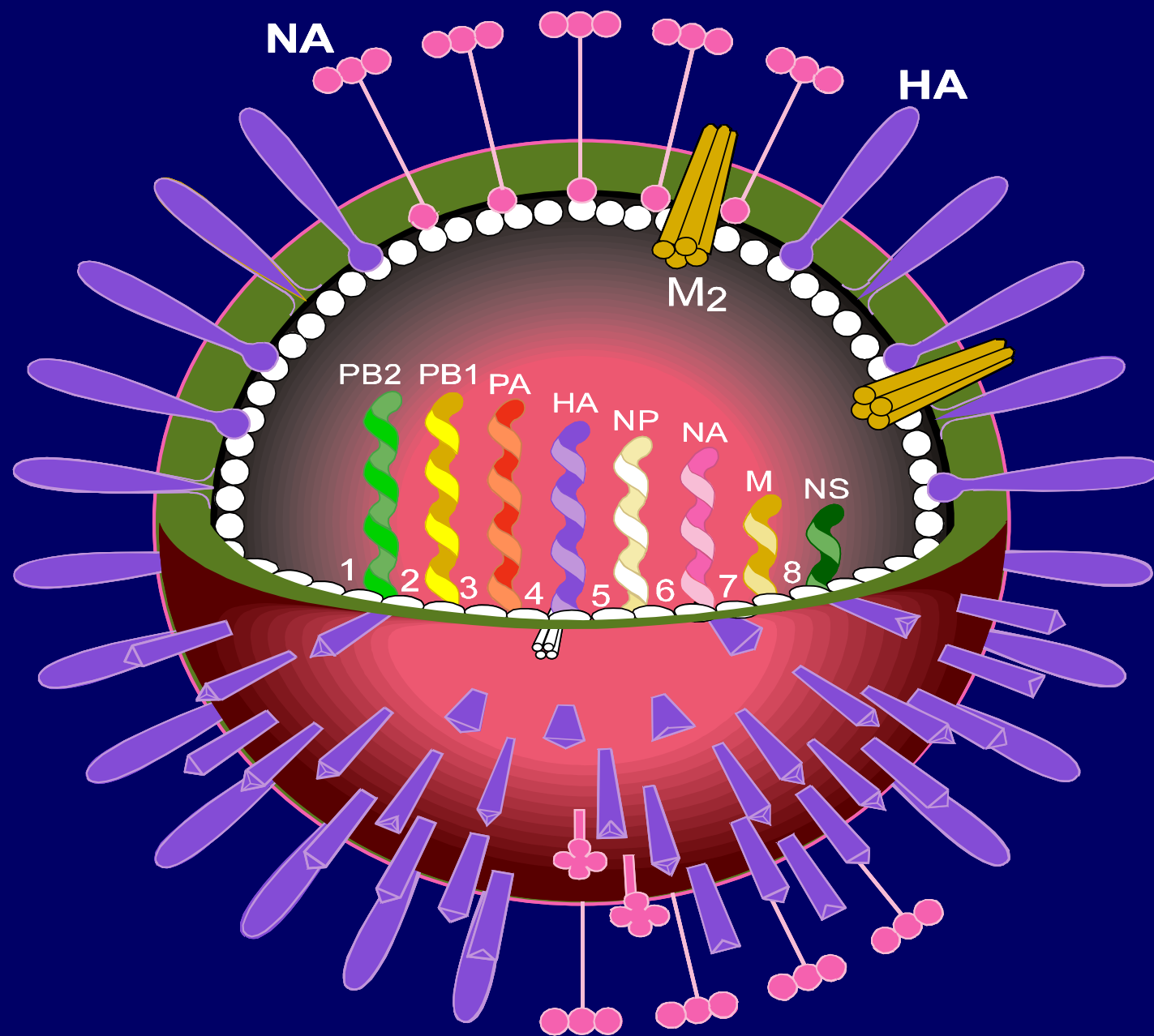
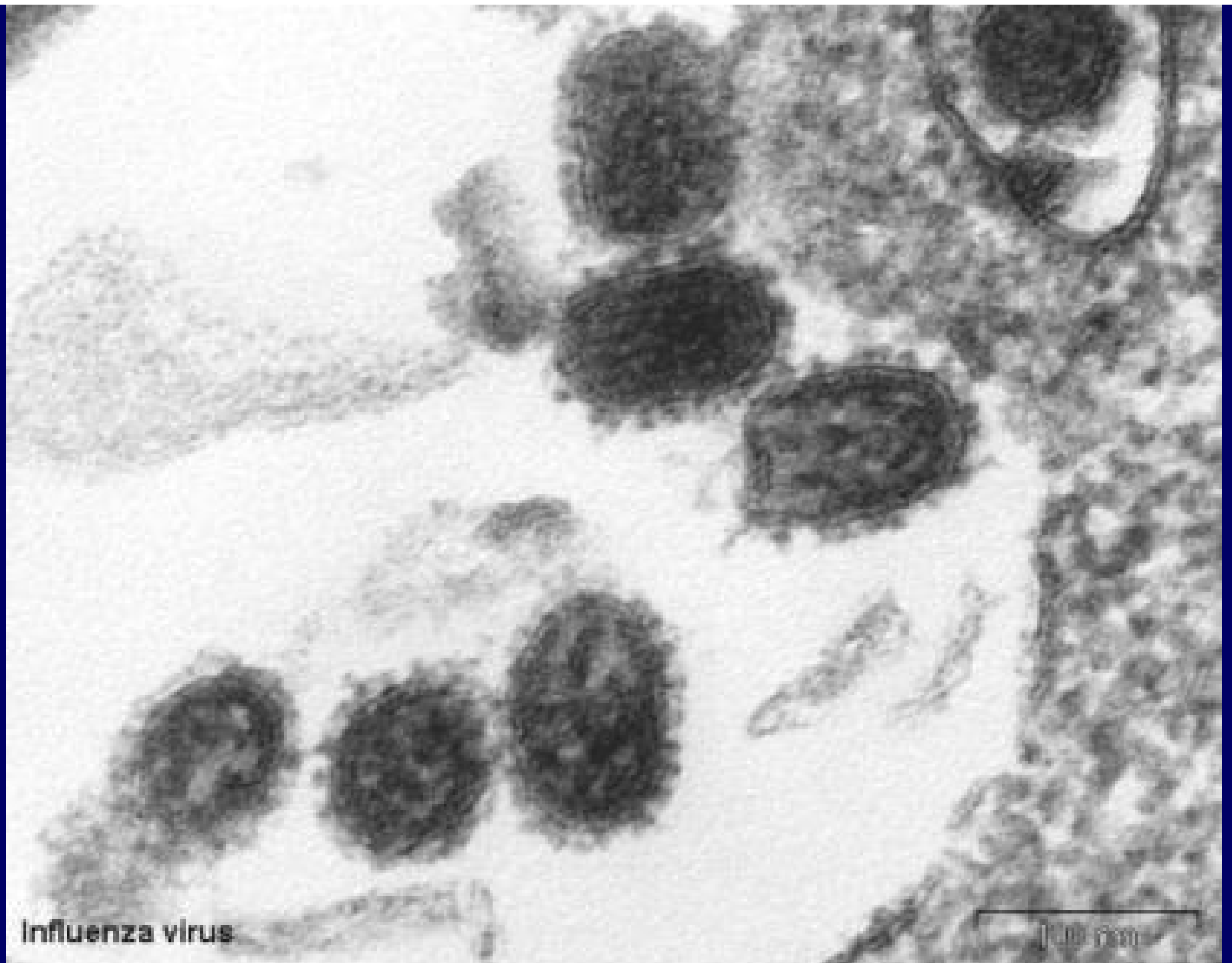


# The 2009 Influenza Pandemic Epidemiologic Challenges

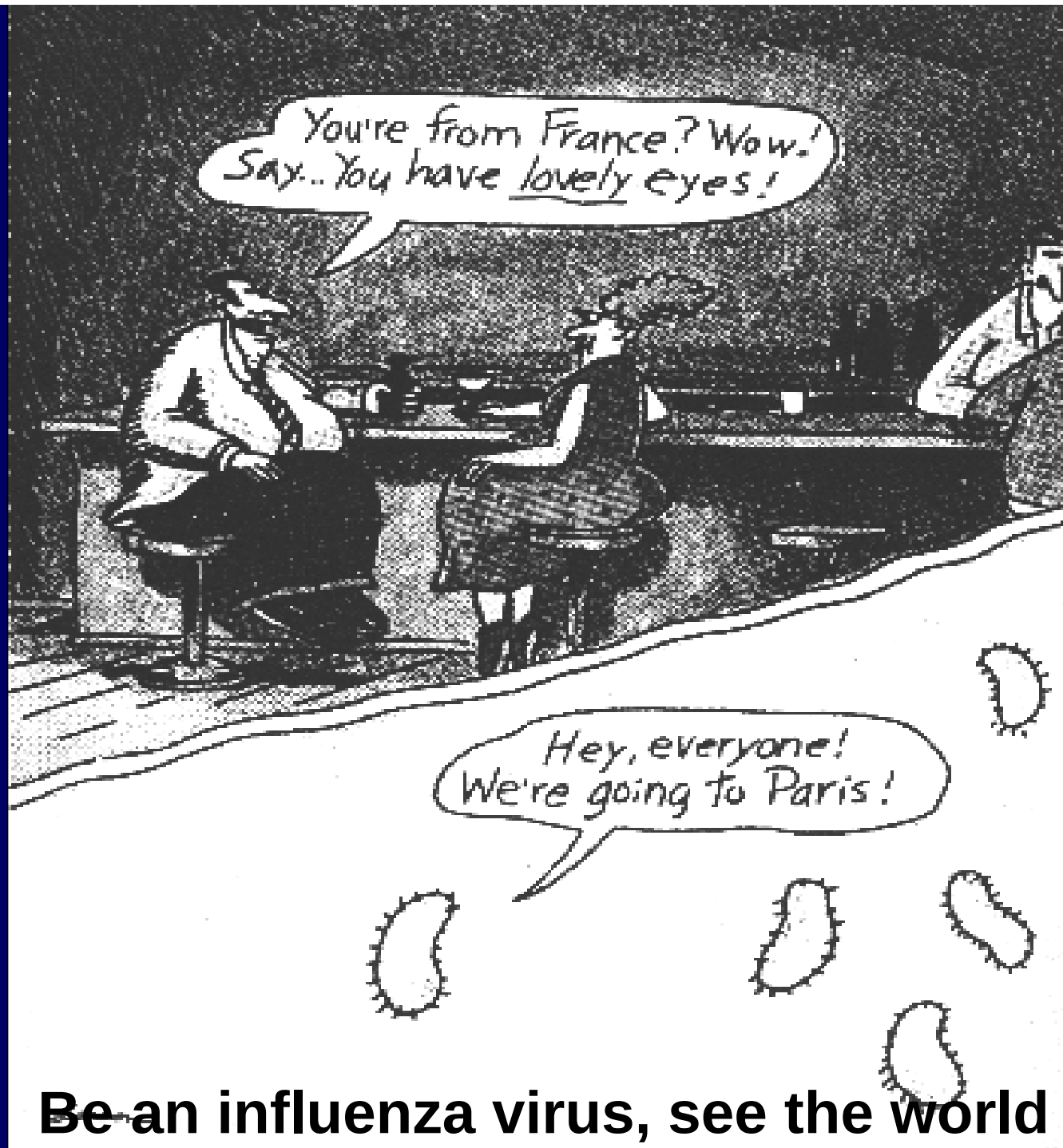
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*Allison McGeer, MSc, MD, FRCPC  
Mount Sinai Hospital  
University of Toronto*

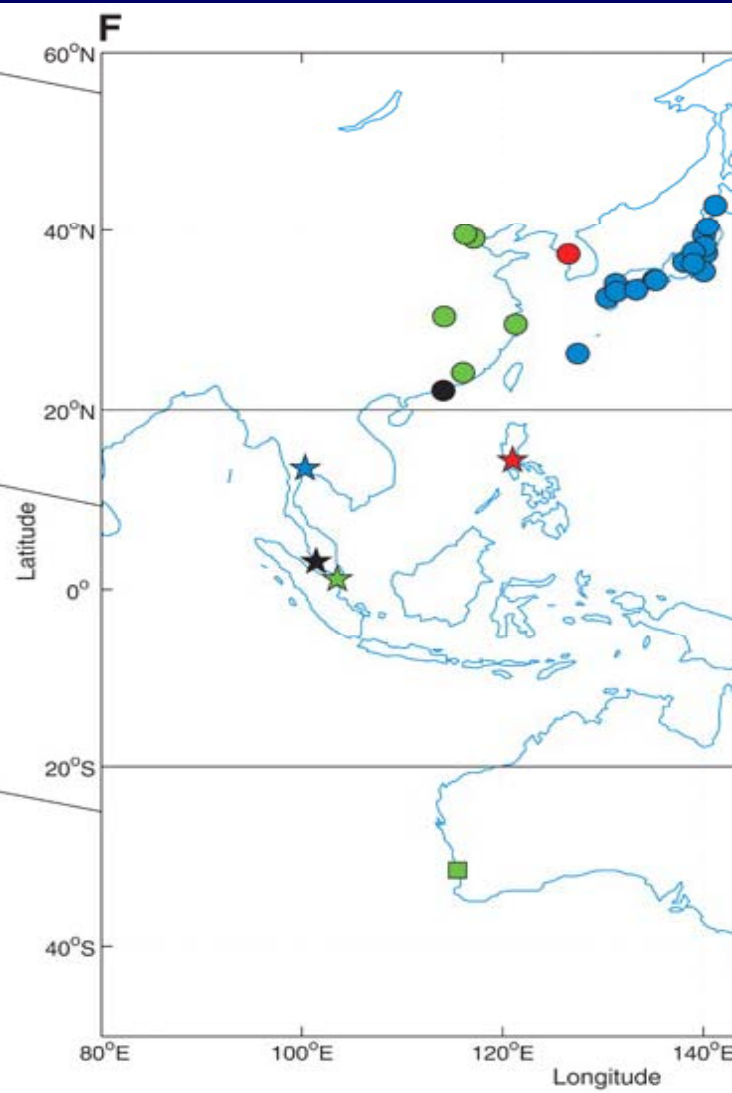
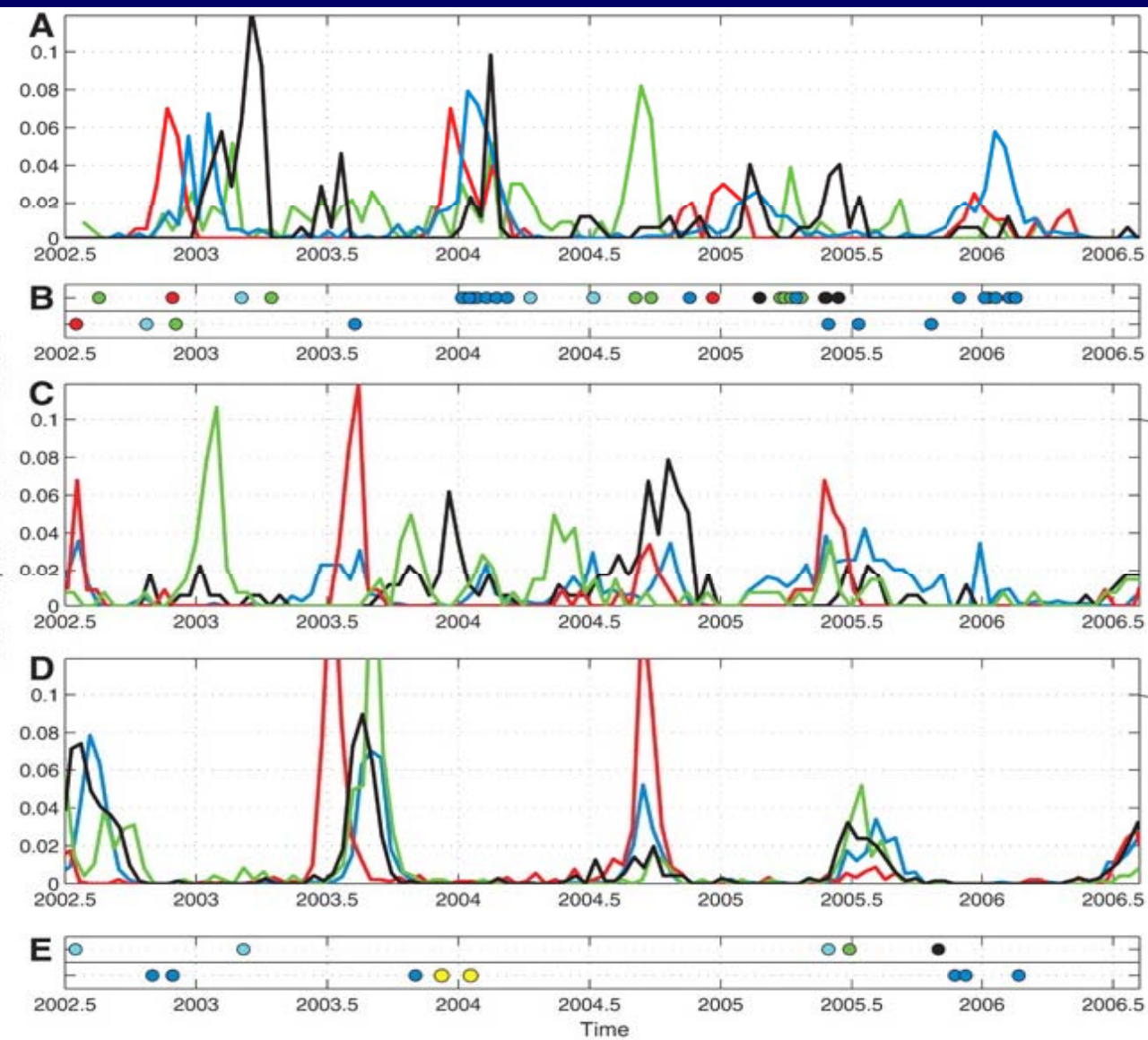






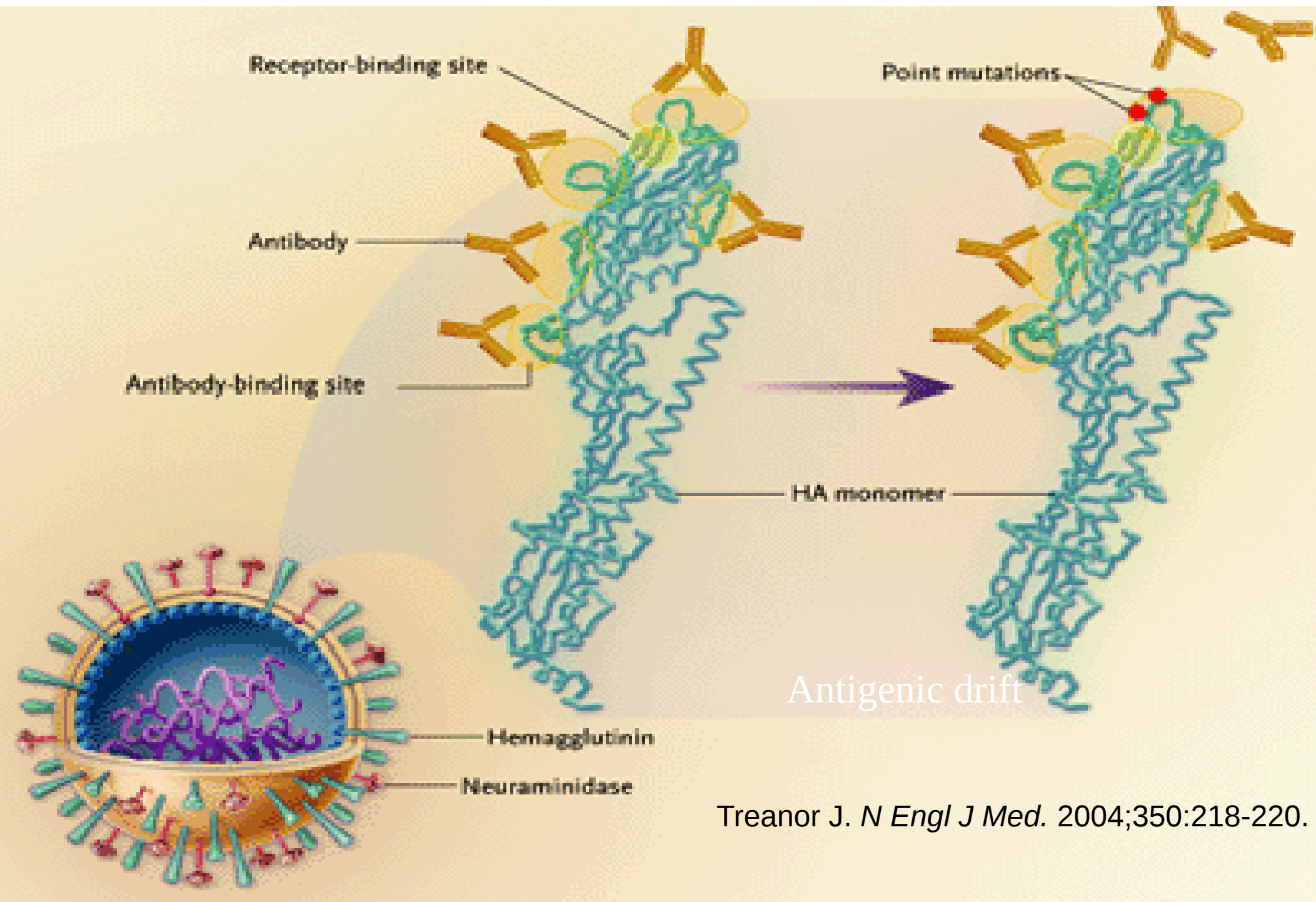


**Be an influenza virus, see the world**



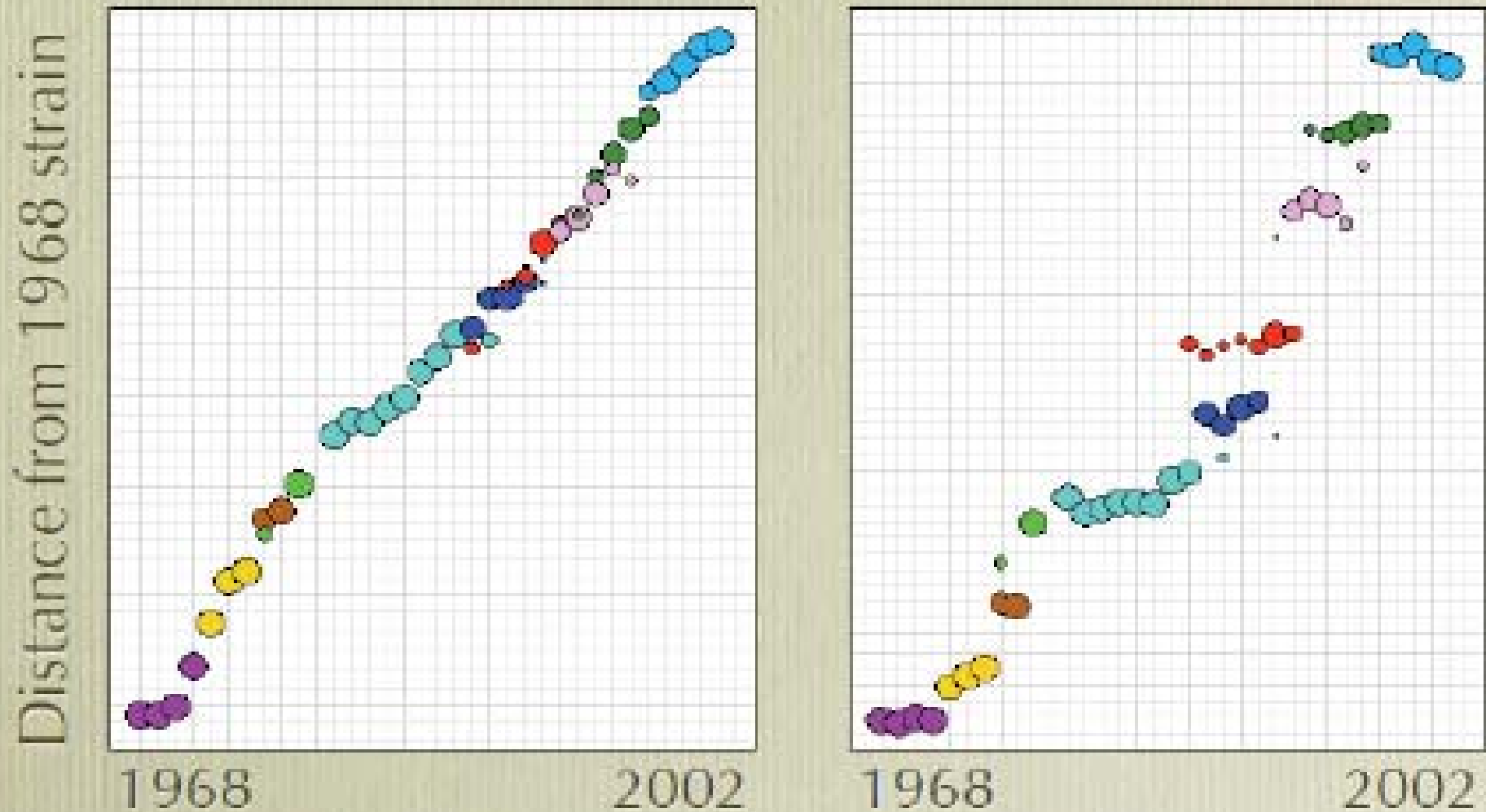
# Changes in Influenza Viruses

- Minor or Seasonal Changes
  - minor changes in A & B strains, same subtype
  - every year while virus is in humans



Treanor J. *N Engl J Med.* 2004;350:218-220.

# Genetic vs Antigenic



Smith et al. 2004

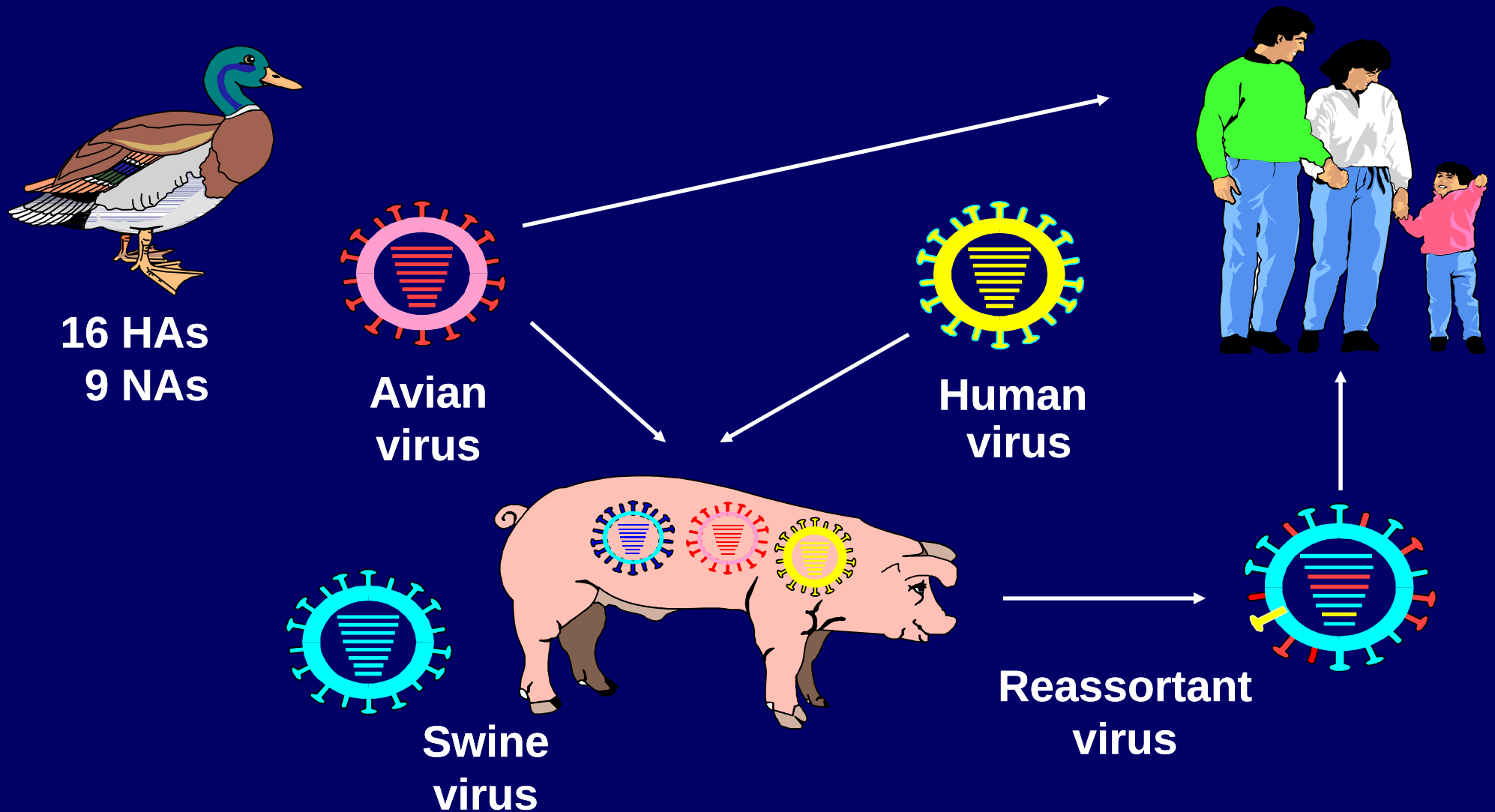
# Annual Influenza in Canada (Pop 33M)

- 5 million (1 in 6) infected per year
- ~50,000 hospitalizations
  - 1% of those >65yrs; 0.5% of those <1yr
- 4,000 - 8,000 deaths (10 in children)
- 7% of children get otitis media
- 1.5 million work-days lost

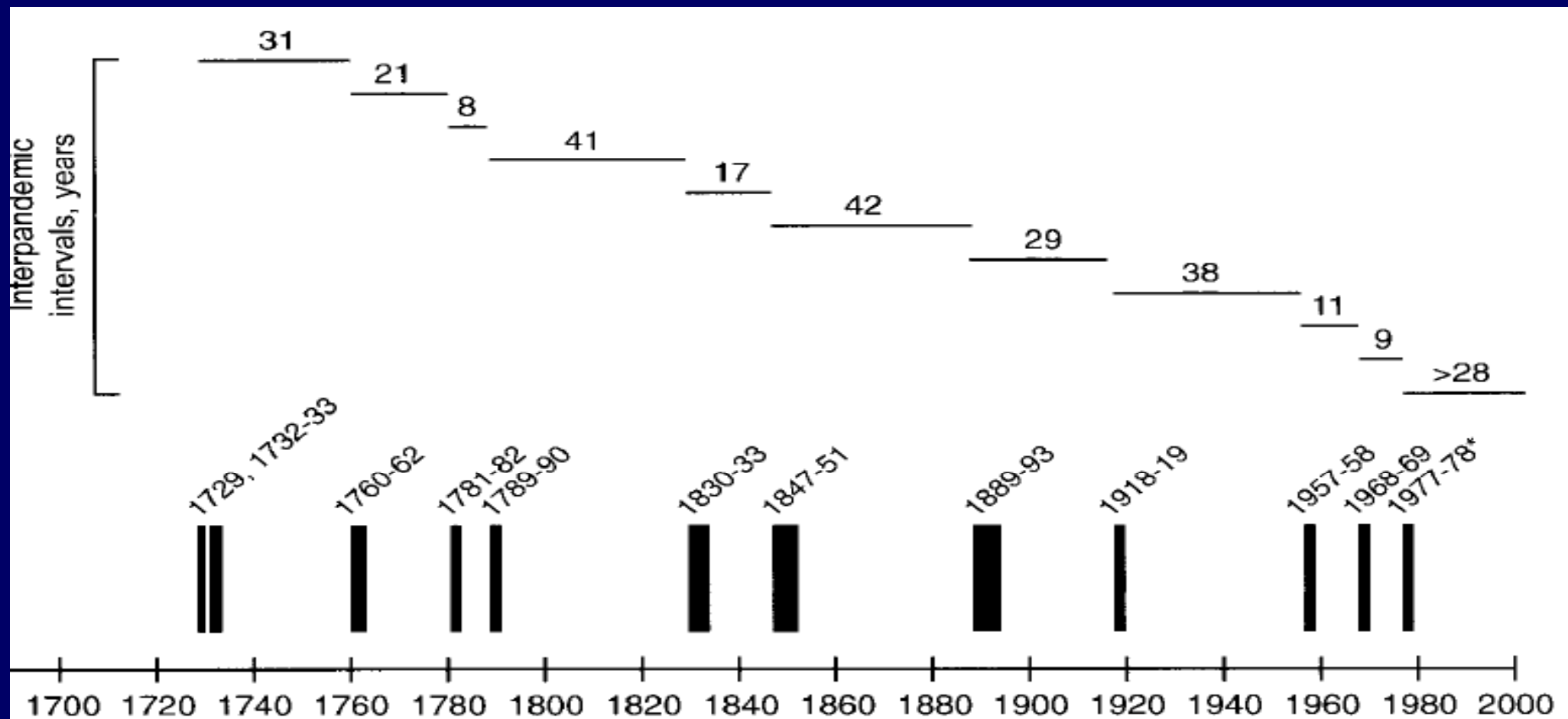
# Changes in Influenza Viruses

- Minor or Seasonal Changes
  - minor changes in A & B strains, same subtype
  - every year while virus is in humans
- Major changes
  - swapping of genetic material between avian/animal strains
  - produce new subtype with changed H and/or N
  - population has no immunity to this new virus

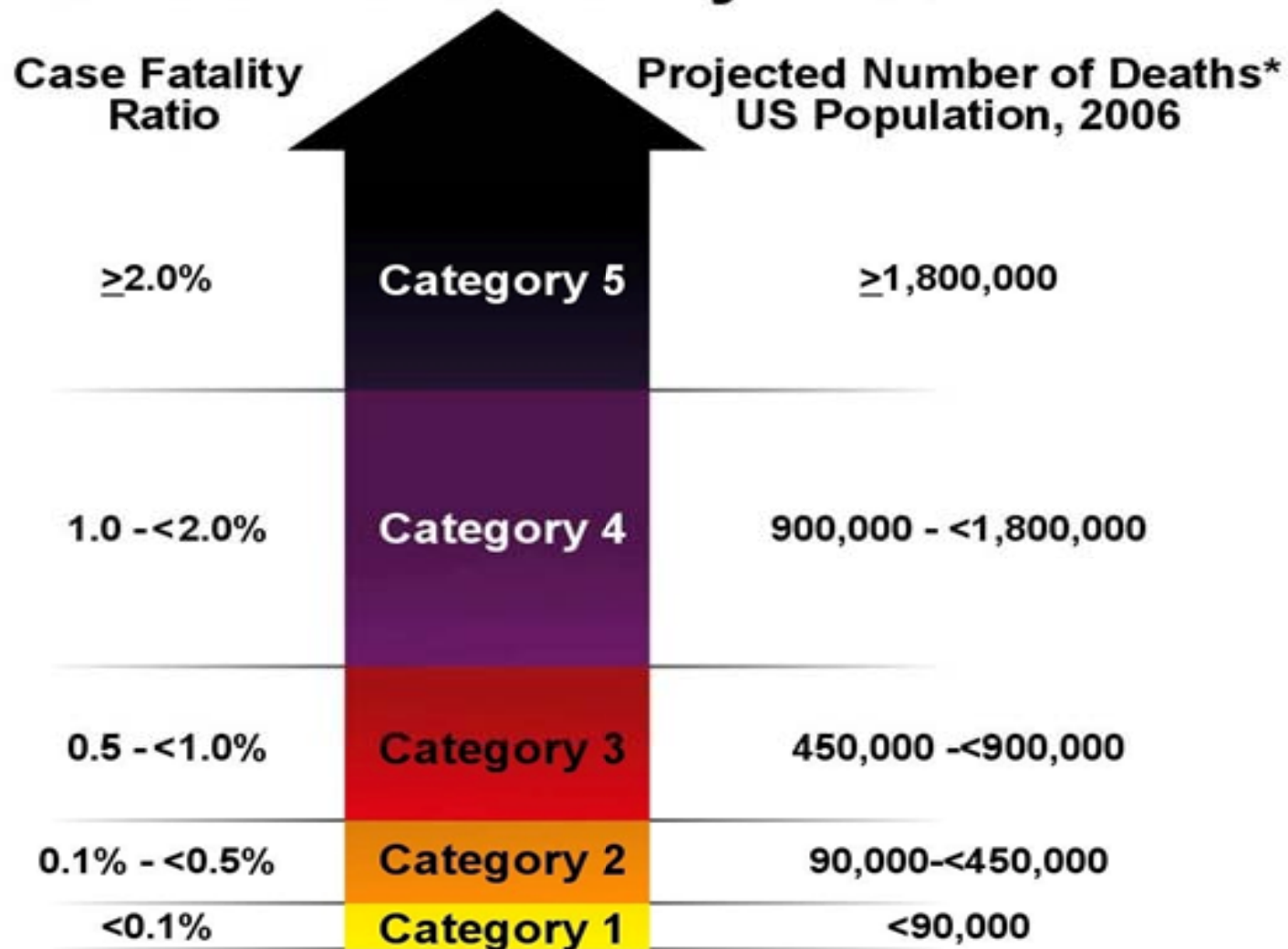
# Evolution of New Viruses



# History

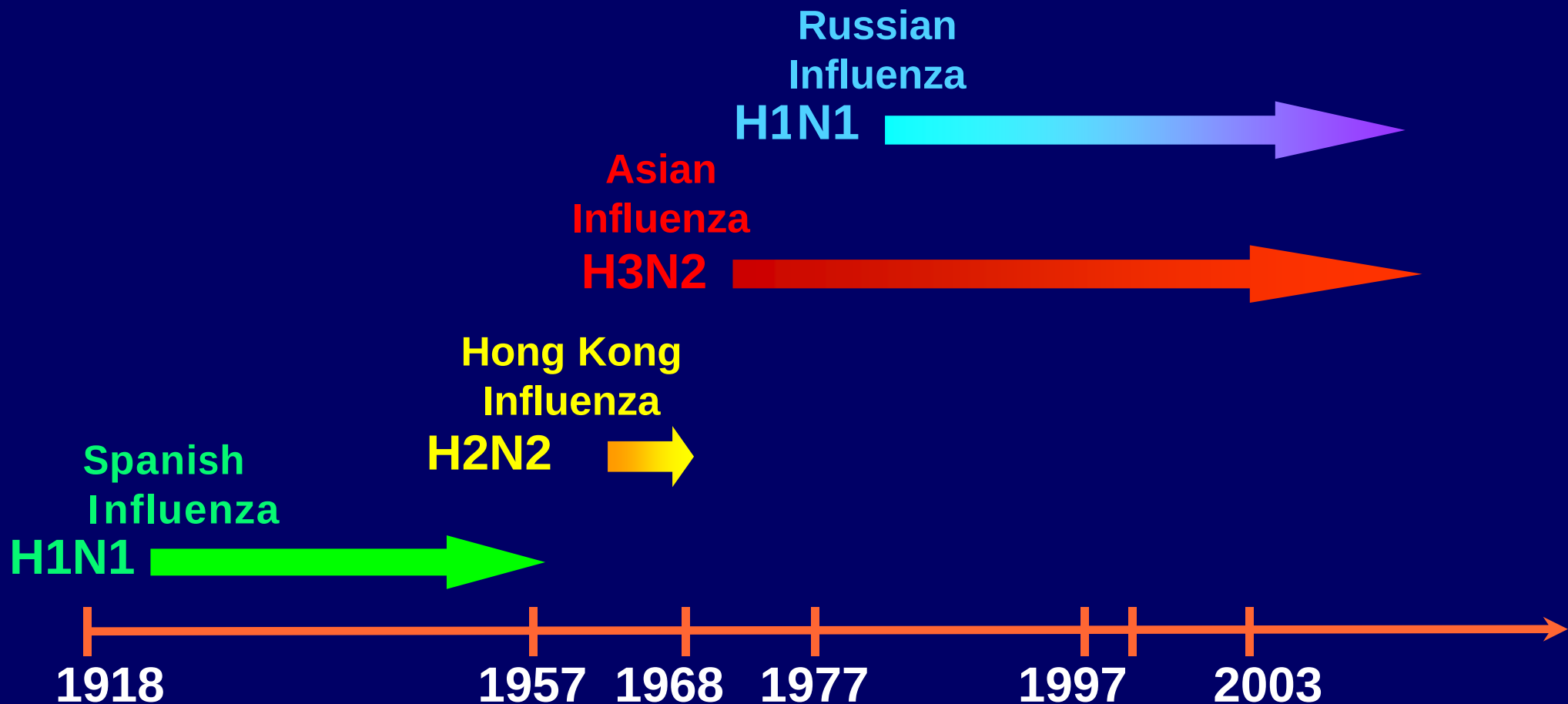


# Pandemic Severity Index



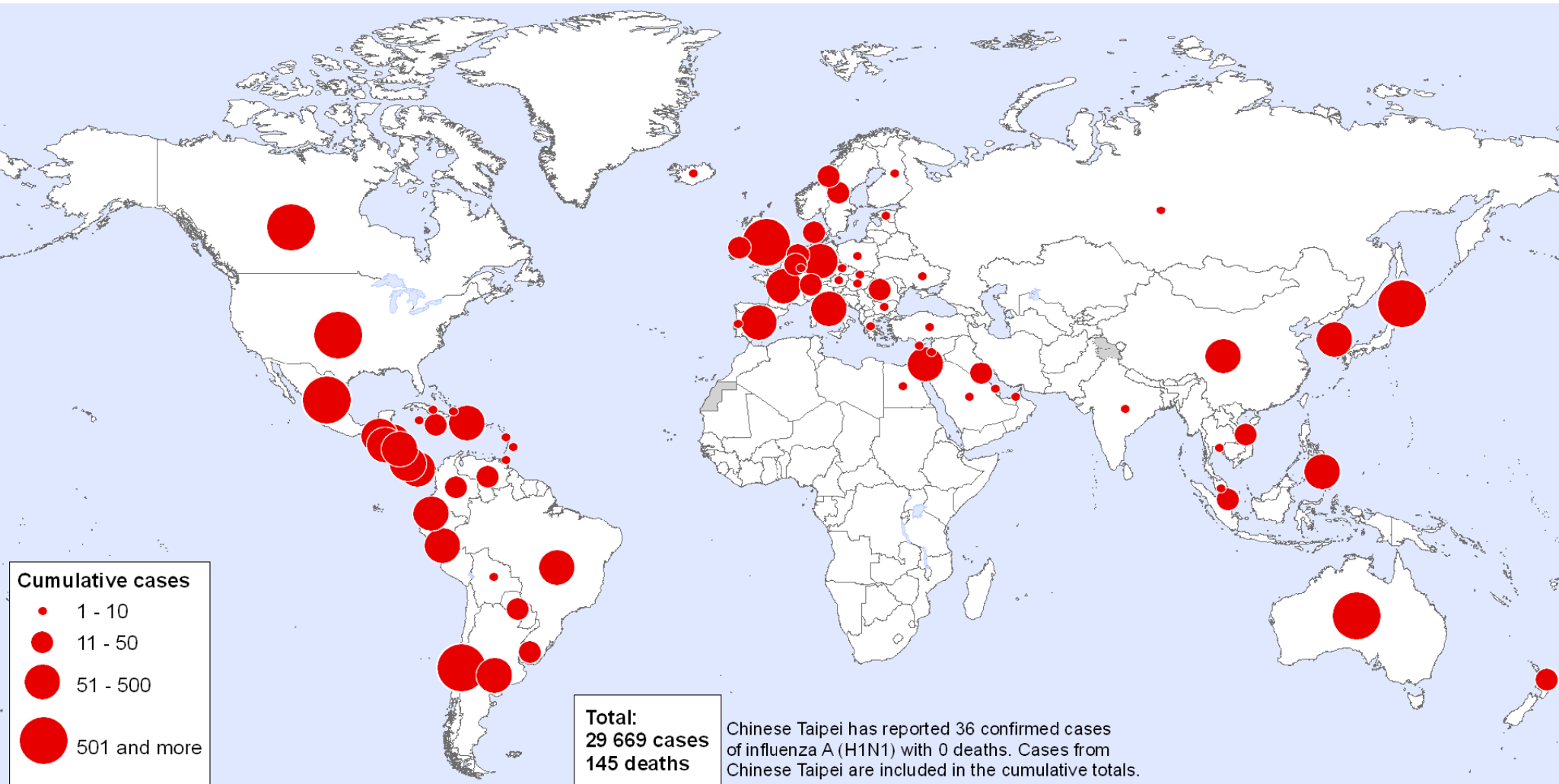
\* Assumes 30% Illness Rate

# Influenza Pandemics, 20<sup>th</sup> Century



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

Status as of 12 June 2009  
06:00 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.

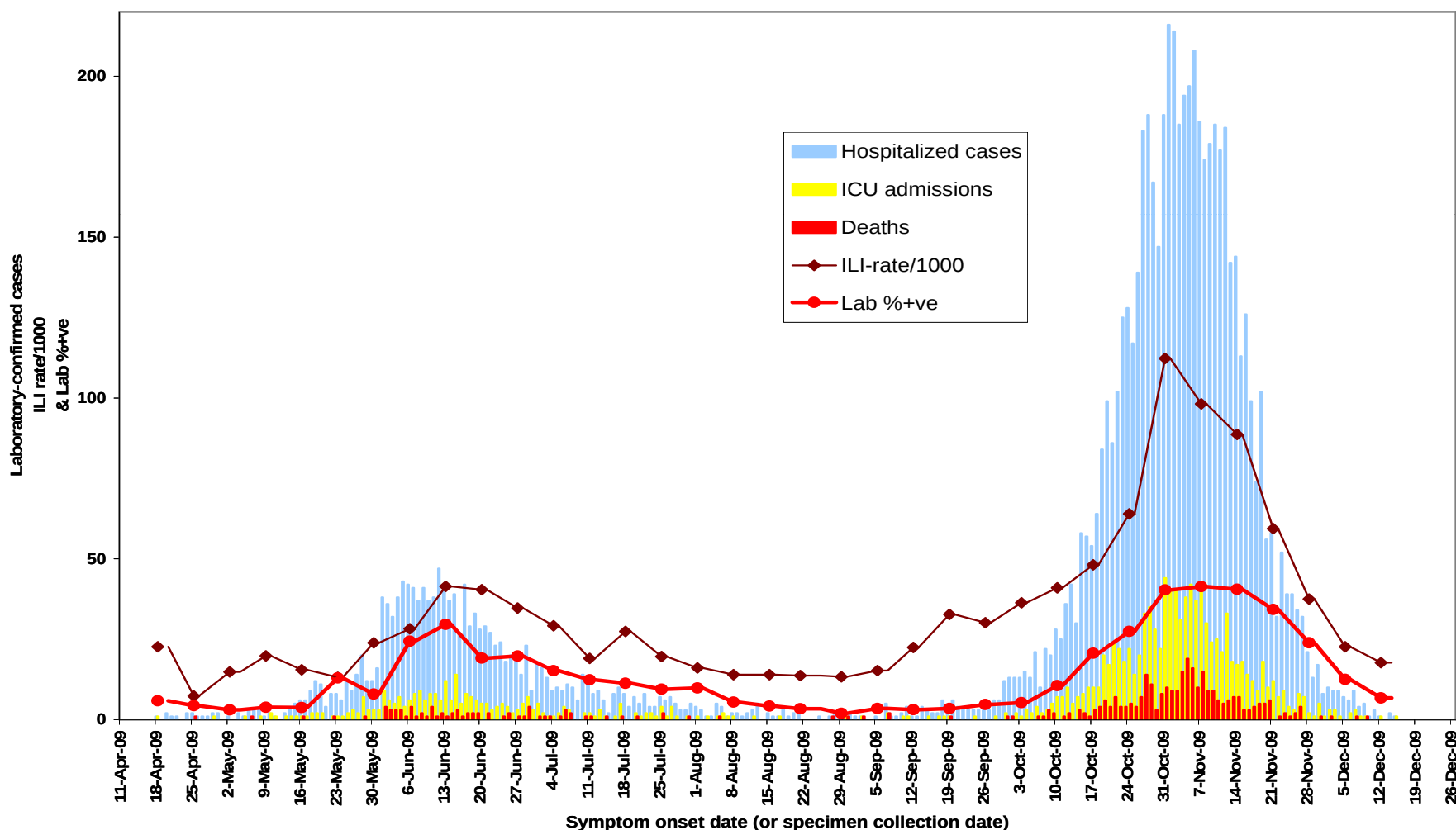
Map produced: 12 June 2009 07:00 GMT

Data Source: World Health Organization  
Map Production: Public Health Information  
and Geographic Information Systems (GIS)  
World Health Organization



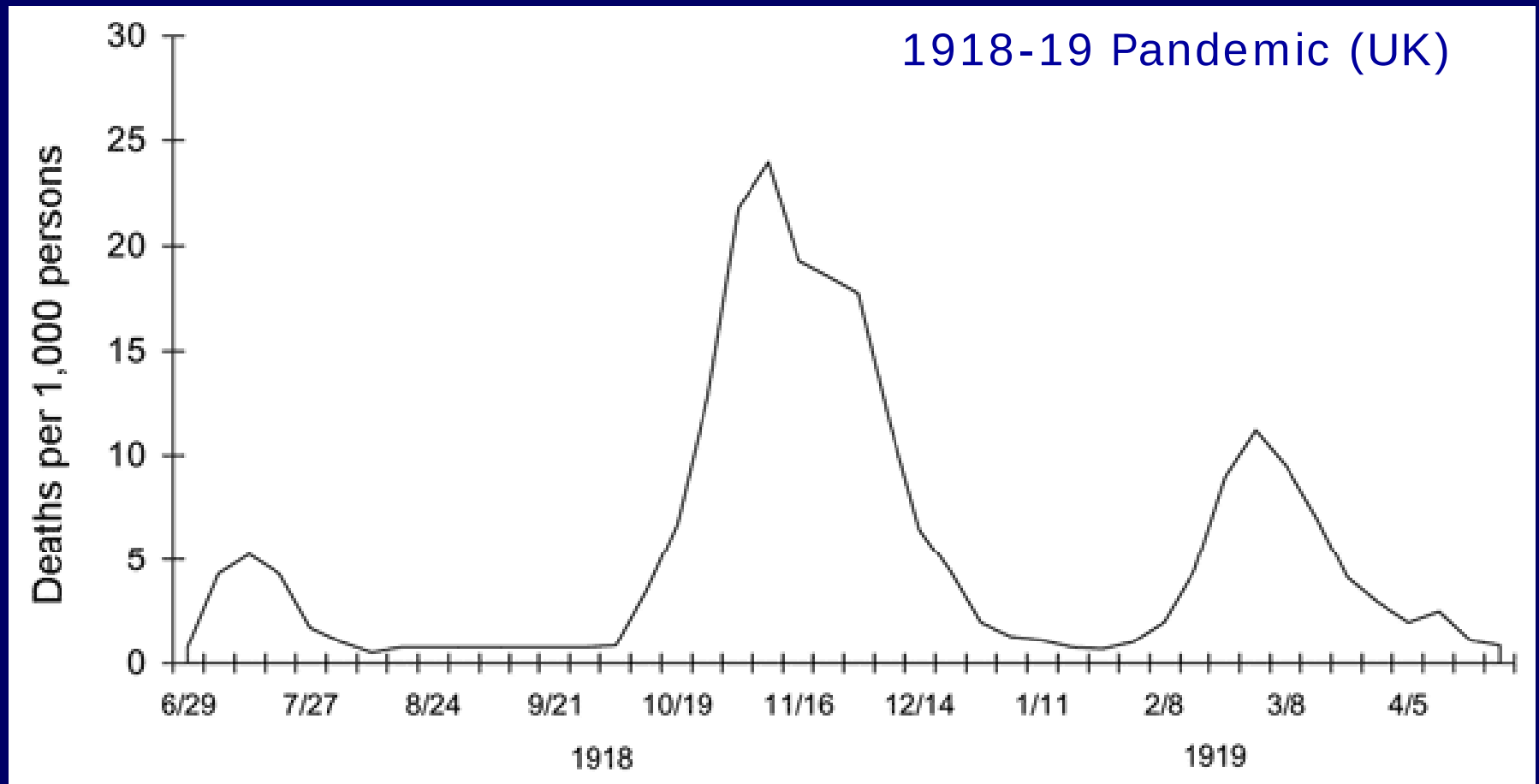
© WHO 2009. All rights reserved

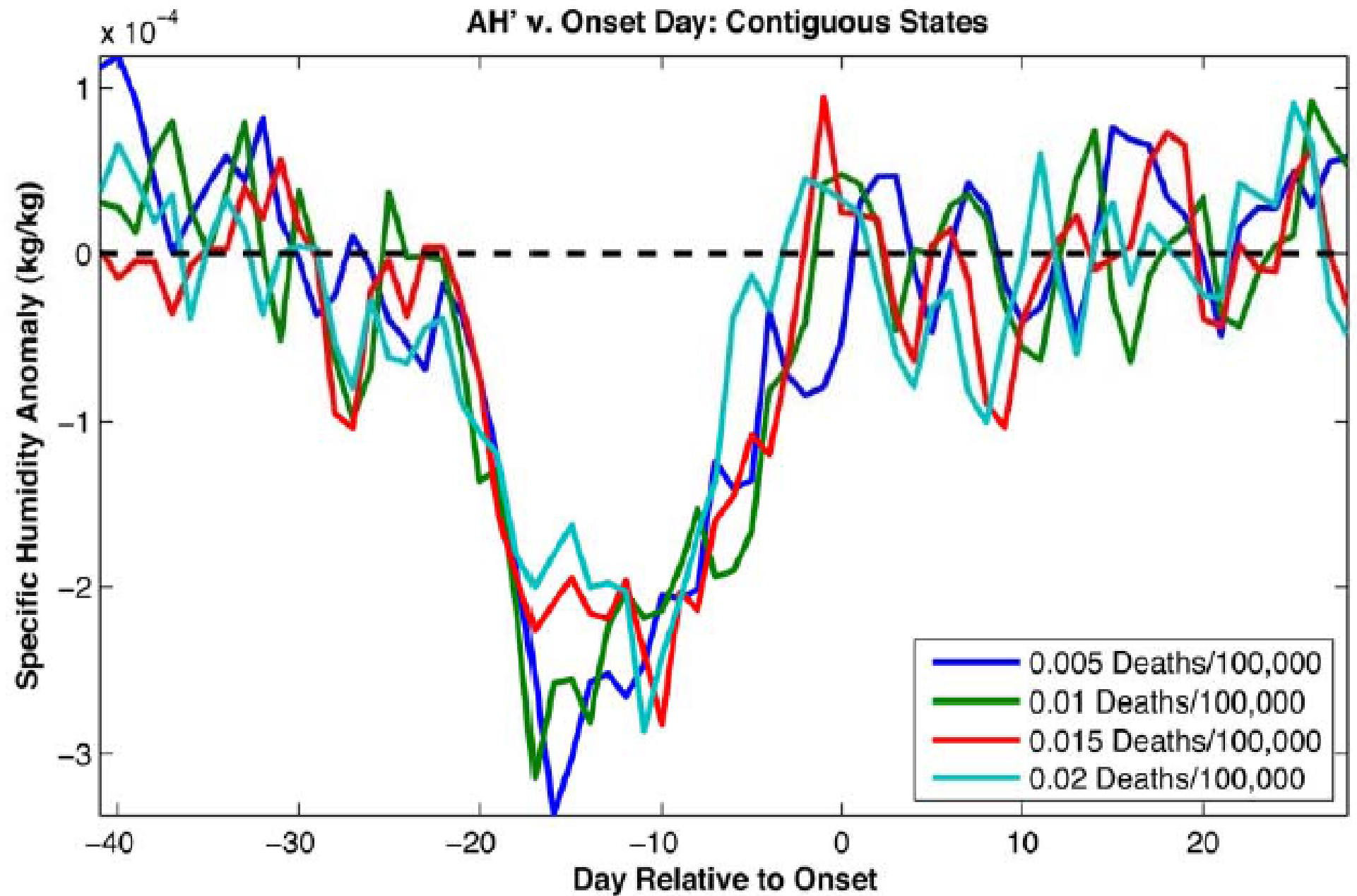
# Epidemic curve of pandemic (H1N1) 2009 hospitalized cases, ICU admissions and deaths in Canada by date of onset, as of December 19, 2009\*



\*Symptom onset date/specimen collection date was available for 98% of hospitalized cases and ICU admissions and 99% of deaths.

# Pandemic waves





Lipsitch, PLoS Biology, March 2010

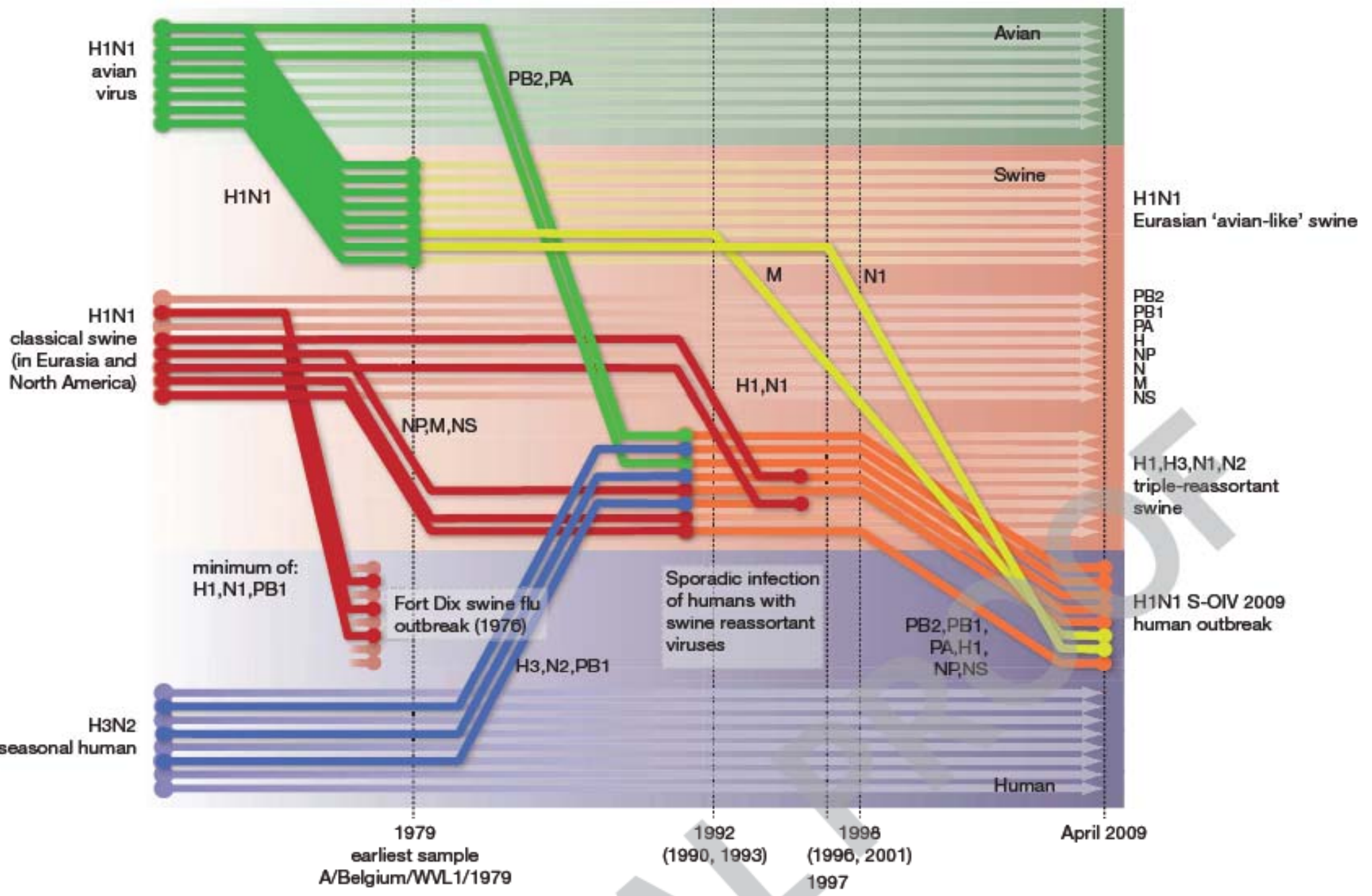
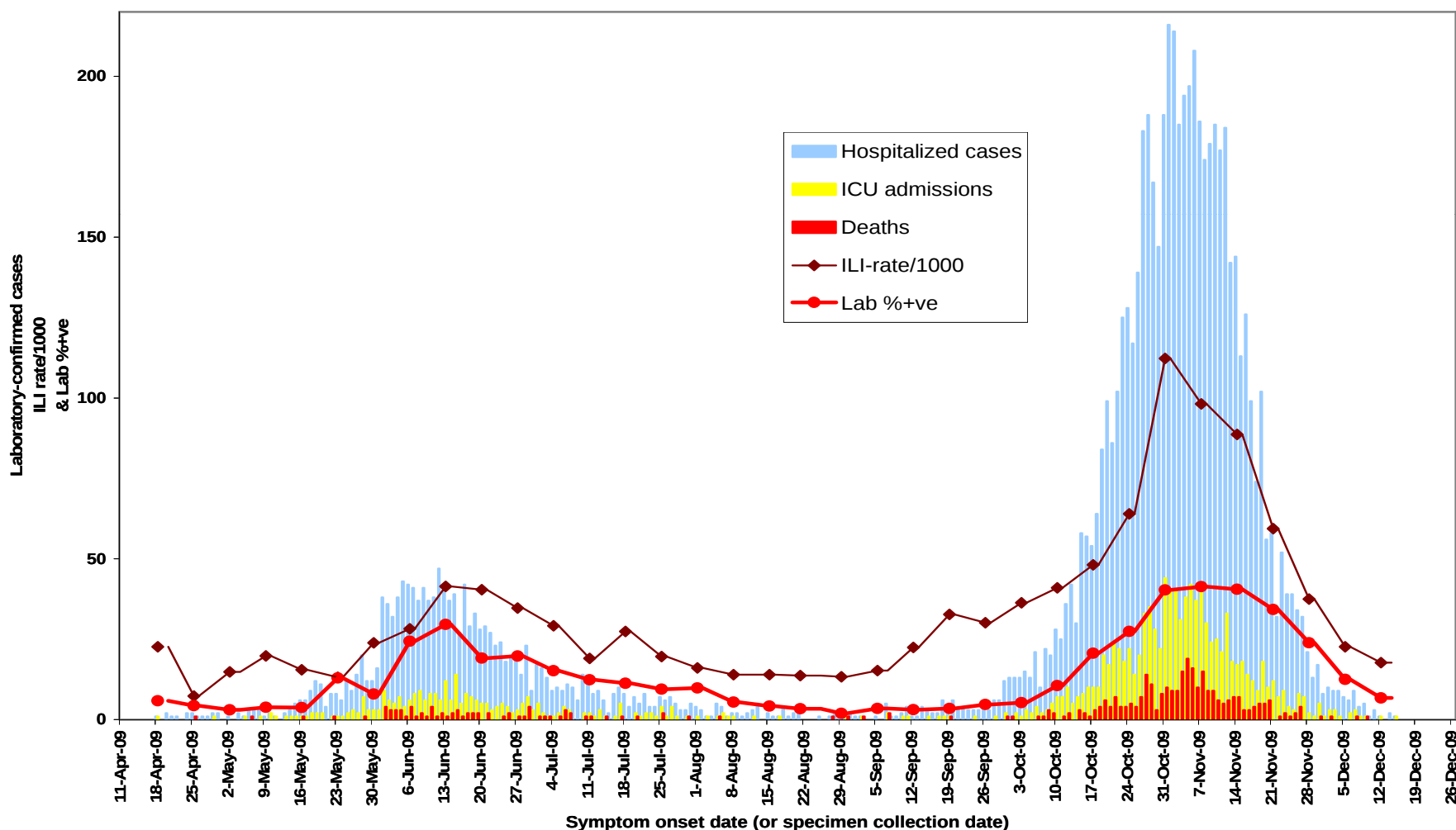


Figure from [Smith et al. 2009 Nature. In press: doi:10.1038/nature08182](https://doi.org/10.1038/nature08182).

# Epidemic curve of pandemic (H1N1) 2009 hospitalized cases, ICU admissions and deaths in Canada by date of onset, as of December 19, 2009\*

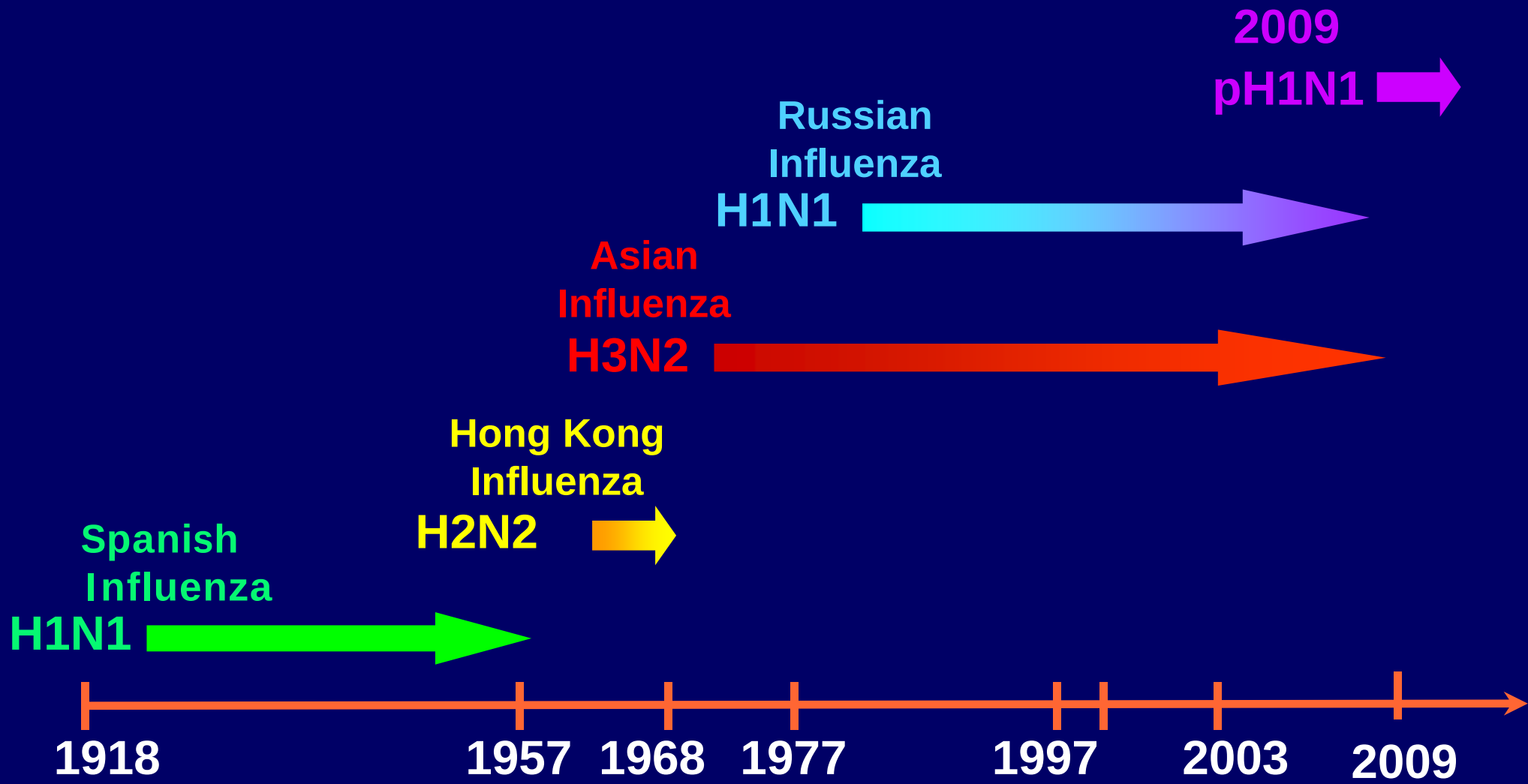


\*Symptom onset date/specimen collection date was available for 98% of hospitalized cases and ICU admissions and 99% of deaths.

# Did control/mitigation measures work?

- Reducing transmission
  - Japan and first wave
- Early antiviral therapy
  - UK

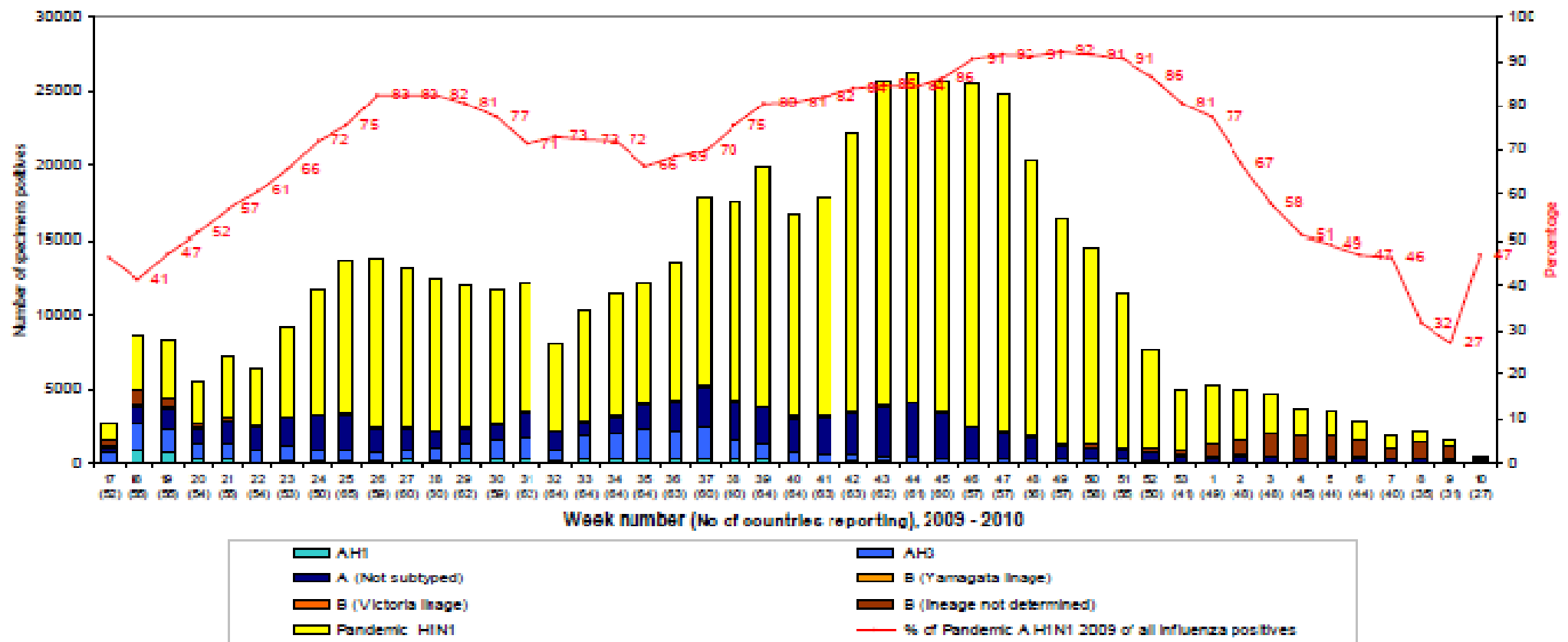
# Influenza Pandemics



# Global circulation of influenza viruses

## Number of specimens positives for influenza by subtypes

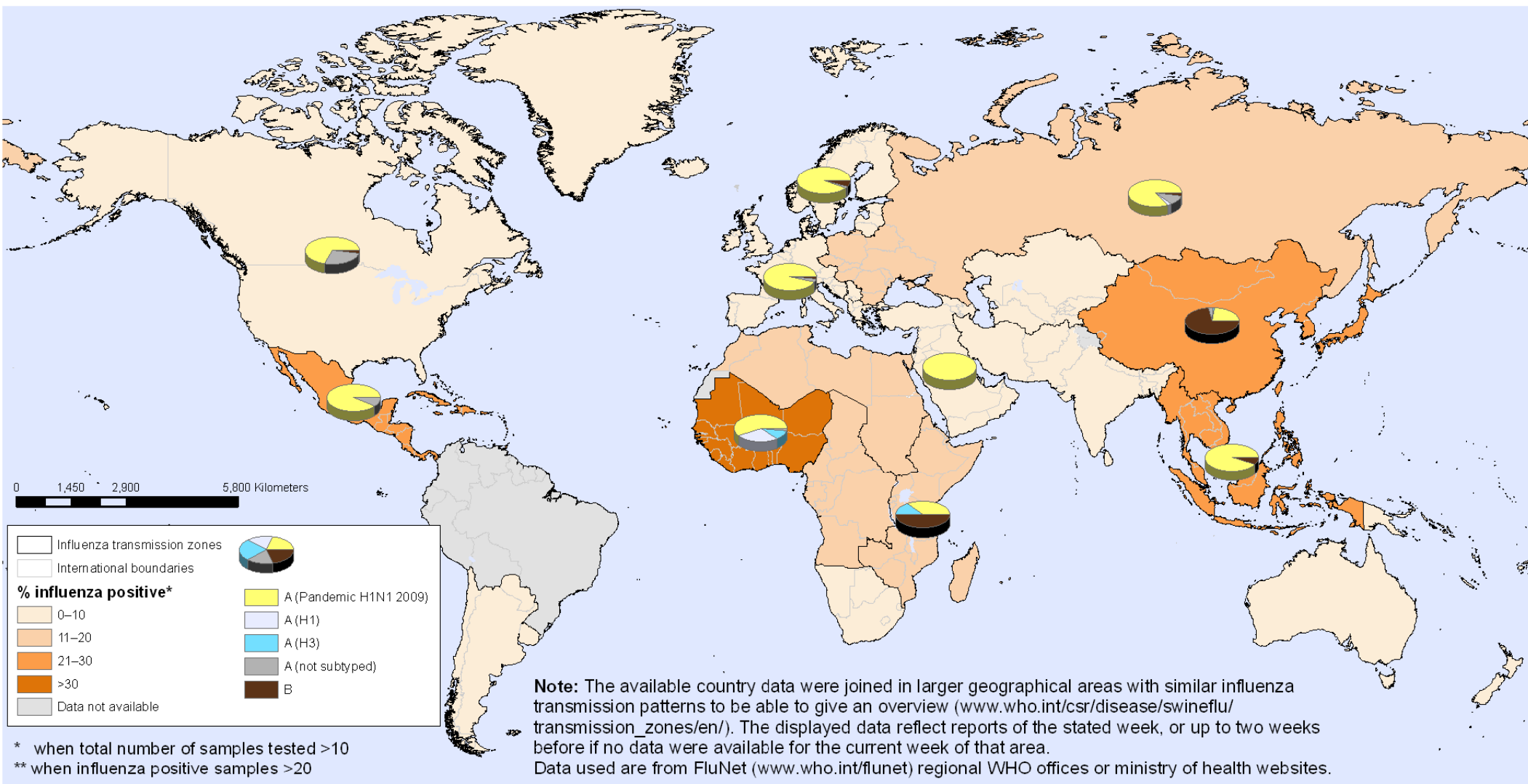
week 17 (2009) - 10 (2010) from 19 April 2009 to 13 March 2010



Data source: FluNet, Global Influenza Surveillance Network (GISN)

# Percentage of respiratory specimens that tested positive for influenza

Status as of week 05  
31 January–06 February 2010



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