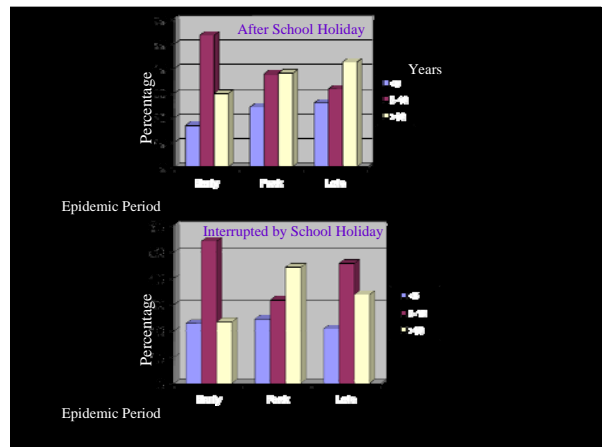
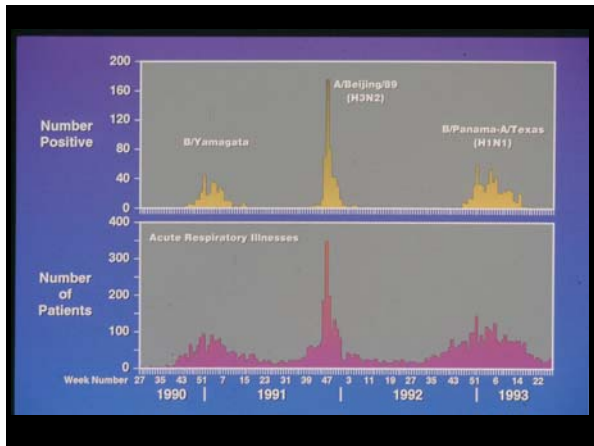


**Shift in Age Distribution of Persons with Culture-Positive Illness Presenting to Sentinel Clinics during Influenza Epidemics, Houston, 1974-1981**

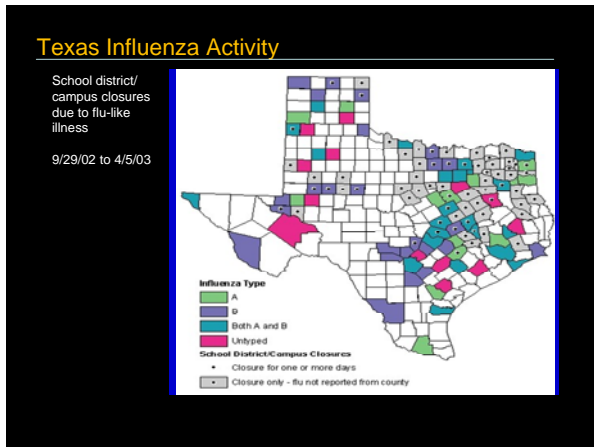
Age (yr)	Epidemic stage		
	Early (%)	Peak (%)	Late (%)
< 5	236(18.4)	489(24.3)	248(24.5)
5-19	687(53.6)	741(36.8)	356(35.2)
≥ 20	359(28.0)	785(39.0)	407(40.3)
Total	1,282	2,015	1,011





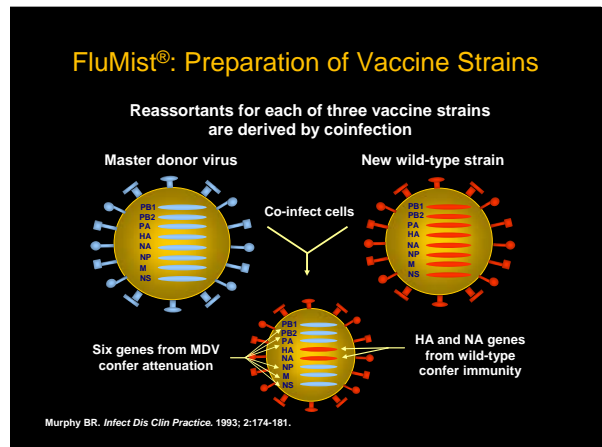
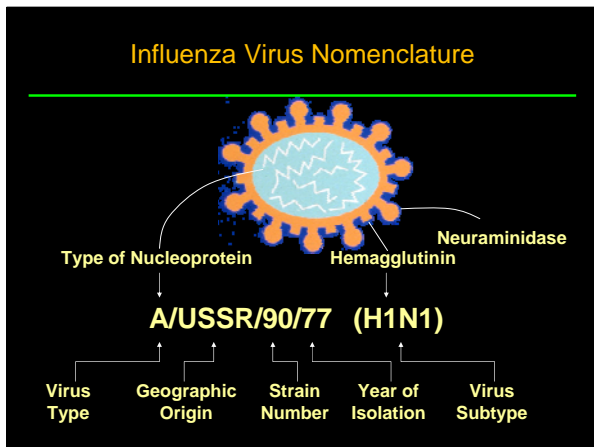
**Influenza Epidemic Disease –Texas, 2003-2004**

Year	Month Epidemic Started	Virus
2000-2001	November 2000	A (H1N1)
2001-2002	January 2002	A (H3N2)
2002-2003	November 2002	B (Victoria Lineage)
2003-2004	October 2003	A (H3N2)



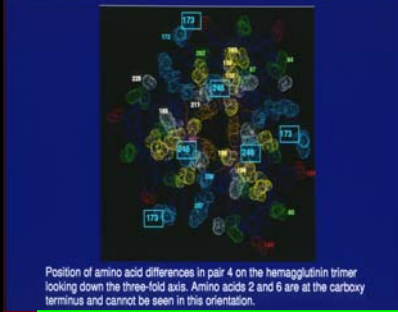
**Hemagglutinin Subtypes of Influenza A Virus**

Subtype	Human	Swine	Horse	Bird
H1	👤	🐷		🐦
H2				🐦
H3	👤	🐷	🐎	🐦
H4				🐦
H5				🐦
H6				🐦
H7			🐎	🐦
H8				🐦
H9				🐦
H10				🐦
H11				🐦
H12				🐦
H13				🐦
H14				🐦
H15				🐦



## Antigenic Variants of Influenza A (H3N2) and Changing Hemagglutinin Amino Acid Positions

Year	Variant
1968-72	A/Hong Kong/68
1972-73	A/England/72
1974-75	A/Port Chalmers/73
1975-76	A/Victoria/75
1977-78	A/Texas/77
1980-83	A/Bangkok/79
1984-85	A/Philippines/73
1985-86	A/Stockholm/85
1987-88	A/Sichuan/87
1989-90	A/Shanghai/87
1991-92	A/Beijing/89
1993-94	A/Beijing/92
1994-95	A/Shangdong/93
1995-96	A/Johannesburg/94
1996-97	A/Wuhan/95
1997-00	A/Sydney/97
2001-02	A/Panama/99
2003-2004	A/Fujian/02
2004-05	A/California/04
2005-06	A/Wisconsin/05



Position of amino acid differences in pair 4 on the hemagglutinin trimer looking down the three-fold axis. Amino acids 2 and 6 are at the carboxy terminus and cannot be seen in this orientation.

Smith et al J Infect Dis 2002;185:980-5.

## ORIGIN OF 20TH CENTURY PANDEMIC STRAINS

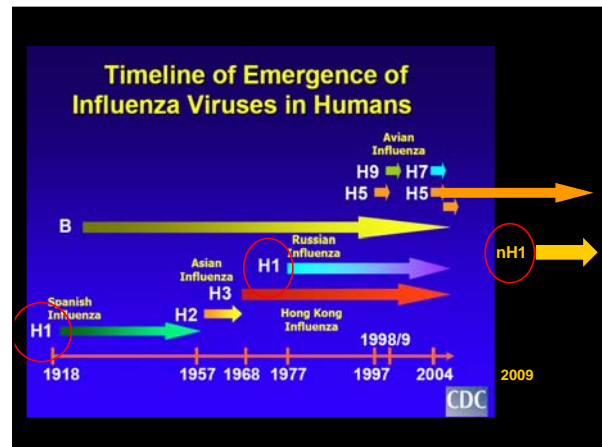
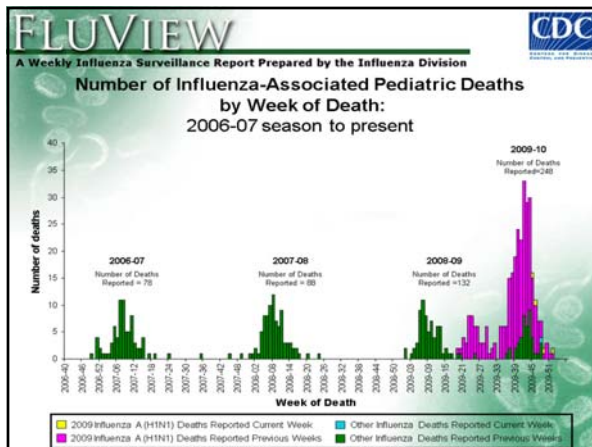
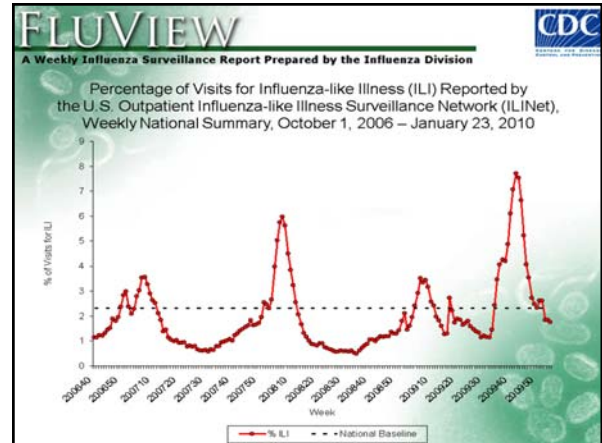
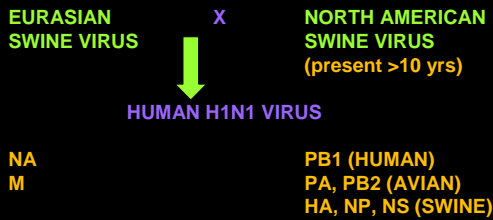
Gene segment	Year		
	1968	1957	1918
PB1	Avian	Avian	Avian
PB2	Human	Human	Avian
PA	Human	Human	Avian
HA	Avian	Avian	Avian
NA	Human	Avian	Avian
NP	Human	Human	Avian
M	Human	Human	Avian
NS	Human	Human	Avian

\*1968 and 1957 viruses were reassortants of human and avian strains.

The 1918 virus was an avian strain that mutated to allow human-to-human transmission.

## THE VIRUS

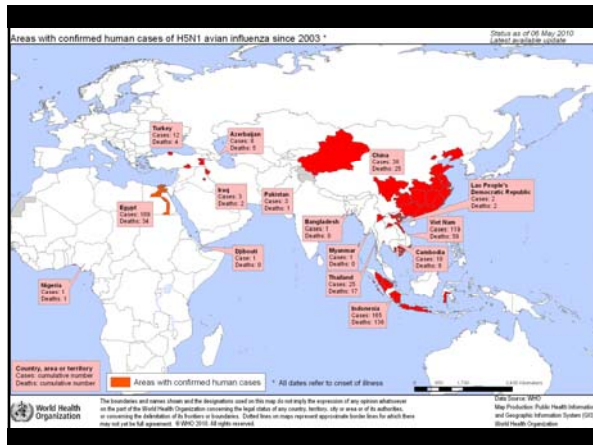
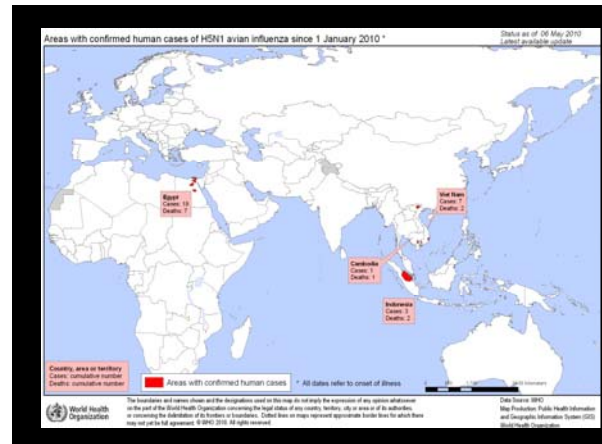
- Several viruses have been sequenced
- Unusual constellation of genes derived from 2 swine viruses has resulted in a virus capable of human-to-human spread



## Annual Impact of Seasonal Influenza in the US: Measuring Disease Burden and Costs

- Annual Disease Burden based on 2003 US population
  - 610,660 life-years lost
  - 3.1 million hospitalized days
  - 31.4 million outpatient visits
- Annual Costs
  - Direct medical costs: \$ 10.4 billion
  - Direct cost and projected lost earning: \$ 16.3 billion
  - Total economic burden (using projected life values): \$ 87.1 billion

NAM Molinari et al., Vaccine 2007;25:5086 (Immunization Service Division, CDC)



## PROBABILITY OF INFLUENZA PREVALENCE FOR 2010-2011

1. Influenza A(H1N1) 2009 (Novel or Pandemic H1N1)
2. Influenza A/Perth/2009 (H3N2)
3. Influenza B lineage not in vaccine
4. Influenza A(H1N1) – “seasonal”
5. Influenza B, vaccine lineage
6. Influenza A/avian(H5N1) – mutated to spread readily in humans

## CONCLUSIONS

- ❖ Virus detection will be the earliest epidemic indicator
- ❖ Culture-based surveillance
  - Need viruses for characterization
    - Antigenic
    - Antiviral Sensitivity
- ❖ Start early with dedicated clinics (no later than 1 October)
- ❖ Maintain high index of suspicion (send suspicious viruses to reference laboratory)