is an infectious respiratory disease that occurs commonly in Autumn and Winter months
- Large scale epidemics usually caused by Influenza A virus about every 2-3 years
- Every year Seasonal Influenza causes 3 million to 5 million cases of severe illness each year, and kills from 250,000 to 500,000
- 2008/9 seasonal Flu vaccines comprise 3 strains:

  A/Brisbane/59/2007 (H1N1)-like virus,
  A/Brisbane/10/2007 (H3N2)-like virus and
  B/Florida/4/2006-like virus.

What is Avian Flu?

- Avian Flu is the same as Bird Flu
- Etymology: Latin *avis*: derived from birds
- Bird Flu is a group of Flu viruses mainly affecting birds

Symptoms of Human form of Bird Flu

- Fever >38C (100%)
- Cough (94-100%)
- Muscle aches (11-50%)
- Headache (10-100%)
- Sore throat (33-71% but not in Vietnam)
- Runny nose (53-58% but not in Vietnam)
- Diarrhoea (17% in ’97 & 41-70% recently)
- Vomiting (10-33%)
- Abdominal pain (17-50%)

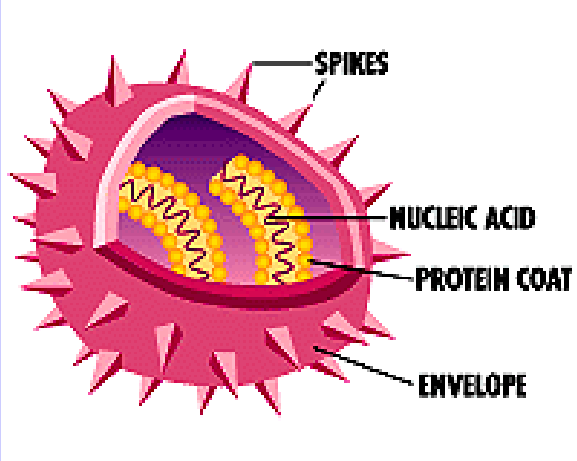
Incubation period – Human H5N1

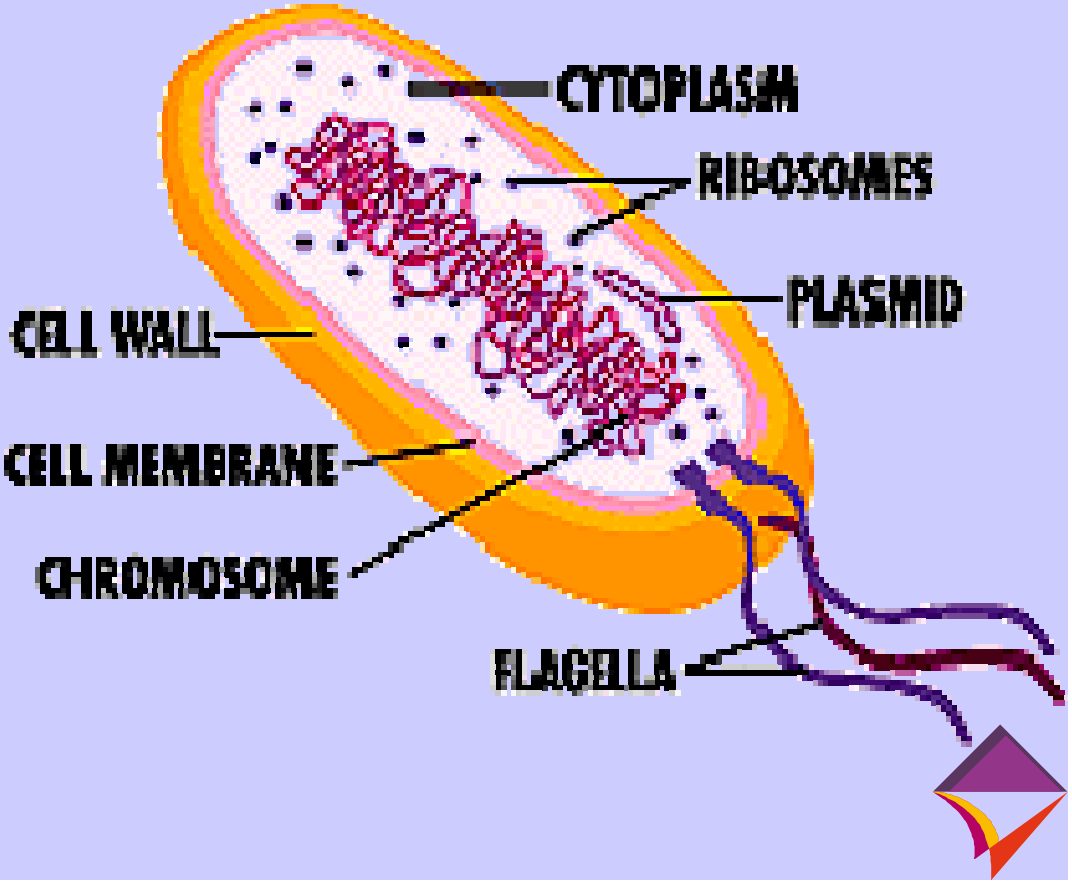
- 1997 Hong Kong: 2-4 days
- 2004 outbreak in Asia: up to 8 days
- In a few household clusters, may be up to 17 days but there may have been unrecognised animal exposure

Infectious Period

- For ordinary Flu, it is one day before feeling ill
- If a mutant H5N1strain can also spread from human to human one day before illness then it will present a challenge in control of spread

What are the differences between viruses and bacteria?





- **Viruses are too small to be seen under a light microscope**
- **Virus can be visualised with an Electron microscope**
- **Bacteria are measured in 1/1,000th mm**
- **Viruses are measured in 1/Millionth mm**
  Can pass through unglazed porcelain
- **The Nucleic Acid bases inside a virus code the genes**
- **A Virus is a parasite and can only reproduce inside a host's cell**
- **Cell death and inflammation stimulate the host's immune response**

Antibiotics and Antivirals

- Antibiotics are used against bacteria
  eg: Penicillins & Ciproxin

- Antivirals are used to fight viruses
  eg: Interferon & Tamiflu

3 Confusing terms

- Endemic
- Epidemic
- Pandemic

Endemic (地方 或 風土病)

- Etymology: from Greek *endEmia* action of dwelling, from *en* in + *dEmos* people, populace

  1 a : native to a particular country

  b : prevalent in a particular area or environment

  2 : restricted to a locality or region

Epidemic (流行病)

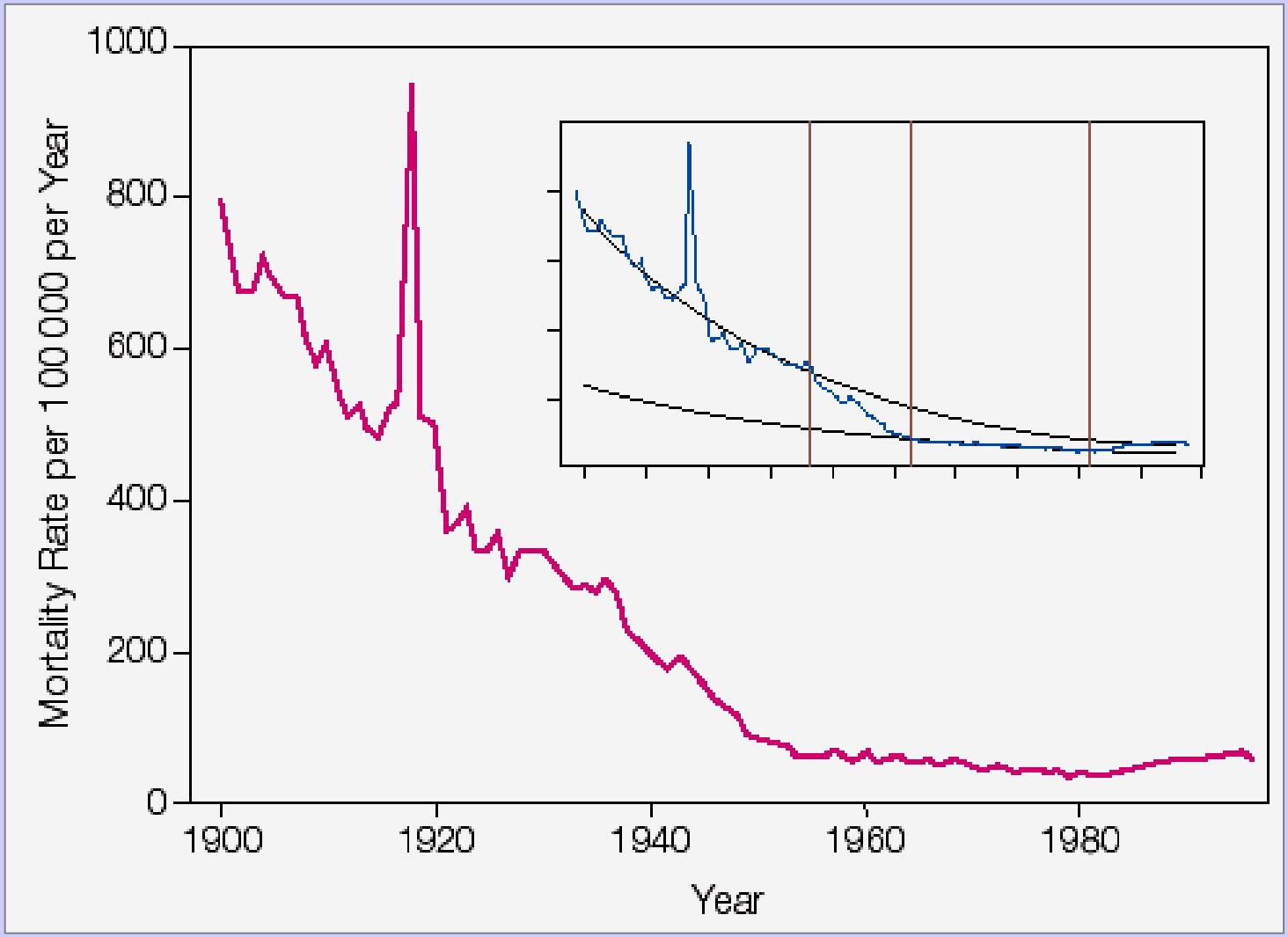
- **Etymology**: epidemic, from Late Latin *epidemia*, from Greek *epidEmia* visit, epidemic, from *epidEmos* visiting, epidemic, from *epi-* + *dEmos* people -
  1 : affecting or tending to affect a disproportionately large number of individuals within a population, community, or region at the same time <typhoid was *epidemic*>
  2 : excessively prevalent

Flu Pandemic (流感大流行)

- Etymology: Late Latin *pandemus*, from Greek *pandEmos* of all the people, from *pan-* + *dEmos* people

- occurring over a wide geographic area and affecting an exceptionally high proportion of the population

Infectious Disease Mortality in the United States During the 20th Century



Armstrong, GL. JAMA. 1999 Jan 6;281(1):61-6.

Pandemic Influenza
1918 Influenza Pandemic

- 20-40 million persons died worldwide, possibly more
- Death rate 25 times higher than previous epidemics
- 500-650,000 deaths in the U.S.: Ten times as many Americans died of flu than died in WW I
- The epidemic preferentially affected and killed younger, healthy persons
- The epidemic was so severe that the average life span in the U.S. was depressed by 10 years

Variable Death Toll

- Global estimates
  - 1918: 20 million dead
  - Current estimates : 2 to 7.4 million
- Varied greatly by country & region
  - Europe & N. America: 3-20 deaths/1,000
  - Africa: 20-445 deaths/1,000 people
  - Asia/Pacific: 3-220 deaths/1,000 people

Deaths Among Healthy Adults

- Influenza deaths usually among youngest & oldest
- Rates during 1918
  - Infants & over 40 ~2-10-fold higher
  - 10-20 yrs old:
    20-100-fold higher
  - 20-30 yrs old
    20-180-fold higher

Pandemic Influenza

Estimated Range of Deaths and Outpatient Medical Visits Due to Pandemic Influenza in King County by Attack Rate*

*Attack Rate	Deaths	Outpatient Medical Visits
25%	578-1,905	178,512-333,315
35%	809-2,666	249,916-466,642

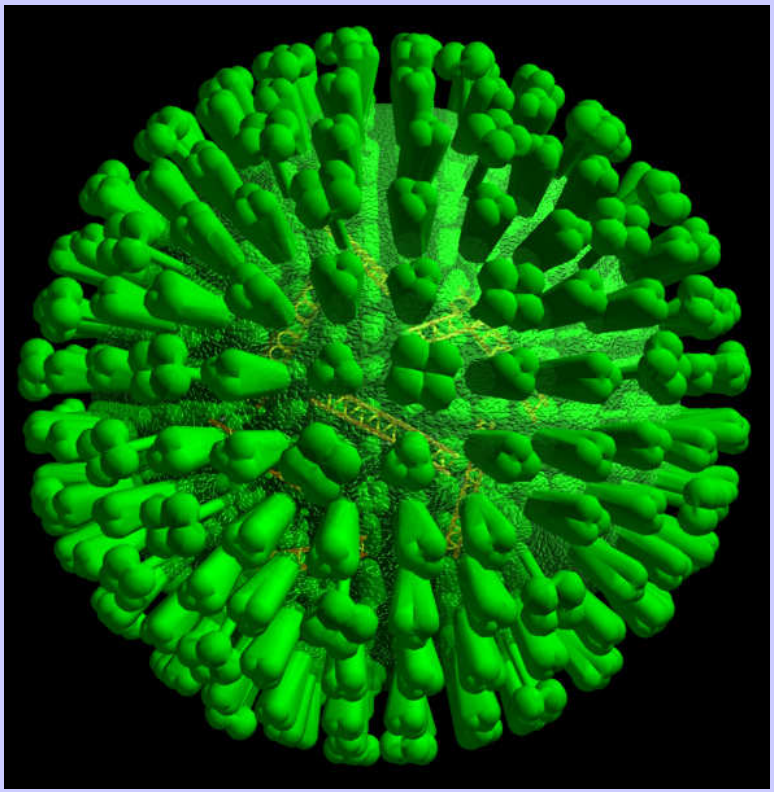
** Estimates based on past pandemics suggest demand for inpatient beds and assisted ventilation may increase by 25%

*Attack rate is the proportion of people exposed to a pathogen who actually get sick. Based on CDC's FluAid pandemic modeling software

** CDC. National Pandemic Influenza Preparedness Plan

The Influenza A Virus

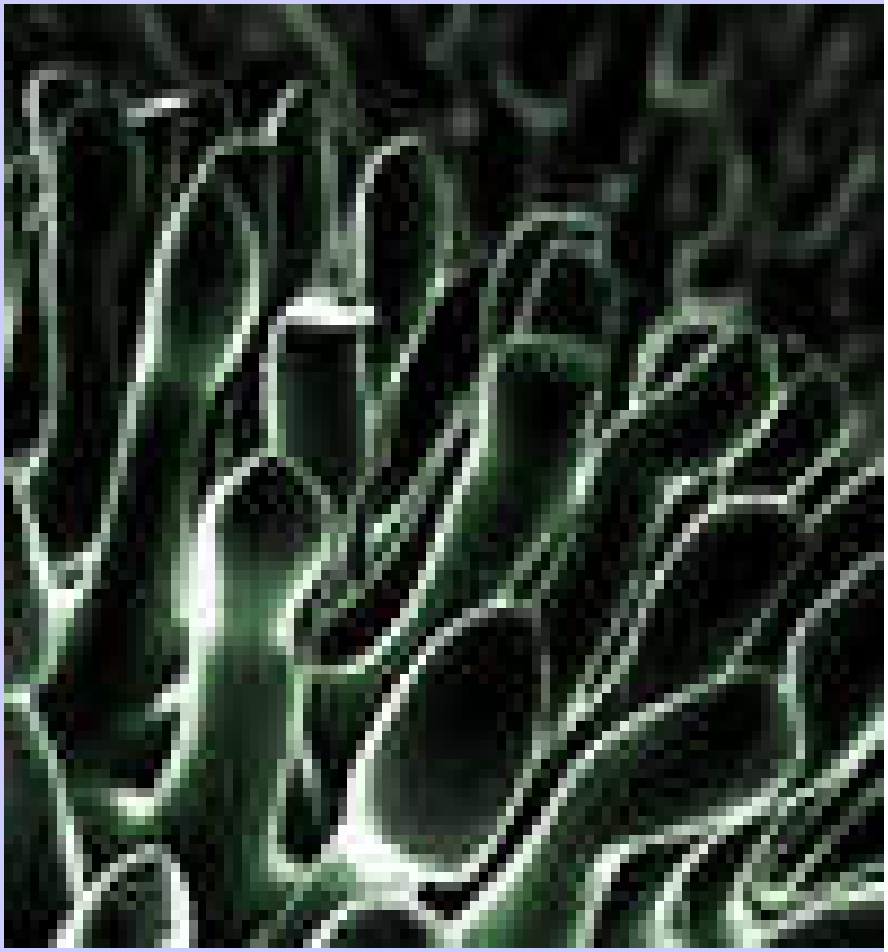
the H & the N



- Typically spherical
  - 50-120 nm diameter
- Single-stranded RNA virus
- Genome in 8 segments
  - Encode key surface glycoproteins
  - Haemagglutinin (HA) 血凝素
  - Neuraminidase (NA) 神經胺酸

Avian Influenza virus coating

- Note viral capsid with protein spikes
- two principal surface glycoproteins, haemagglutinin (HA) and neuraminidase (NA)
- HA allows the virus to bind to host membrane
- NA is an enzyme promoting dispersion of budding new virions



Flu Haemaglutinin

- 15 subtypes identified allow for…
- Variability in human infection
  - H1, H2, & H3 pandemic potential
  - H5 poor human-human spread
  - H7 birds not humans
- Different possible host species
  - H1: birds, pigs, & people
  - H5: birds & people

Antigenic Drift & Shift

- Influenza viruses change regularly
- Usually “antigenic drift” 抗原漂移 (輕微改變)
  - “Normal” mutations
  - Changes in surface glycoprotiens but can cross-react with existing immunity
- Sometimes “antigenic shift” 抗原轉移 (重大改變)
  - Segments can rearrange when co-infecting same cell
  - Reassortments of genes with very different strains can profoundly change infectivity

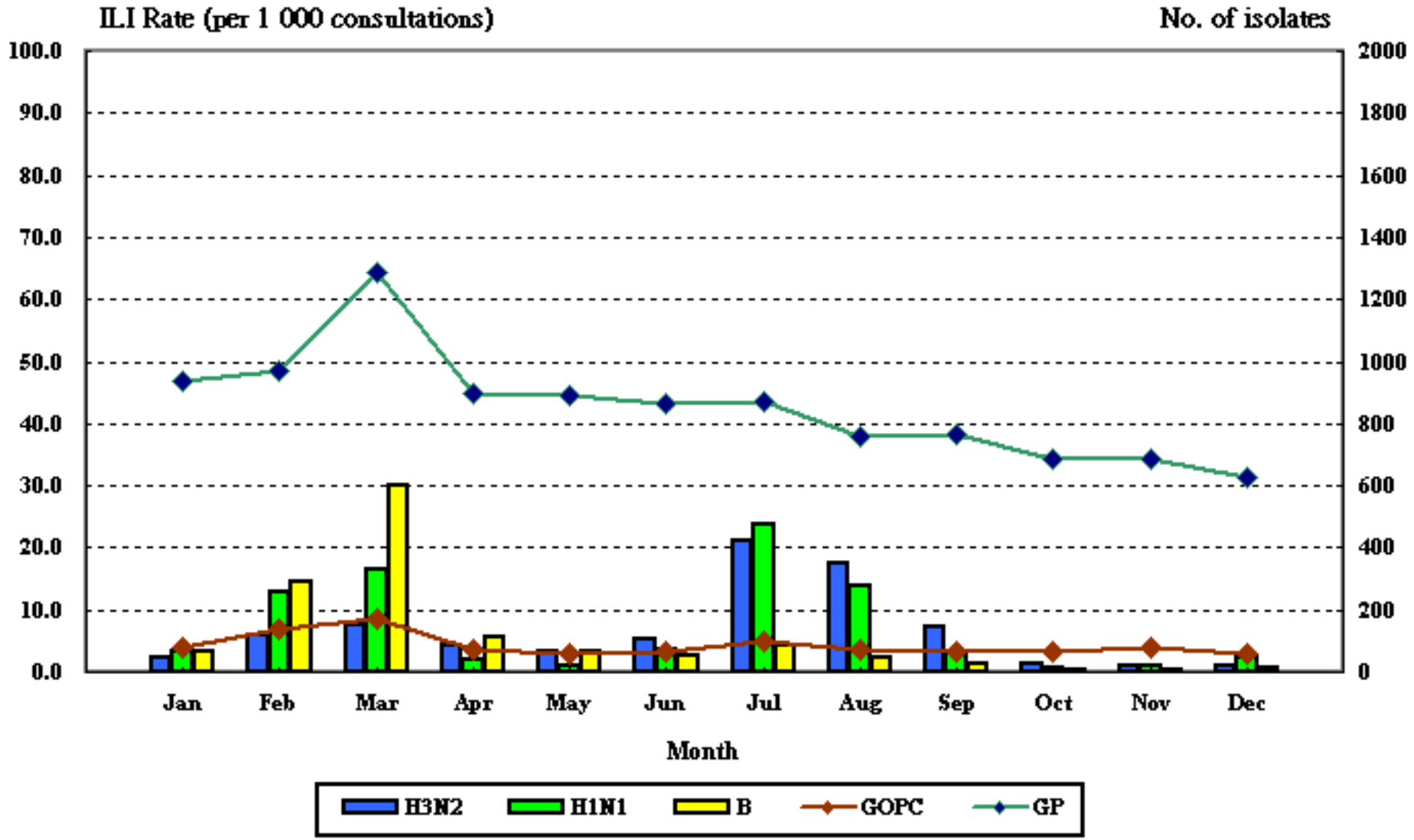
Droplet vs. Aerosolized Spread

- Droplet transmission 小滴
  - Respiratory secretions >5μm
  - Fall out of air quickly with **~3 feet**
  - Easier to protect against?
- Aerosolized transmission 霧化
  - Respiratory secretions <5μm
  - Can **stay airborne for hours**
- Both can occur for any one disease

Avian Influenza H5N1

- Hong Kong, 1997
  - 18 people hospitalized; 6 die
  - Hundreds likely ill
  - Young adults affected
- Infection directly from chickens
  - Most avian flu viruses do not directly infect humans
- No person-to-person transmission

Consultation rate of influenza-like illness and double peaks of influenza isolates, 2008 (from CHP.gov.hk)



Workplace preparedness

- To continue to disseminate health information useful for the prevention of novel influenza to employers and employees
- people with fevers should not go to work, and that employers should not require any employee who has a fever to work.
- To remind employers of the importance of taking measures to prevent avian / pandemic influenza during workplace inspection visits and outreach occupational health talks.
- To appeal to employers' associations, trade unions, industry-based committees and human resources managers' clubs to seek their assistance
- in reminding employers and employees of the need to exercise continued vigilance

(Labour Department, Department of Health)

Private Property Management

- step up cleansing and other avian influenza/pandemic influenza prevention measures. *(Home Affairs Department)*
- issue guidelines on inspection and disinfection of common parts of buildings. *(Home Affairs Department)*
- to give advice on proper cleansing and maintenance of buildings. *(Home Affairs Department)*
- To continue to follow up the drainage repair works required of the remaining 300 odd private buildings where rectification of drainage defects. *(Buildings Department)*
- To increase public's awareness on the importance of proper maintenance of U-traps and drainage pipes to guard against the spread of infectious diseases. *(Buildings Department)*
- To step up inspection of conditions of drainage pipes in private buildings. *(Buildings Department)*
- To stand ready to deal with any problems relating to the fabric of buildings in collaboration with other government departments, and to take any actions as may be necessary under the Buildings Ordinance.

(Buildings Department)

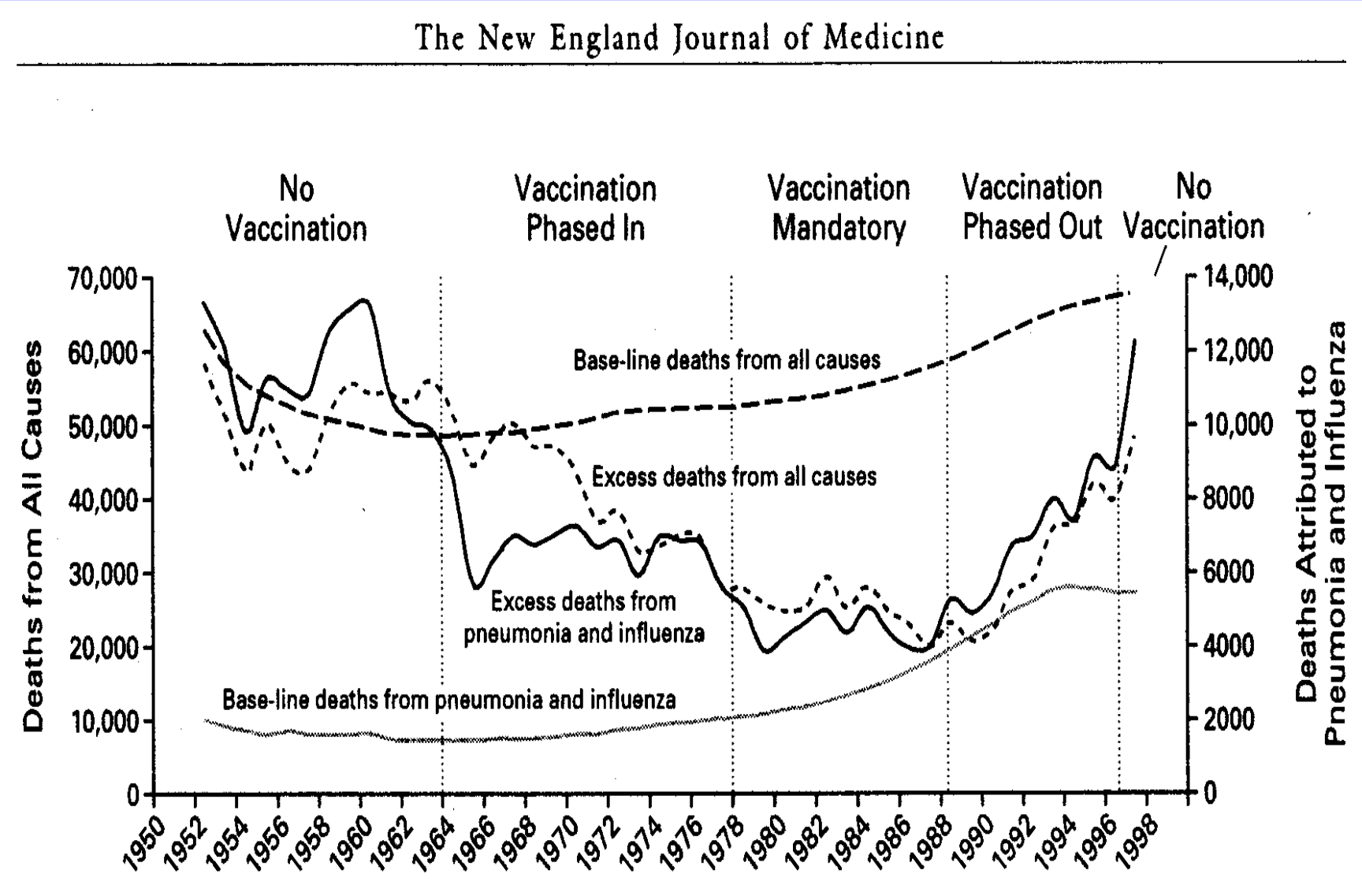
Percentage of Subjects With Solicited Local or Systemic Adverse Events Within 4 Days* of Vaccination From Study FLUARIX-US-001 (Total Vaccinated Cohort)

Adverse Event	**FLUARIX**
	(n = 760)
Local	
Pain	54.7 (51.1-58.3)
Redness	17.5 (14.9-20.4)
Swelling	9.3 (7.4-11.6)
Systemic	
Muscle aches	23.0 (20.1-26.2)
Fatigue	19.7 (17.0-22.7)
Headache	19.3 (16.6-22.3)
Arthralgia	6.4 (4.8-8.4)
Shivering	3.3 (2.1-4.8)
Fever (>100.4℉)	1.7 (0.9-2.9)

Percentage of Subjects With Solicited Local or Systemic Adverse Events Within 4 Days* of Vaccination From Study FLUARIX (Total Vaccinated Cohort)

Adverse Event	FLUARIX		Placebo
	(n = 760)		(n = 192)
Local			
Pain	54.7 (51.1-58.3)		12.0 (7.7-17.4)
Redness	17.5 (14.9-20.4)		10.4 (6.5-15.6)
Swelling	9.3 (7.4-11.6)		5.7 (2.9-10.0)
Systemic			
Muscle aches	23.0 (20.1-26.2)		12.0 (7.7-17.4)
Fatigue	19.7 (17.0-22.7)		17.7 (12.6-23.9)
Headache	19.3 (16.6-22.3)		21.4 (15.8-27.8)
Arthralgia	6.4 (4.8-8.4)		6.3 (3.3-10.7)
Shivering	3.3 (2.1-4.8)		2.6 (0.9-6.0)
Fever (>100.4℉)	1.7 (0.9-2.9)		1.6 (0.3-4.5)

日本的死亡數字:基線與越額
所有死因與因肺炎和流感致死的數字比較1950-1998



Reichert T et al. NEMJ, Vol. 344, No 25. Page 1948

What is the treatment for this new A/H1N1 Flu?

- Hospitalisation for severe cases
- Intensive care unlikely
- Good nursing care
- Assisted respiration unlikely to be needed
- Specific antivirals within 48 hours of disease onset. e.g.: Tamiflu and Relenza
- Contact tracing

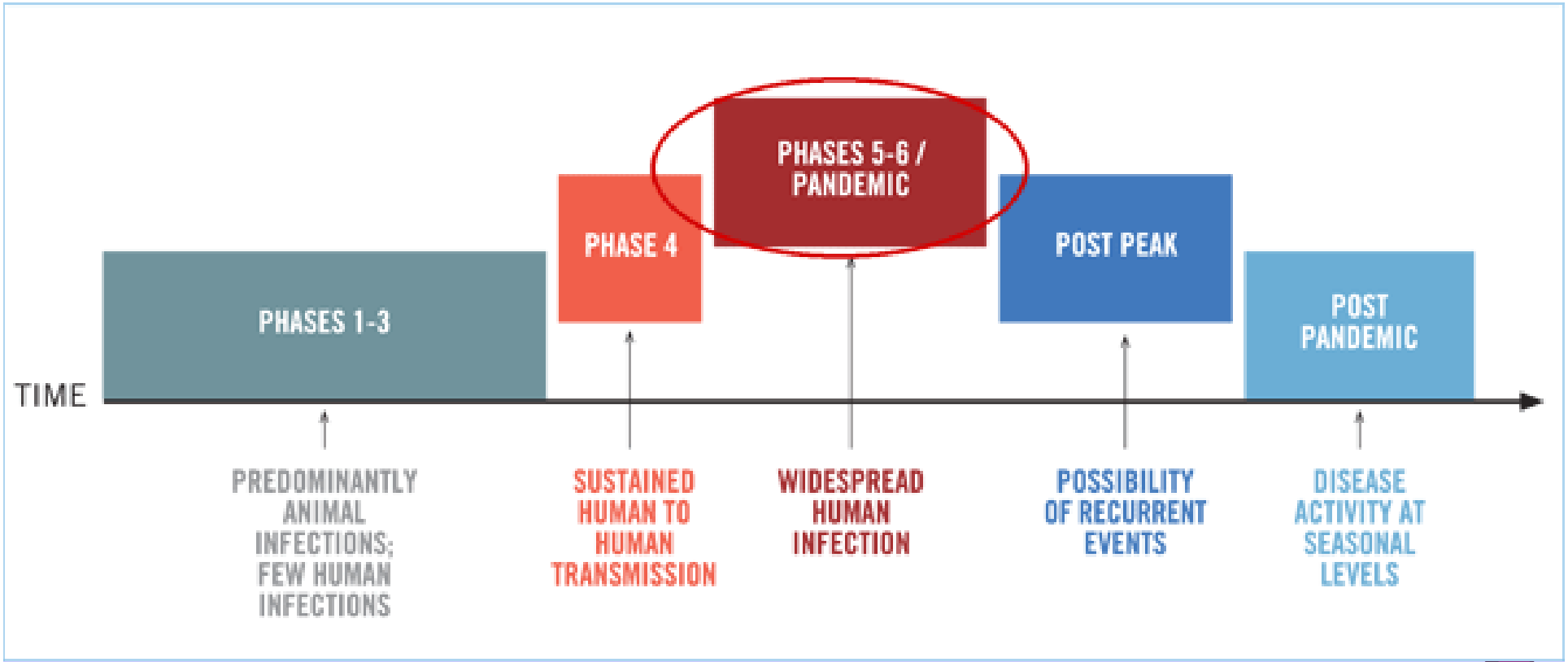
Side-effects of Tamiflu (OSELTAMIVIR)

- nausea, vomiting, abdominal pain, dyspepsia, diarrhoea
- headache, psychiatric effects in children
- fatigue, insomnia, dizziness
- conjunctivitis, epistaxis
- rash; *rarely* hypersensitivity reactions
- *very rarely* hepatitis, Stevens-Johnson syndrome

Neuropsychiatric side-effects of Tamiflu in Japanese children

- May be due to Flu-associated encephalopathy?
- Increased access & use of Tamiflu
- Coincident intensive monitoring
- May be due to different Asian metabolism?
- Cannot conclude that there is a causal relationship

The current WHO phase of pandemic alert is 5



Previous WHO phases of alert

Inter-pandemic phase	Low risk of human cases	1
New virus in animals, no human cases	Higher risk of human cases	2
Pandemic alert	No or very limited human-to-human transmission	3
New virus causes human cases	Evidence of increased human-to-human transmission	4
	Evidence of significant human-to-human transmission	5
Pandemic	Efficient and sustained human-to-human transmission	6

How can I protect myself?

- Good personal hygiene is essential, such as washing hands regularly and covering your mouth when sneezing or coughing.
- Avoid crowded places/ contact with poultry.
- Wear a mask if there is an outbreak or you have any flu-like symptoms and rest at home.
- Adequate sleep and a well-balanced diet are important.
- Food safety：
  http://www.chp.gov.hk/files/pdf/grp-foodpois-en-2004052100.pdf

Avoid touching birds

避免接觸到禽鳥

If you have touched birds, you should wash hands thoroughly

如接觸禽鳥後,
應馬上徹底清洗雙手

Cook poultry and eggs thoroughly

禽鳥和禽鳥蛋要徹底煮熟

Ten things you need to know about pandemic influenza

1. **Pandemic influenza is different from avian influenza.**
2. **Influenza pandemics are recurring events.**
3. **The world may be on the brink of another pandemic.**
4. **All countries will be affected.**
5. **Widespread illness will occur.**
6. **Medical supplies will be inadequate.**
7. **Large numbers of deaths will occur.**
8. **Economic and social disruption will be great.**
9. **Every country must be prepared.**
10. **WHO will alert the world when the pandemic threat increases.**

Thank you!

and

Be prepared