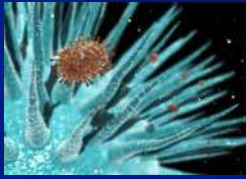


2012-2013 Influenza Season



Scott Epperson
Surveillance and Outbreak Response Team
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Influenza Division

National Center for Immunization & Respiratory Diseases
Influenza Division



Influenza

□ Influenza virus

- Type A
 - Subtypes determined by surface proteins HA (1-17) and NA (1-9)
- Type B
 - Divided into 2 distinct lineages (Victoria and Yamagata)
- Type C
 - Does not typically cause substantial human disease, not routinely tested for
- Yearly co-circulation of seasonal viruses: A (H3N2), A (H1N1), and B

□ Seasonal epidemics in the U.S.

- >200,000 hospitalizations*
- Avg. 3,000 to 49,000 deaths†

*Thompson et al. Influenza-Associated Hospitalizations in the United States. *JAMA* 2004; 292(11):1333-1340.
†CDC. Estimates of Deaths Associated with Seasonal Influenza – United States, 1976 – 2007. *MMWR* 59(33):1057-1062.

Influenza Virus

- Eight RNA segments code for 11 proteins
- Virus needs one of each of the 8 gene segments to be viable
- HA (hemagglutinin) and NA (neuraminidase) genes code for surface proteins; A subtype nomenclature
- Other genes are responsible mostly for virus structure and replication



Influenza Illness

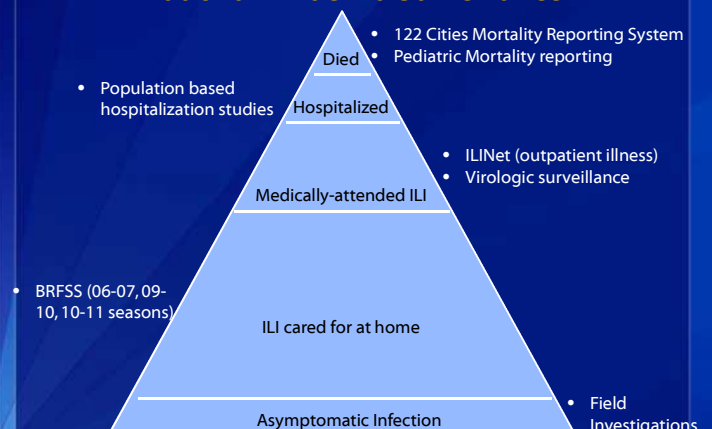
- Illness ranges from asymptomatic to severe (including death)
- Viruses circulate and cause illness year round, seasonal epidemics in winter months in temperate northern and southern hemispheres

Routine Influenza Surveillance

National Center for Immunization & Respiratory Diseases
Influenza Division



National Influenza Surveillance



Objectives of Influenza Surveillance

- Determine which influenza viruses are circulating; where are they circulating; when are they circulating
- Determine intensity and impact of influenza activity
- Detect unusual events
 - Infection by unusual viruses
 - Unusual syndromes caused by influenza viruses
 - Unusually large/severe outbreaks
 - Other strange things...

Influenza Surveillance

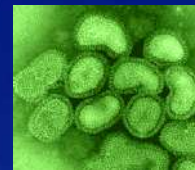
- Responsibility for national influenza surveillance rests with CDC
 - Influenza surveillance coordinator
- State, local, and territorial public health departments are our primary partners
- Goal is to build a system that is useful on the local level that feeds into national level surveillance
- CDC participates in global influenza surveillance efforts coordinated by WHO

The Five Categories of Influenza Surveillance

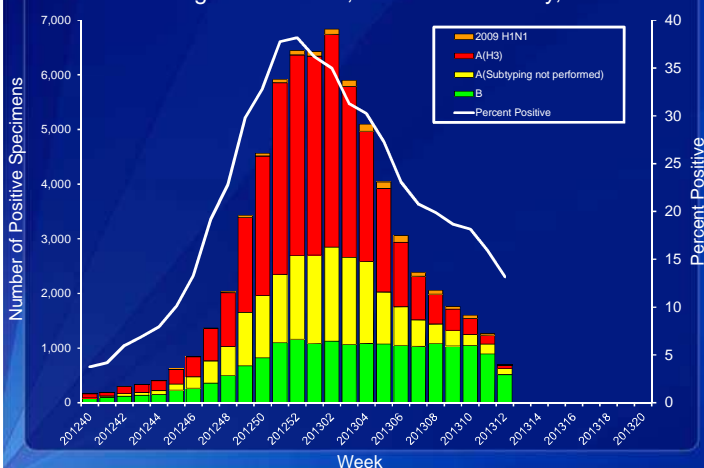
- Virologic Surveillance
 - WHO (World Health Organization) and NREVSS (National Respiratory and Enteric Virus Surveillance System) Collaborating Laboratories
 - Novel influenza A virus reporting
- Outpatient Illness Surveillance
- Mortality Surveillance
- Hospitalization Surveillance
- Summary of the Geographic Spread of Influenza

Virologic Surveillance in the U.S.

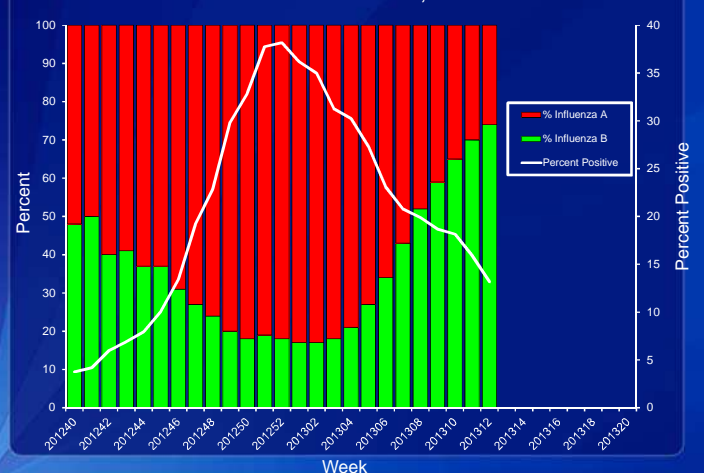
- ~150 participating laboratories
 - Weekly reports
 - # specimens tested
 - # positive for influenza by type, subtype, age
 - Specimens collected during routine patient care



Influenza Positive Tests Reported to CDC by U.S. WHO/NREVSS Collaborating Laboratories, National Summary, 2012-13



Percent Influenza A and B, 2012-2013



National Influenza Centres and WHO Collaborating Centres for Influenza



Viral Strain Surveillance

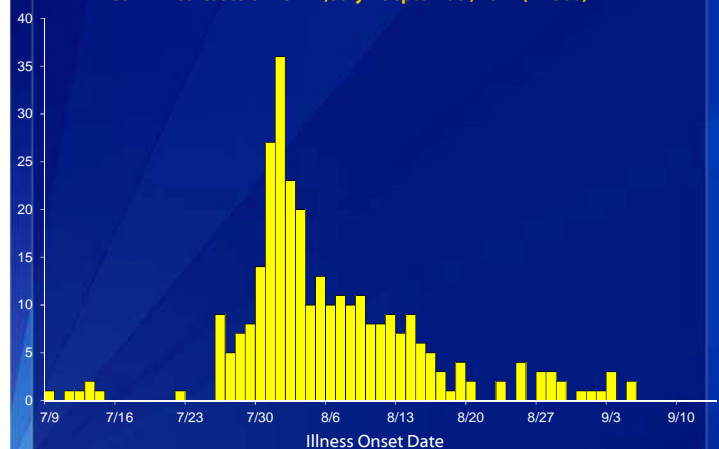
- WHO labs submit subset of positives to CDC strain surveillance lab
- Detailed antigenic characterization
 - Similarity to vaccine strains
- Antiviral resistance testing
- Genetic sequencing of a subset of isolates

Influenza A (H3N2)v

- In August 2011 first case of triple-reassortant influenza A (H3N2) with M gene from influenza A (H1N1)pdm09 detected
- 13 confirmed cases detected from 6 states (IN, IA, ME, PA, UT, and WV)
 - Several cases were associated with larger outbreaks of respiratory illness in children
 - Child care settings became a particular focus
- Large outbreak in summer 2012 associated with exposure to swine at state and local fairs



Confirmed Cases of H3N2v, July – September, 2012 (N=306)

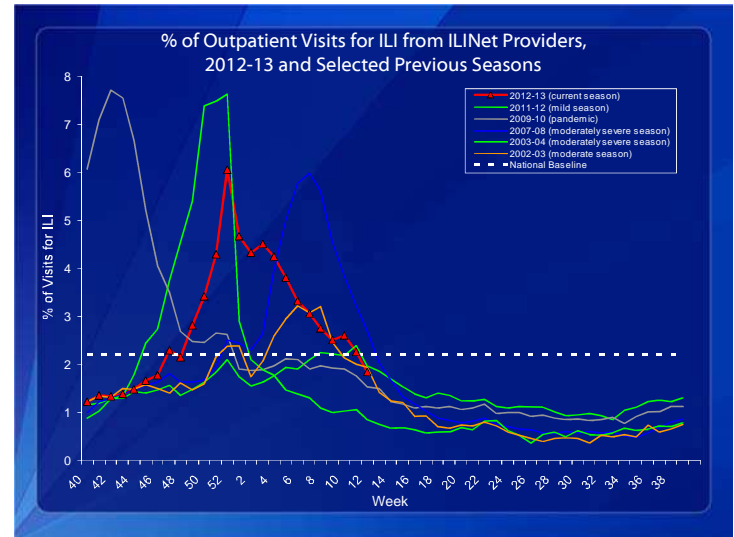
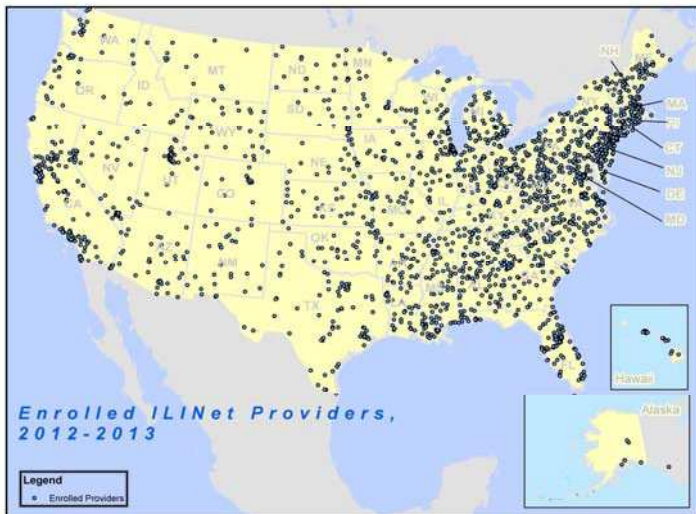


The Five Categories of Influenza Surveillance

- Viral Surveillance
- Outpatient Illness Surveillance
 - U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet)
- Mortality Surveillance
- Hospitalization Surveillance
- Summary of the Geographic Spread of Influenza

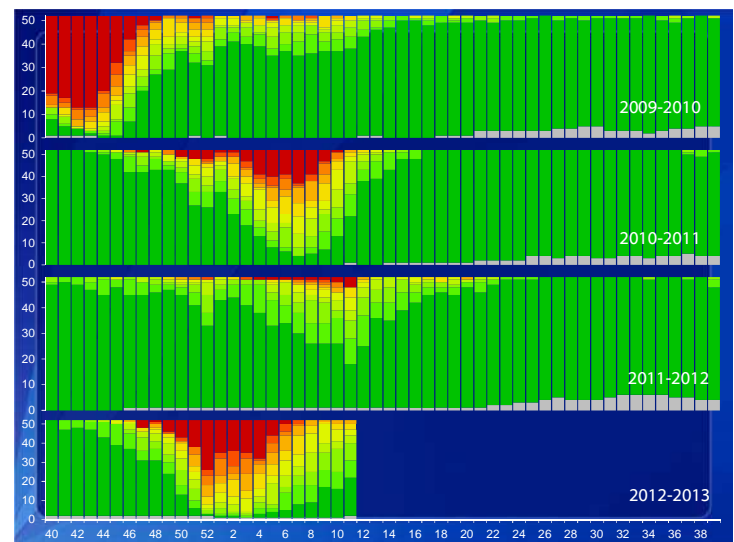
ILINet

- ~2,900 physicians/facilities enrolled for the 2012-13 season
- Weekly reports
 - Total # of patient visits
 - # visits for influenza-like illness (ILI) by age group
 - ILI = fever $\geq 100^{\circ}\text{F}$ (37.8°C) and cough or sore throat, in absence of a known cause other than influenza
- Submit respiratory specimens to state lab for testing



ILINet Activity Indicator Map

- Individual provider baselines
- Helps to control for which sites are reporting
- Consistent analysis method that allows between jurisdiction comparisons



ILINet Activity Indicator Map

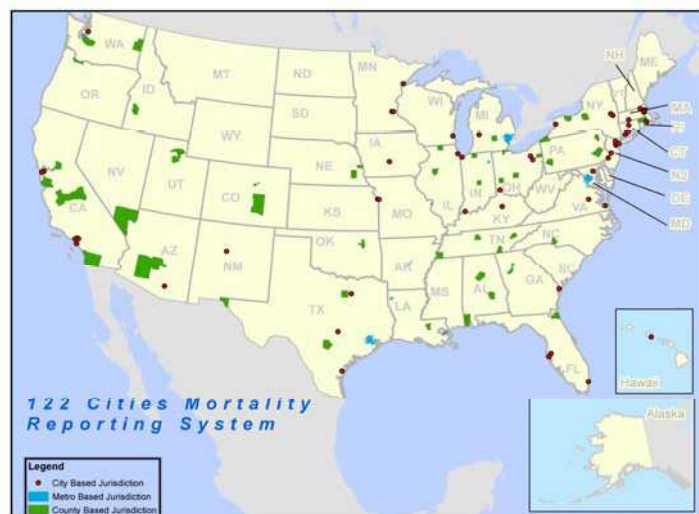
<http://gis.cdc.gov/grasp/fluview/main.html>

The Five Categories of Influenza Surveillance

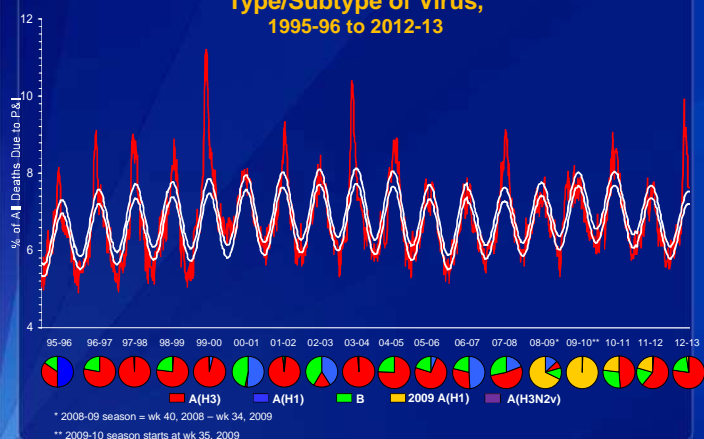
- Viral Surveillance
- Outpatient Illness Surveillance
- Mortality Surveillance
 - 122 Cities Mortality Reporting System
 - Influenza-Associated Pediatric Deaths
- Hospitalization Surveillance
- Summary of the Geographic Spread of Influenza

122 Cities Mortality Reporting System

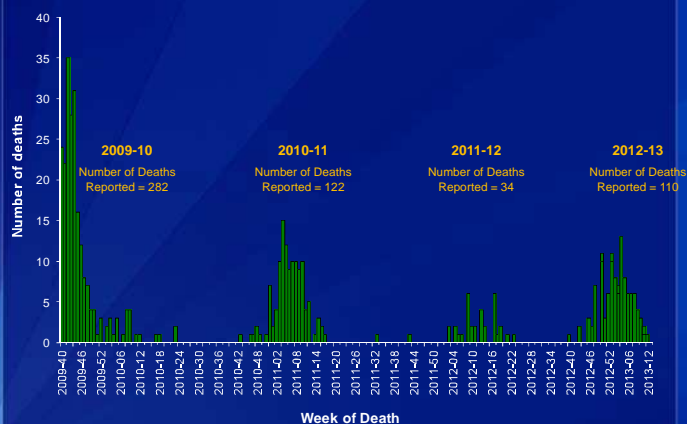
- Purpose: monitor P&I related mortality in a timely manner
- Weekly reports from vital statistics offices in 122 U.S. cities
 - Total # of death certificates processed
 - # with pneumonia or influenza listed (some exclusions)
- Approximately 25% of U.S. deaths
- Timely



Pneumonia and Influenza Mortality and Type/Subtype of Virus, 1995-96 to 2012-13



Influenza-Associated Pediatric Deaths by Week of Death

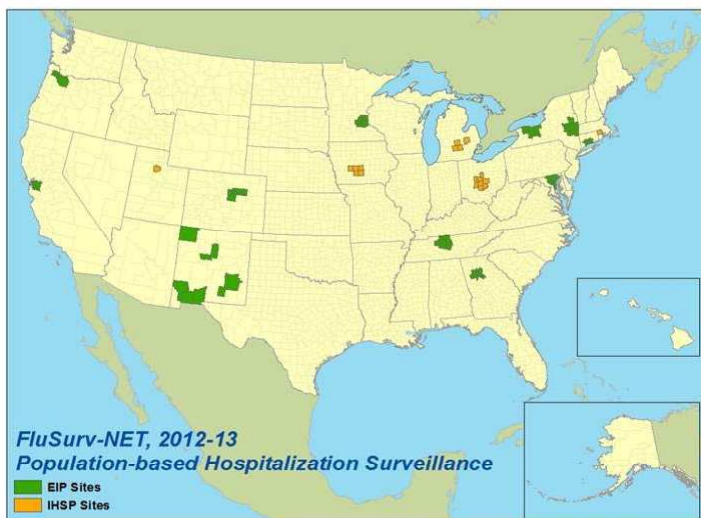


The Five Categories of Influenza Surveillance

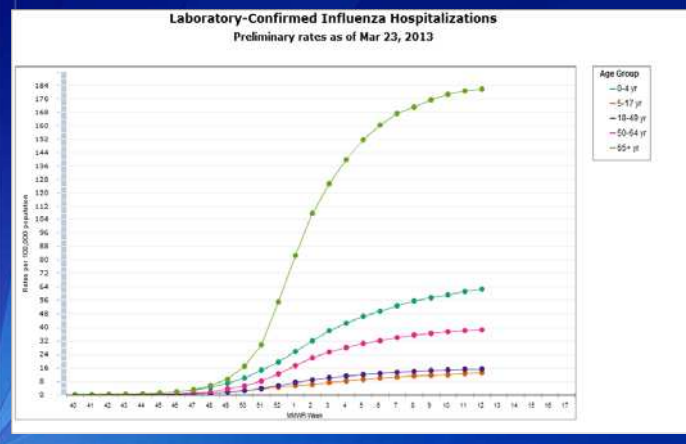
- Viral Surveillance
- Outpatient Illness Surveillance
- Mortality Surveillance
- Hospitalization Surveillance
 - Emerging Infections Program (EIP)
 - Influenza Hospitalization Surveillance Project (IHSP)
- Summary of the Geographic Spread of Influenza

Hospitalization Surveillance

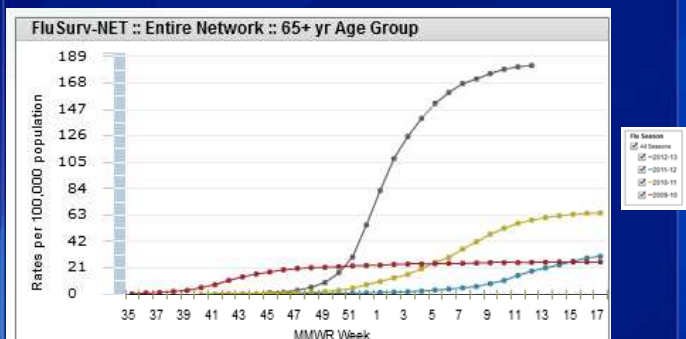
- Emerging Infections program (EIP) in 10 states
 - Population-based surveillance for laboratory-confirmed influenza-associated hospitalizations
 - Cases identified from testing performed as part of routine patient care
 - CRF completed by program staff
- Influenza Hospitalization Surveillance Project (4 states)
 - Sites added during pandemic to increase geographic coverage
 - Same case finding and data collection methods as EIP



Rates of Laboratory-Confirmed Influenza Hospitalization by FluSurvNet



FluSurvNet Hosp. rates, 65+ years



The Five Categories of Influenza Surveillance

- Viral Surveillance
- Outpatient Illness Surveillance
- Mortality Surveillance
- Hospitalization Surveillance
- Summary of the Geographic Spread of Influenza

Geographic Spread of Influenza

- Weekly reports from State and Territorial epidemiologists
- Assessment of overall influenza activity at state level
 - None, sporadic, local, regional, or widespread
 - Incorporates multiple sources of surveillance data

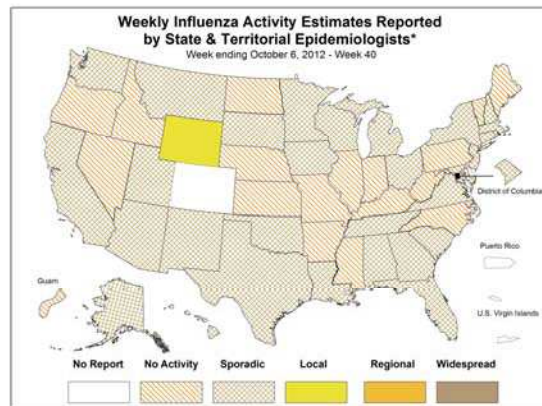
Activity Level	ILI activity ^a Outbreaks	Laboratory data
No activity	None	No lab confirmed cases
Sporadic	Not increased	Isolated lab confirmed cases
Local	Increased ILI in 1 region ^b ; ILI activity in other regions is not increased	Recent (within the past 3 weeks) lab evidence of influenza in region with increased ILI
Regional (doesn't apply to states with 18 regions)	2 or more institutional outbreaks (ILI or lab confirmed) in 2 or more than half of the regions	Recent (within the past 3 weeks) lab evidence of influenza in region with the outbreaks, virus activity is no greater than sporadic in other regions
Widespread	Increased ILI in 12 or more than half of the regions	Recent (within the past 3 weeks) lab confirmed influenza in the affected regions

^a ILI activity can be assessed using a variety of data sources including ILINet providers, school/workplace absenteeism, and other syndromic surveillance systems that monitor influenza-like illness.

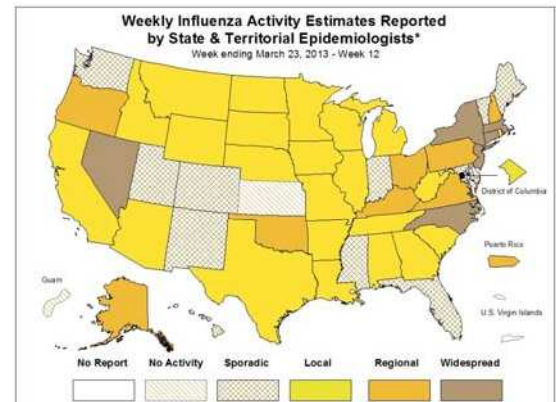
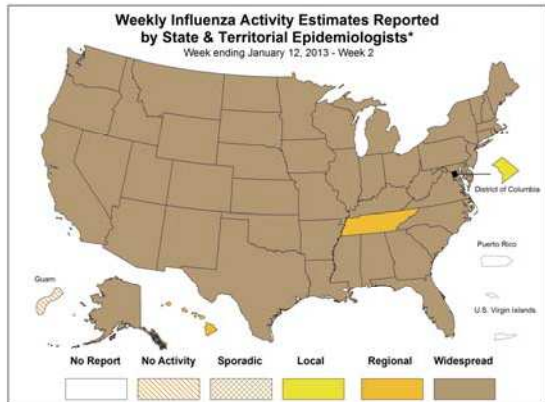
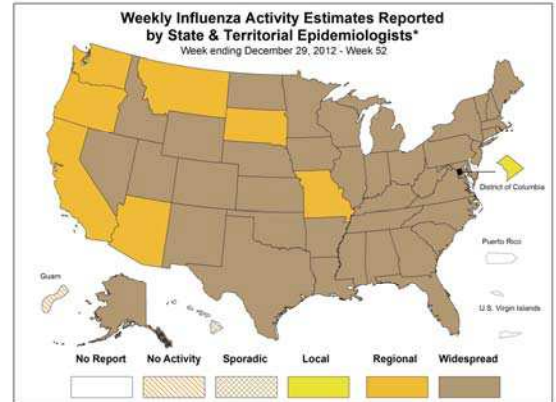
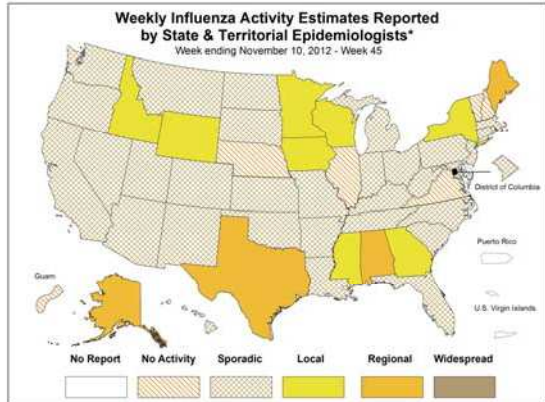
^b Lab confirmed case = case confirmed by rapid diagnostic test, antigen detection, culture, or PCR.

^c Institution includes nursing home, hospital, prison, school, etc.

^d Region = population under surveillance in a defined geographical subdivision of a state.



* This map indicates geographic spread & does not measure the severity of influenza activity.



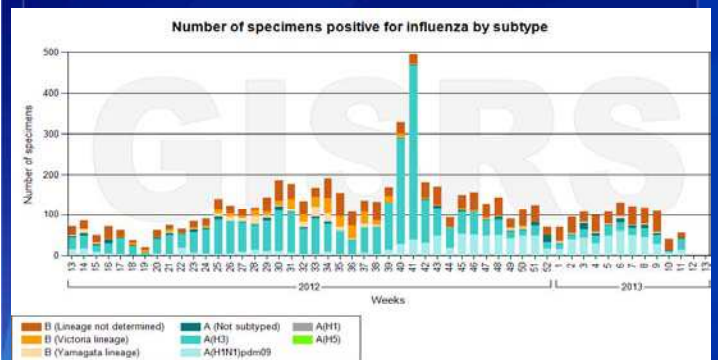
International Influenza Surveillance

National Center for Immunization & Respiratory Diseases
Influenza Division



WHO AFRO Region

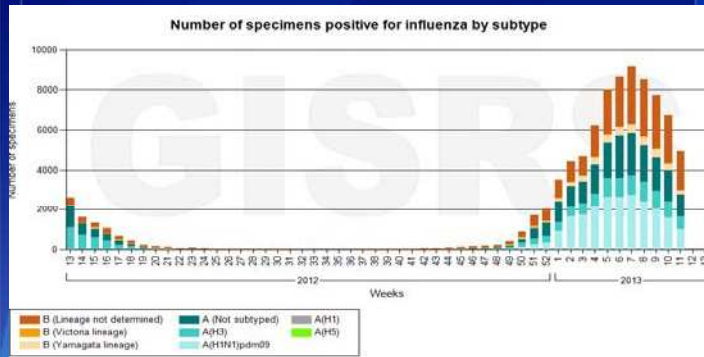
2012-2013: number of influenza-positive cases by epidemiologic week and subtype
• February and March: Mix of Influenza A(H3N2), Influenza B, and 2009 H1N1.



Source: WHO FluNet

WHO EURO Region

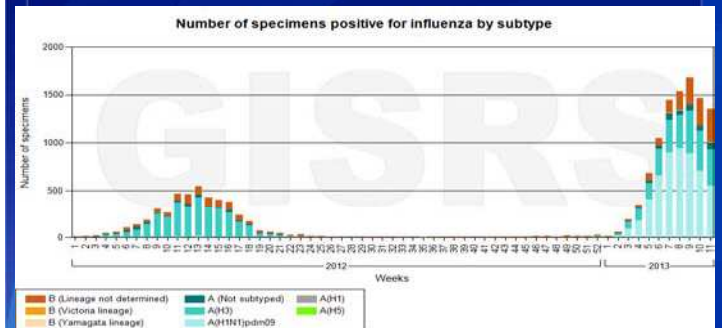
2012-2013: number of influenza-positive cases by epidemiologic week and subtype
February to mid-March: Mix of Influenza B, Influenza A(H3N2), and 2009 H1N1.



Source: WHO FluNet

Russian Federation

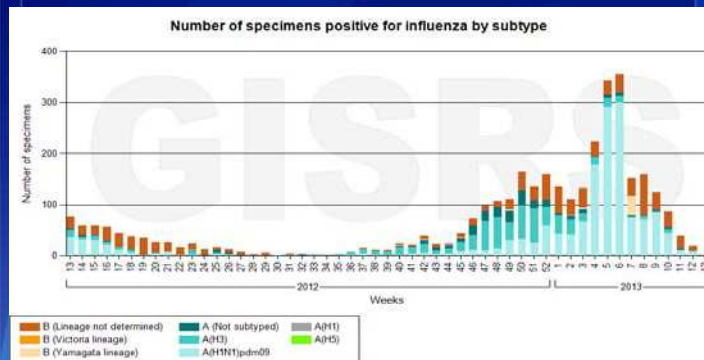
2012-2013: number of influenza-positive cases by epidemiologic week and subtype
February to mid-March: sharply increasing activity, now decreasing; 2009 H1N1 predominant, some Influenza A(H3N2) and Influenza B also.



Source: WHO FluNet

WHO EMRO Region

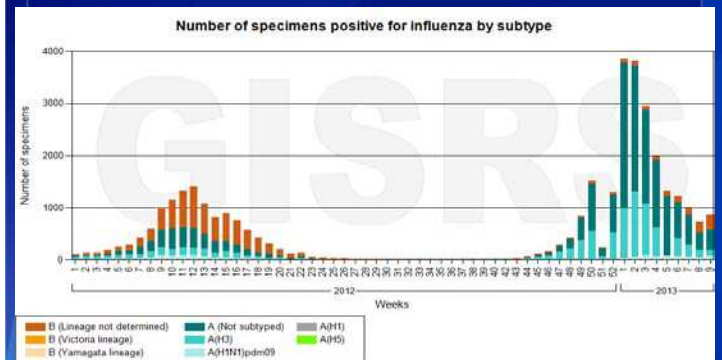
2012-2013: number of influenza-positive cases by epidemiologic week and subtype
February to mid-March: 2009 H1N1 predominant, increasing Influenza B.



Source: WHO FluNet

Canada

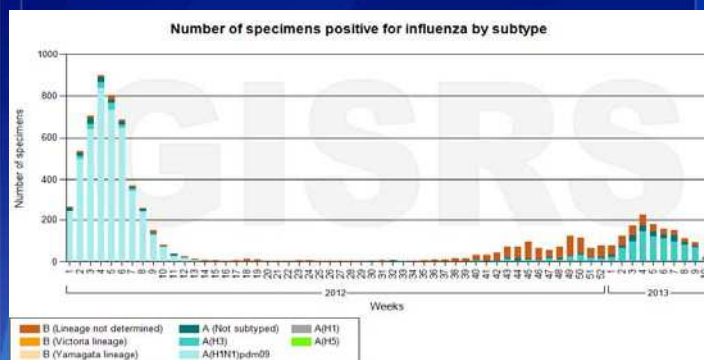
2012-2013: number of influenza-positive cases by epidemiologic week and subtype
February: decreasing activity; mix of mostly Influenza A(H3N2) and Influenza B



Source: WHO FluNet

Mexico

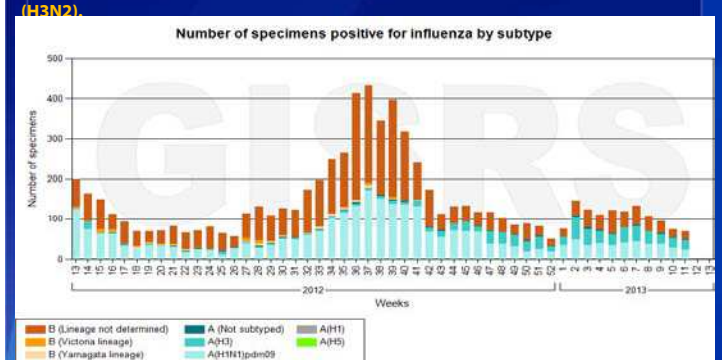
2012-2013: number of influenza-positive cases by epidemiologic week and subtype
February through early March: decreasing activity; mostly influenza A (H3N2)



Source: WHO FluNet

WHO SEARO Region

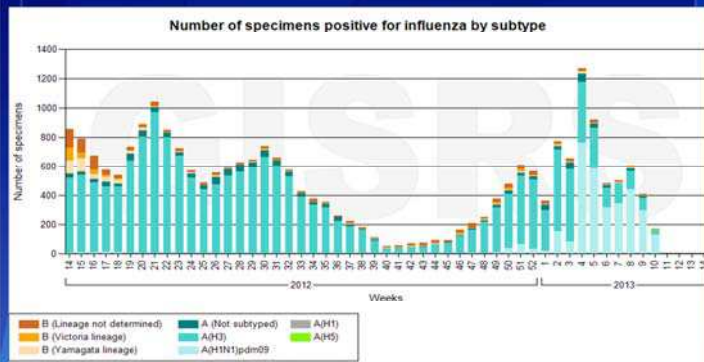
2012-2013: number of influenza-positive cases by epidemiologic week and subtype
February through mid-March: Mix of 2009 H1N1, Influenza B and Influenza A (H3N2).



Source: WHO FluNet

China

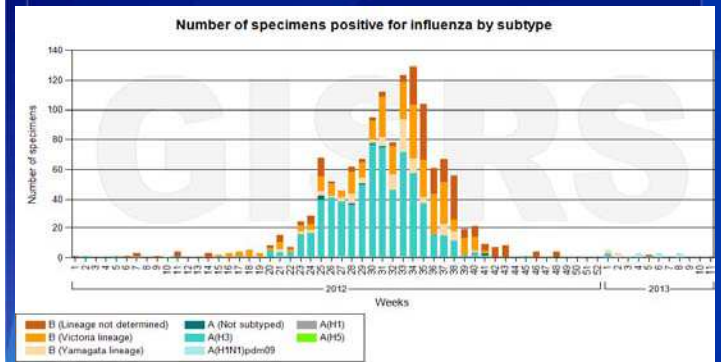
- 2012-2013: number of influenza-positive cases by epidemiologic week and subtype
- 2013: mix of 2009 H1N1 and H3 in Northern and Southern China



Source: WHO FluNet

South Africa

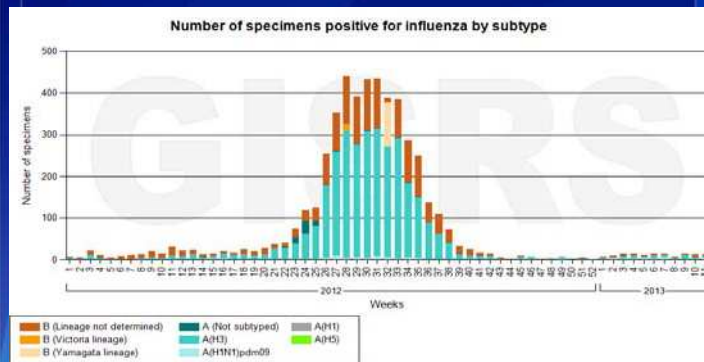
- 2012-2013: number of influenza-positive cases by epidemiologic week and subtype
- 2013: low activity heading into standard influenza season



Source: WHO FluNet

Australia

- 2012-2013: number of influenza-positive cases by epidemiologic week and subtype
- 2013: low activity heading into standard influenza season



Source: WHO FluNet

Acknowledgments

- State/territorial/local influenza coordinators
- Participating healthcare providers and lab
- Lynnette Brammer
- Lenee Blanton
- Krista Kniss
- Tiffany D'Mello
- Alejandro Perez
- Rosaline Dhara
- Desiree Mustaquim
- Craig Steffens

Useful Links

- WHO FluNet: http://www.who.int/influenza/gisrs_laboratory/flunet/en/
- CDC Flu Website: <http://www.cdc.gov/flu/>
- CDC FluView: <http://www.cdc.gov/flu/weekly/>
- FluView Interactive: <http://www.cdc.gov/flu/weekly/fluviewwinteractive.htm>

Questions?

Email: Sepperson@cdc.gov

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: <http://www.cdc.gov>

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

National Center for Immunization & Respiratory Diseases

