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Preparing For The Challenge Of Pandemic Influenza: Developing Capacity For Addressing New Treats

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Public Health England

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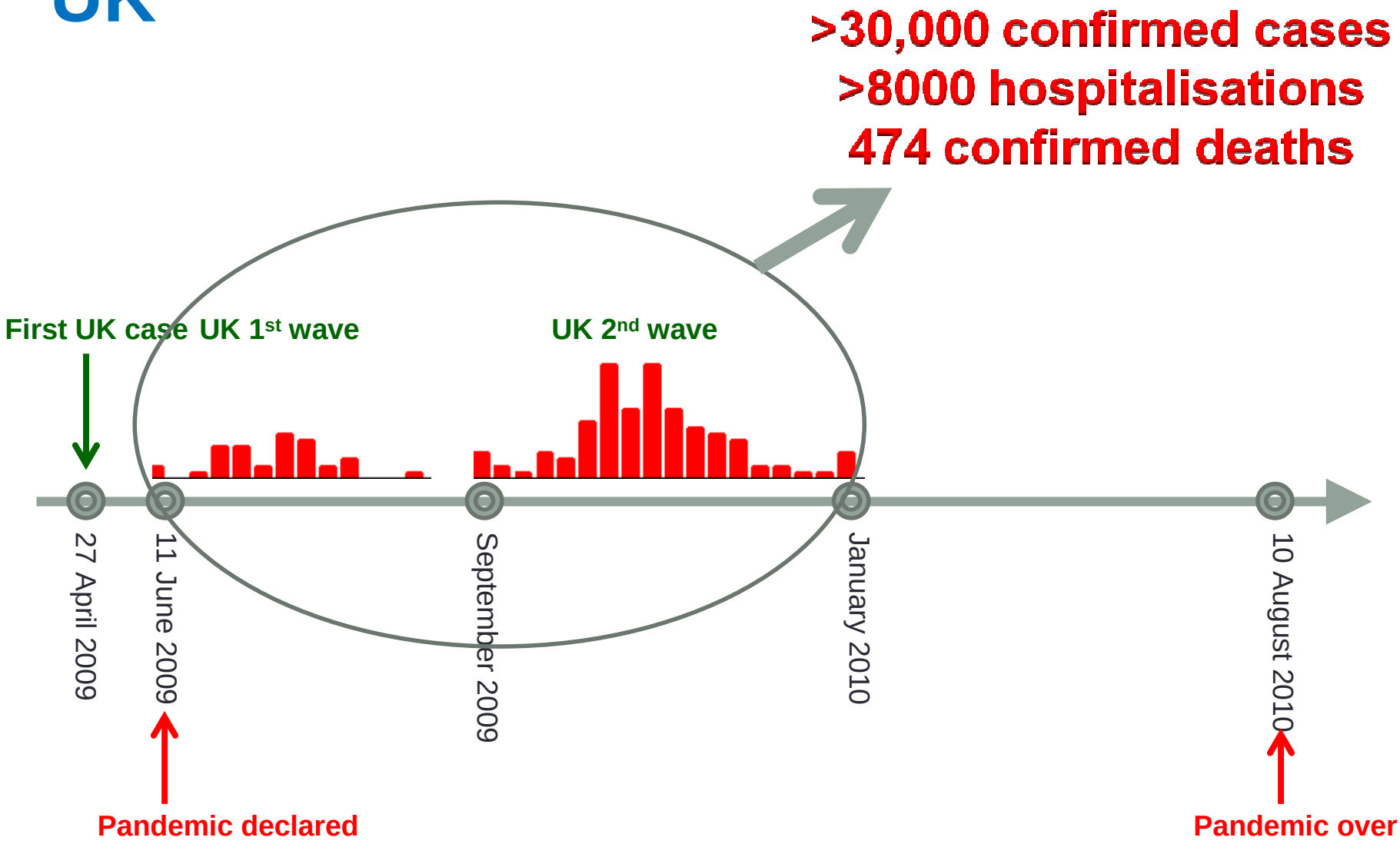
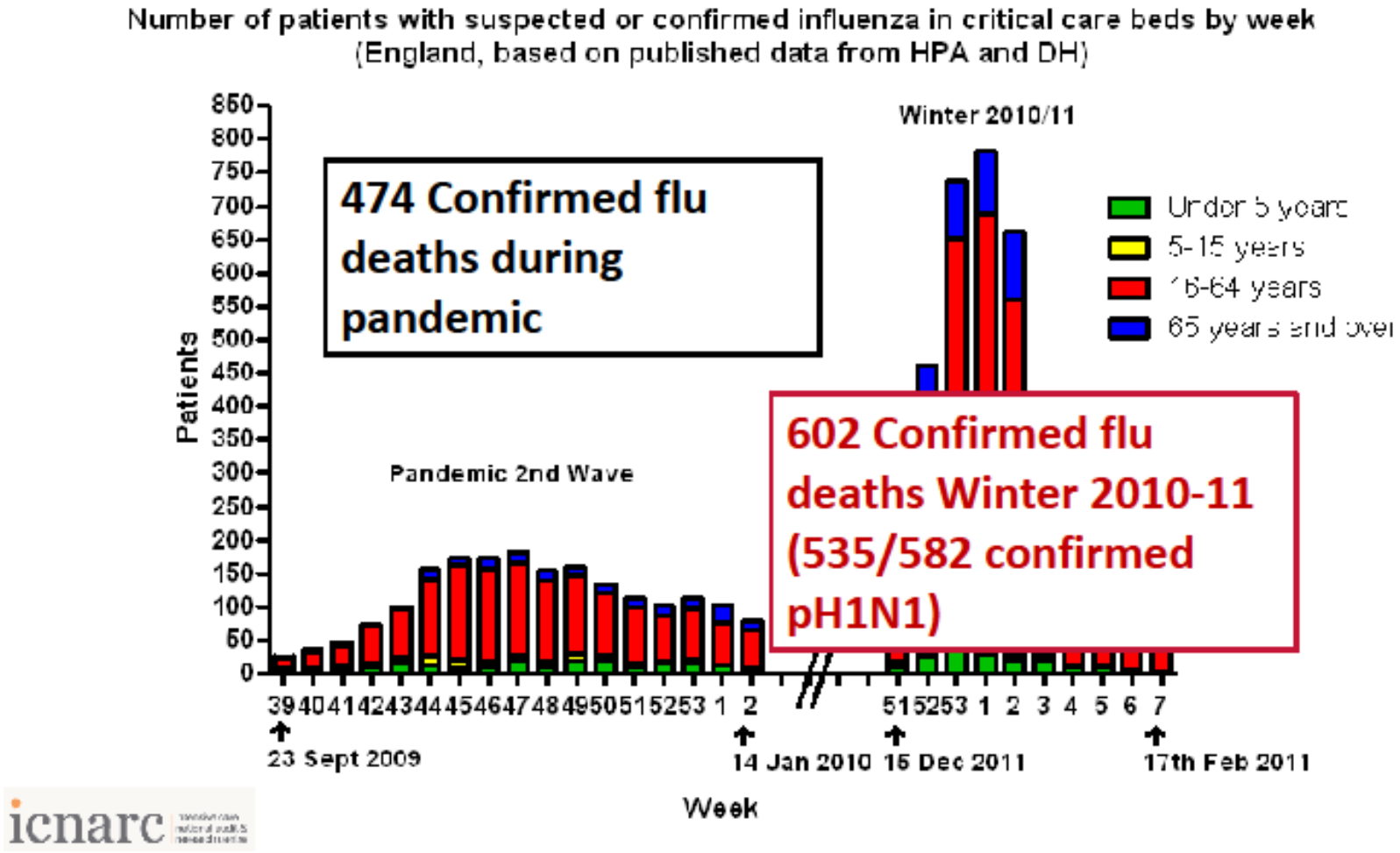
Imperial College Healthcare NHS Trust

The 2009-10 H1N1 Pandemic in the UK

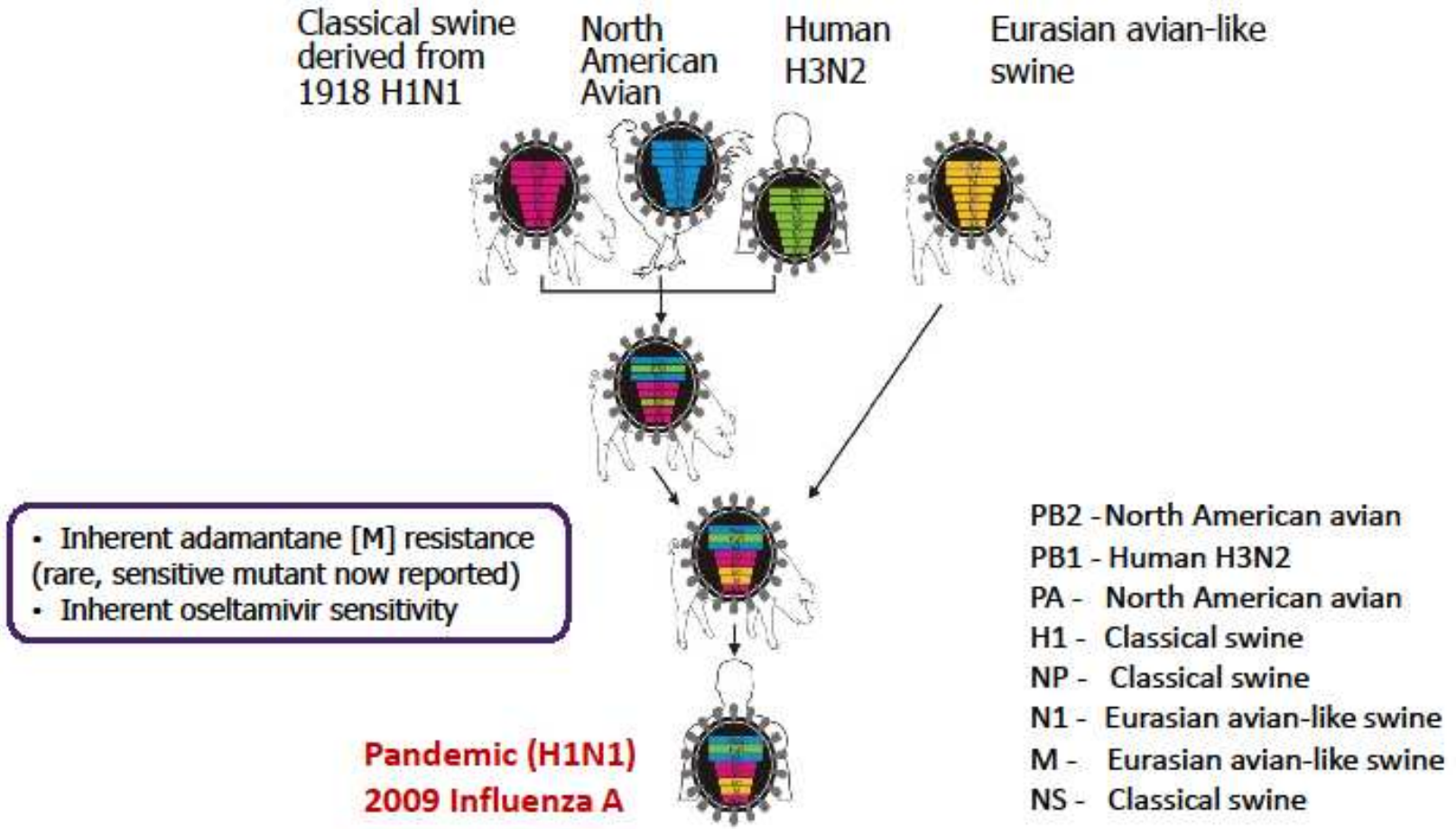


Winter 2010/11: pmd09H1N1 Returns UK



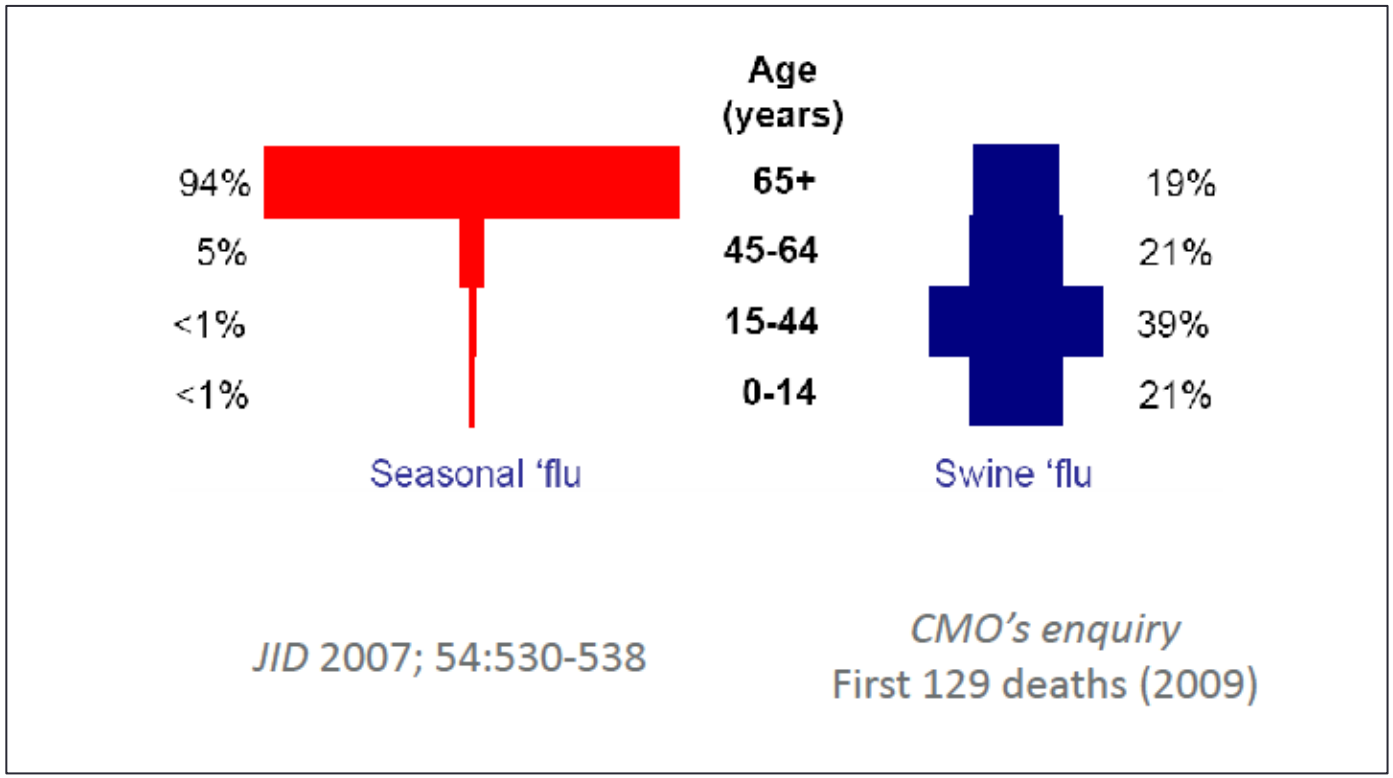
Critically ill cases – 2nd and 3rd wave

Source of pH1N1 2009 Influenza Virus



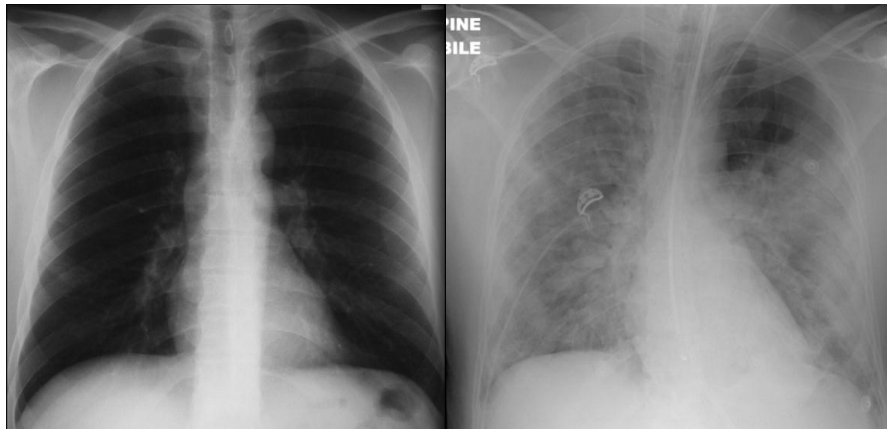
Dawood et al., NEJM, 2009; Garten et al., Science, 2009; Smith et al., Nature, 2009

Seasonal vs. pmd09H1N1 Mortality



Big Questions following pdm09H1N1

- Why do some have mild disease and others severe?
- What determines outcome?

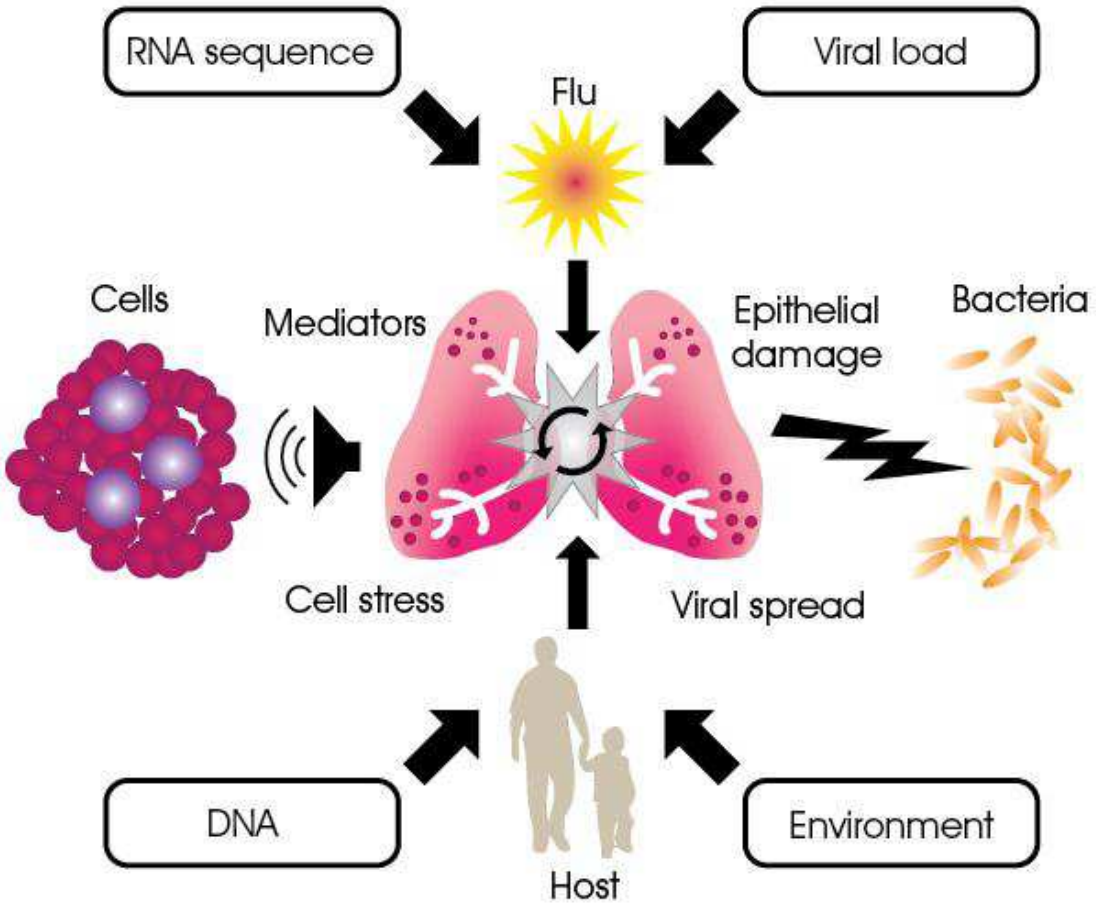


Do we have early enough warning for major emerging infections?

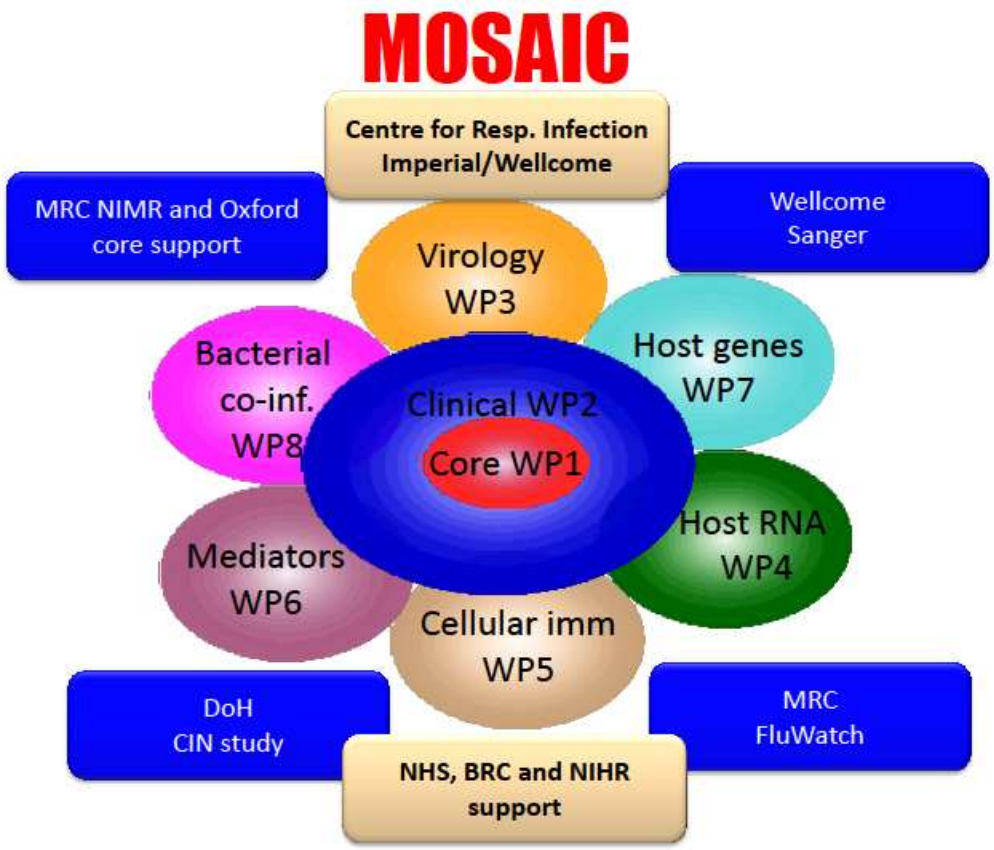
Are Influenza surveillance systems sufficient?

SEVERITY OF INFLUENZA

What causes severe disease?



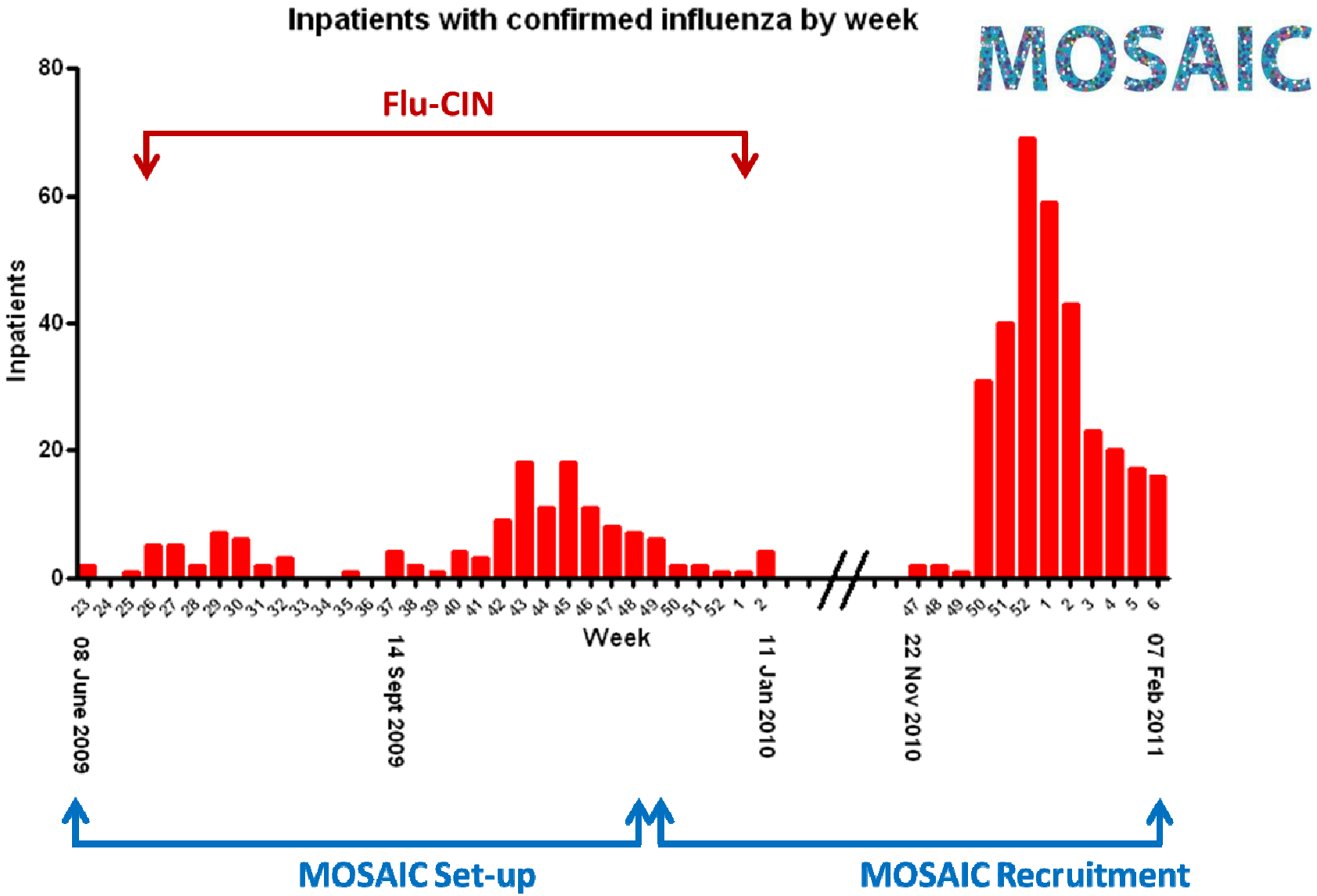
Understanding Pathogenesis through a Multidisciplinary Approach



Integrated study of host clinical features, virology, bacteriology, host genetics, cellular immunology and mediators

Timings

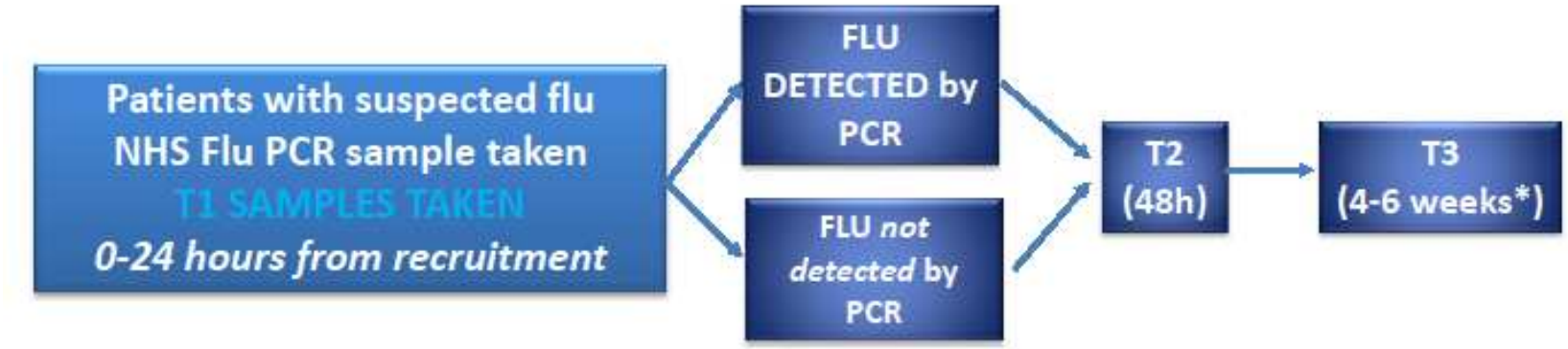
Launched 1st December 2009
Closed 11th February 2011

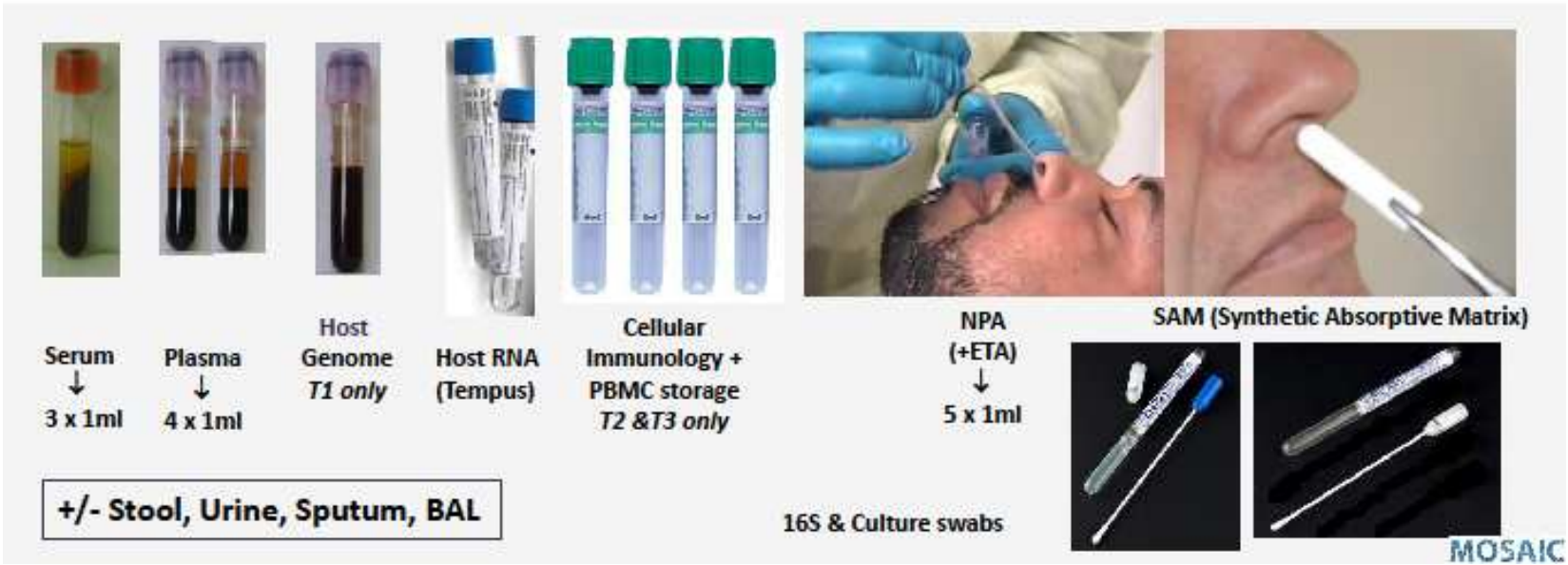


MOSAIC

- 255 patients
  - Cases: influenza-like illness
- 5 London hospitals; 4 Liverpool hospitals
  - Total of 4800 beds
- 2 seasons
- Samples from multiple time points: 8000 sample biobank
  - respiratory tract
  - blood
  - other
- Extensive Clinical Information
  - **Flu-CIN**: 40+ pages, retrospective data, both seasons
  - **CRF**: 2 pages, direct interview, only season 2

Sample Collection (Adults)





MOSAIC Learning

- Increased Knowledge of Pathogenesis
  - Design better patient assessment
  - Improved focus on case management
  - Better prognostics
- Proactive Preparedness for Future Emerging Infections
  - Barriers to rapidly initiating research
  - Better data collection tools
  - Pre-specified sampling frame
  - Funding sources
  - Trained personnel
  - International Severe Acute Respiratory Infection Consortium (ISARIC)

IMPROVING SURVEILLANCE OF INFLUENZA & OTHER INFECTIONS

Improving Surveillance

- WHO review of worldwide influenza surveillance
- Presentation bias
  - Limits the ability to capture the full spectrum of disease, especially annual burden
- Presentation biases currently adjusted using Bayesian modelling approaches.
- Known abnormal responses to pH1N1 in UK
  - **Summer 2009**
    - Public encouraged to seek primary care
    - Greater than normal presentation
  - **Winter 2009/2010**
    - Public encouraged to use telephone care line instead of GP
    - Lower than normal presentation

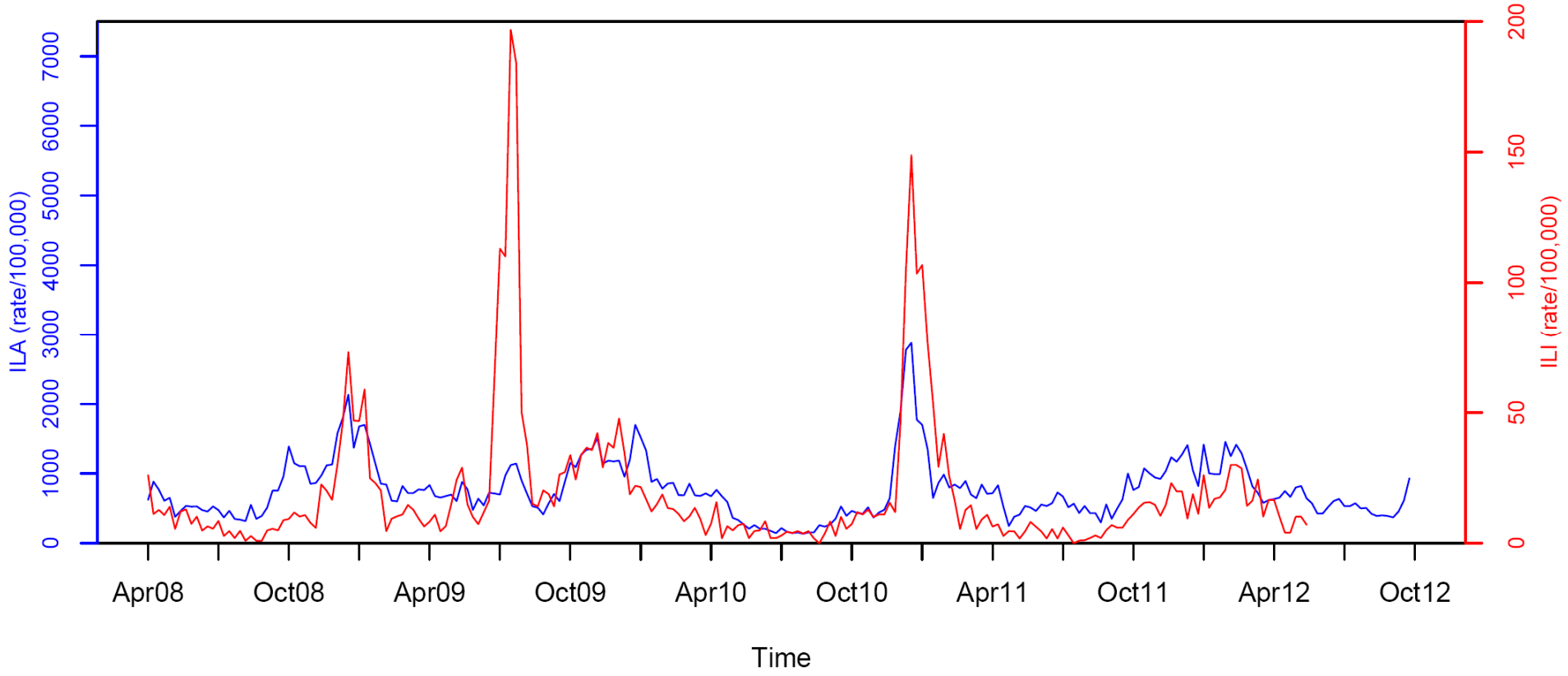
Surveillance Data

- ICHT Staff Illness Absence (ILA)
  - Absences due to “cold”, “cough”, “influenza” weekly counts
  - Week 14 in 2008 (2008-03-31) to week 39 in 2012 (2012-09-30)

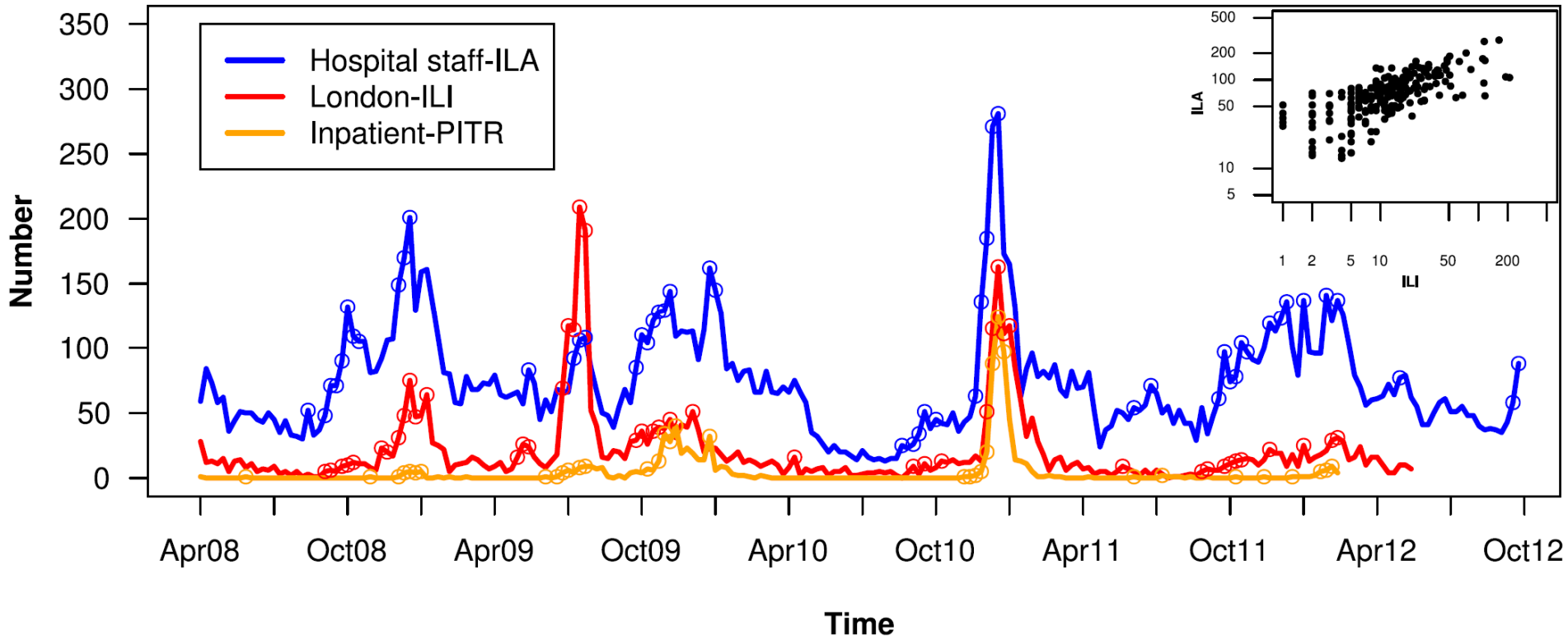
- Royal College of General Practicioner ILI
  - Data from the London Strategic Health Authority (SHA)
  - Week 14 in 2008 to week 20 in 2012 (2012-05-20)
  - Restricted to cases between 15 and 64 years of age

- Inpatient confirmed influenza test results (PITR)
  - All inpatients with a positive serology or influenza A RNA
  - Week 14 in 2008 until week 7 in 2012 (ending 2012-02-19).

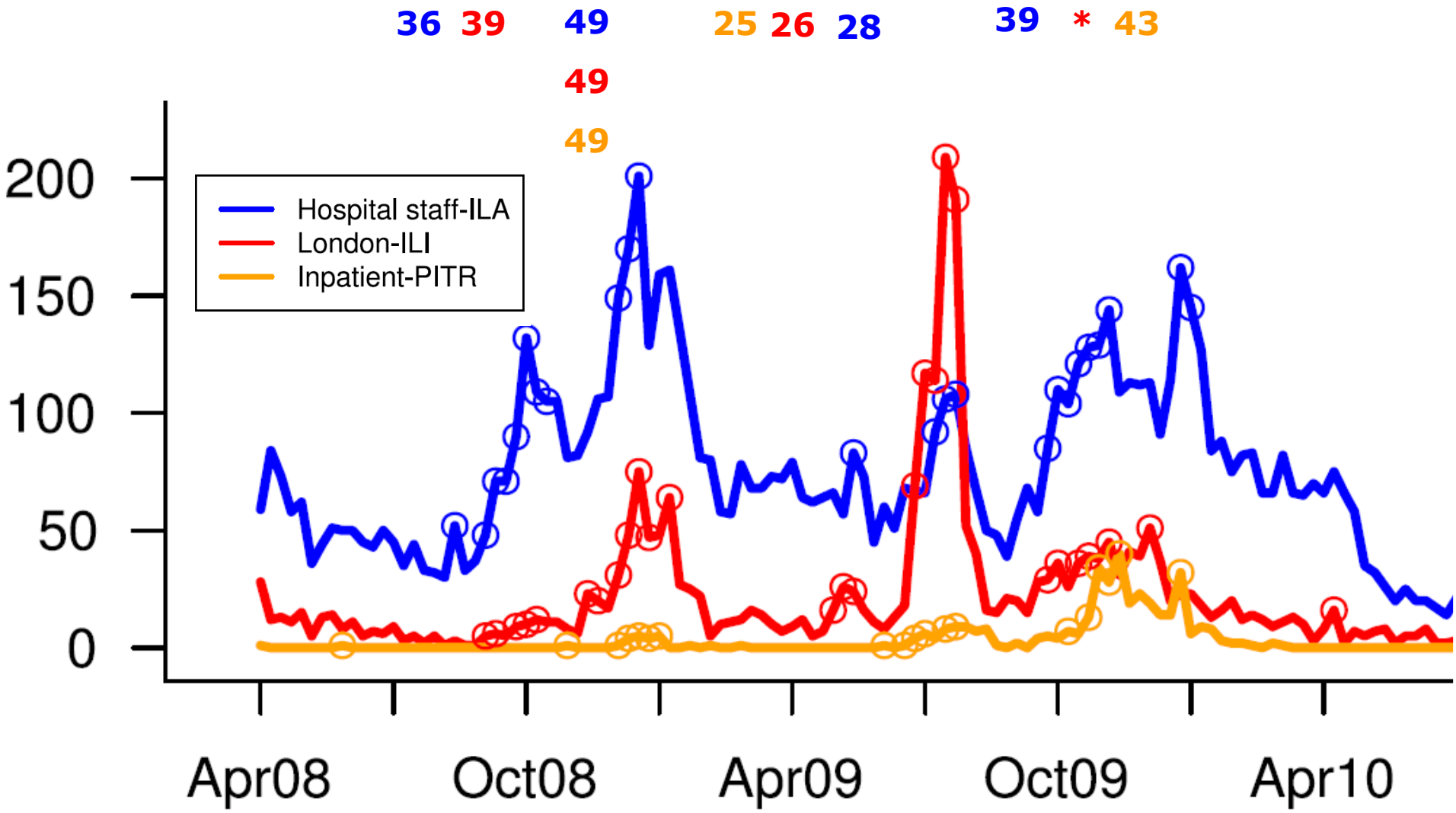
London-ILI & Hospital Staff-ILA Rates (Mar 2008 – Sept 2012)



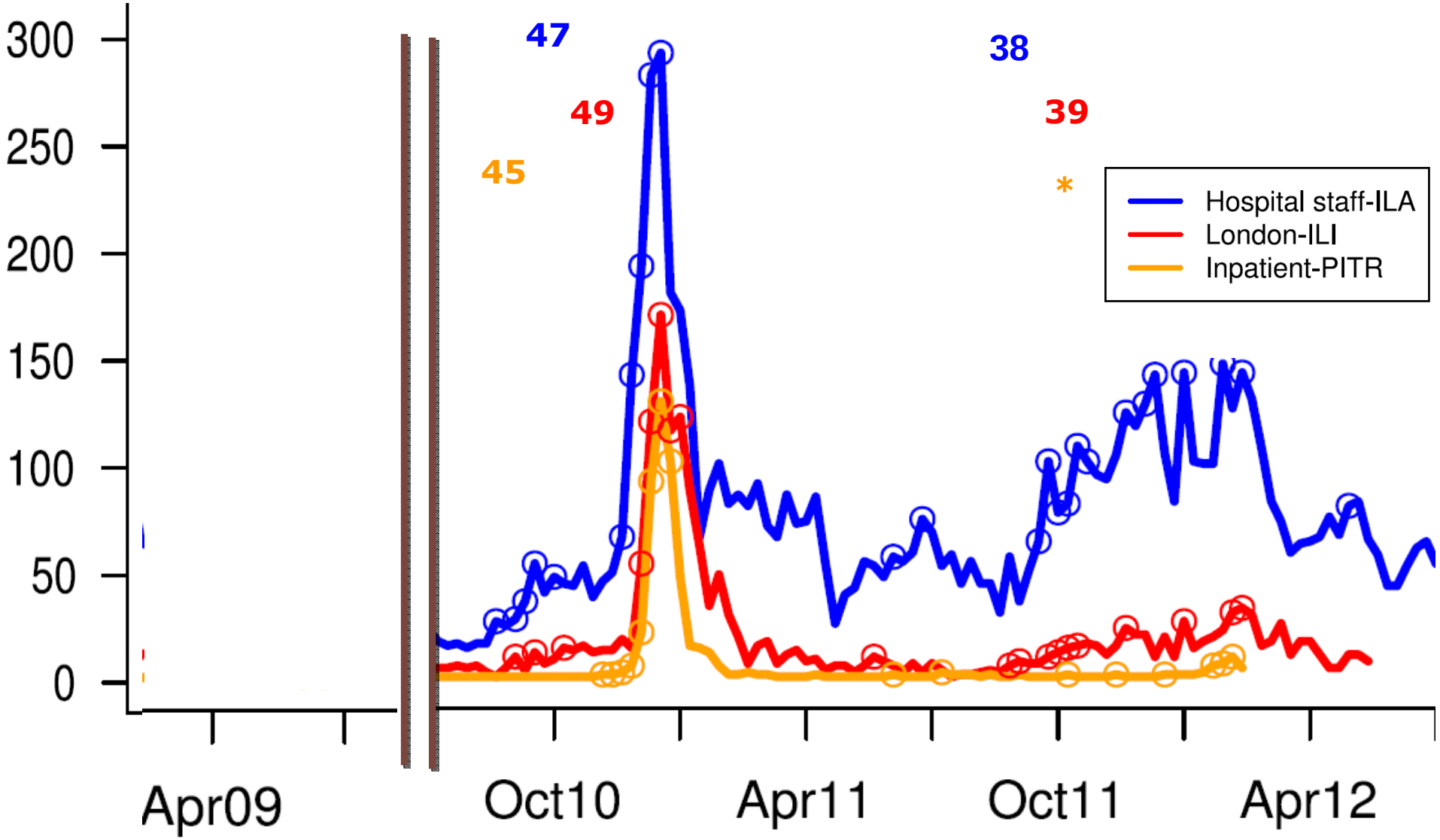
London-ILI, Hospital Staff ILA & Inpatient- PITR Counts (Mar 2008 – Sept 2012)



Weeks of Significant Case Increase (March 2008 – July 2010)

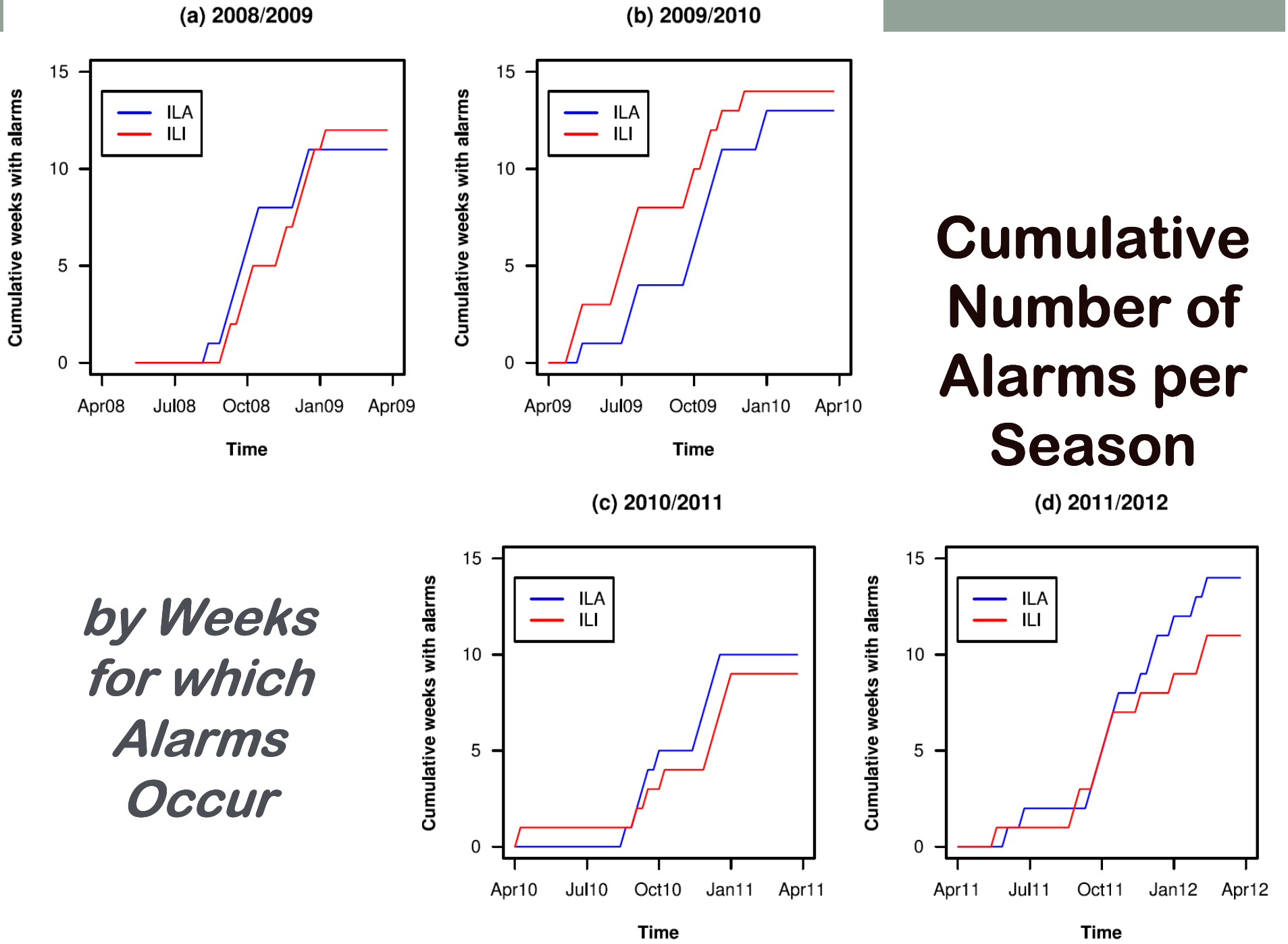


Weeks of Significant Case Increase (August 2010– July 2012 with pH1N1)

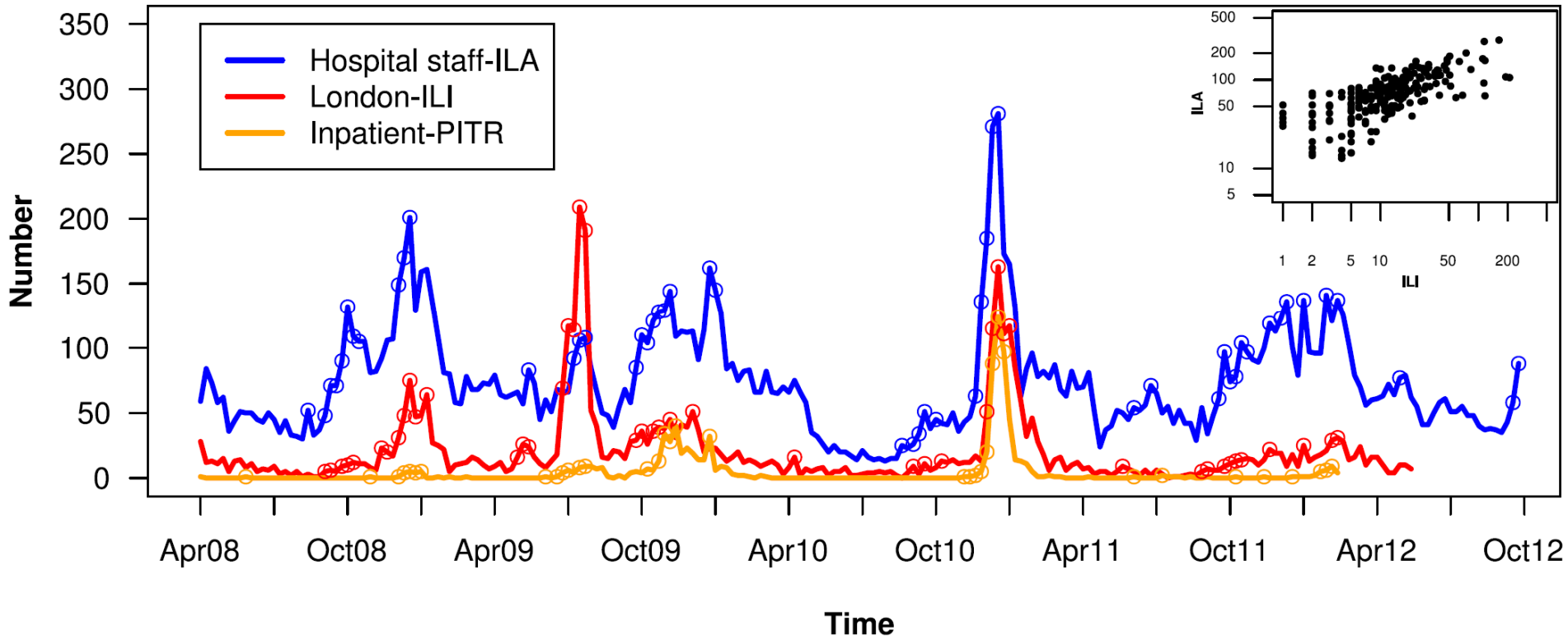


Cumulative Number of Alarms per Season

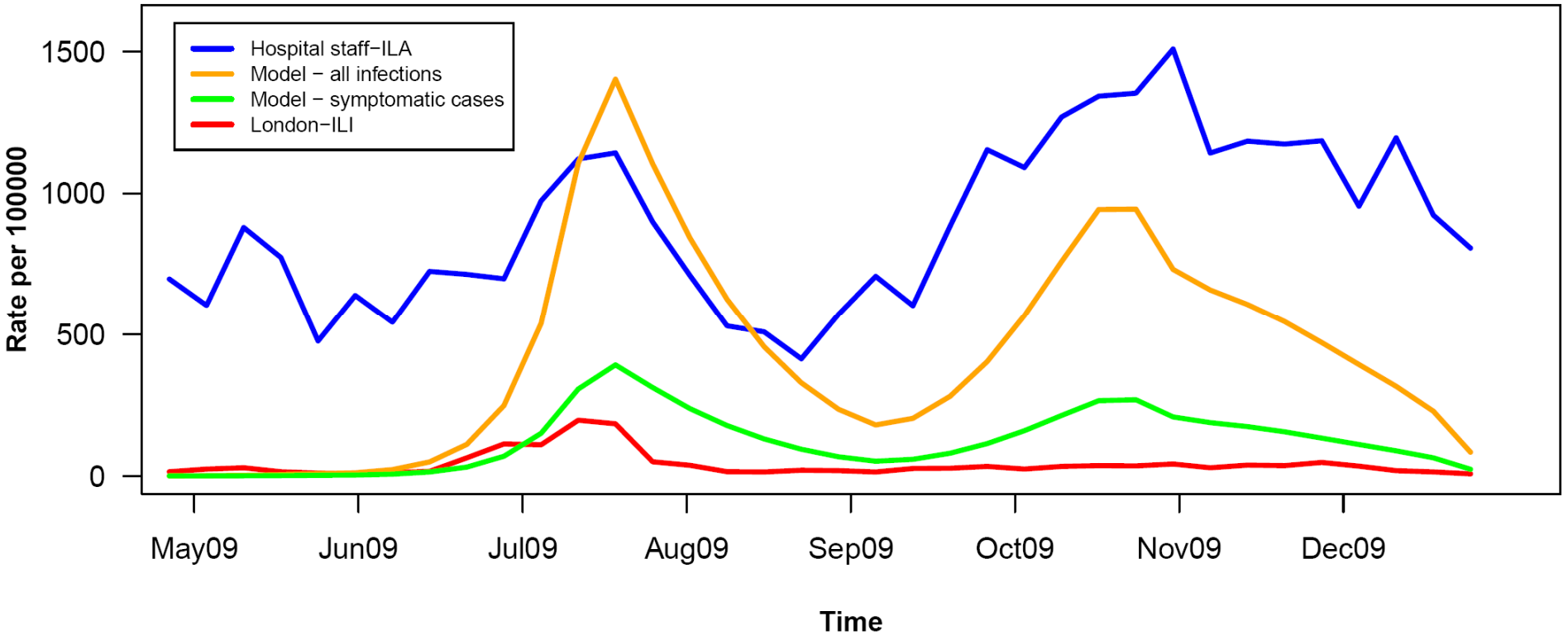
by Weeks for which Alarms Occur



London-ILI, Hospital Staff ILA & Inpatient- PITR Counts (Mar 2008 – Sept 2012)



Comparison to Age Adjusted Model



Comparison of ILA and ILI

- **Similarities**
  - Significant alarms on similar weeks
  - Peaks & Troughs similar timing
  - Counts by week highly correlated between ILA & ILI
  - Similar number of alarms on similar weeks
- **Differences**
  - Hospital staff-ILA alarms up to 3 weeks before ILI
  - Rates of peaks different relative to one another for ILA & ILI
  - Peaks during pH1N1 introduction closer to adjusted true estimates for ILA

Improving Surveillance

- Novel use of existing data
- Finding new sources of earlier & more accurate warning
- Automated data processing – informatics
- Working in partnership across organisations & disciplines

Different Strategies to Help us Prepare

- Requires prospective planning
- Creative use of existing resources
- Funding & expertise when and where its needed
- Working across disciplines and public sectors

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