How the Pandemic Influenced Surveillance in the United States

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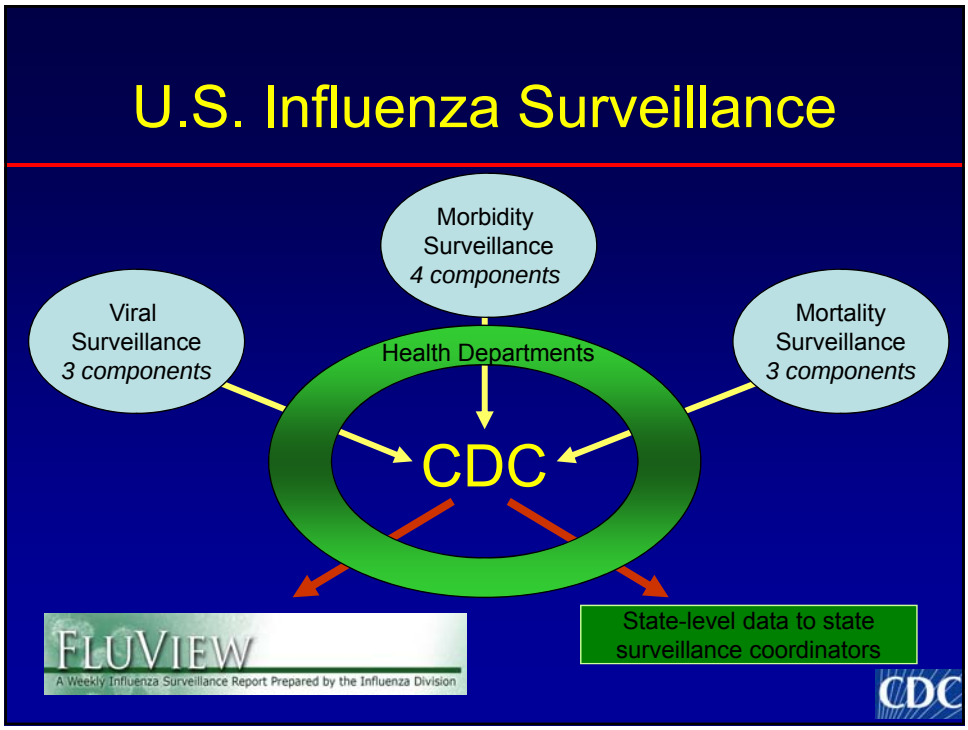
Outline

- Overview of surveillance systems
- Modification to our outpatient ILI surveillance
  - Early surveillance challenges that led to the changes
  - Steps along the way
- Enhanced analysis of ILI data


U.S. Influenza Surveillance
Morbidity Surveillance
4 components
Viral Surveillance
3 components
Mortality Surveillance
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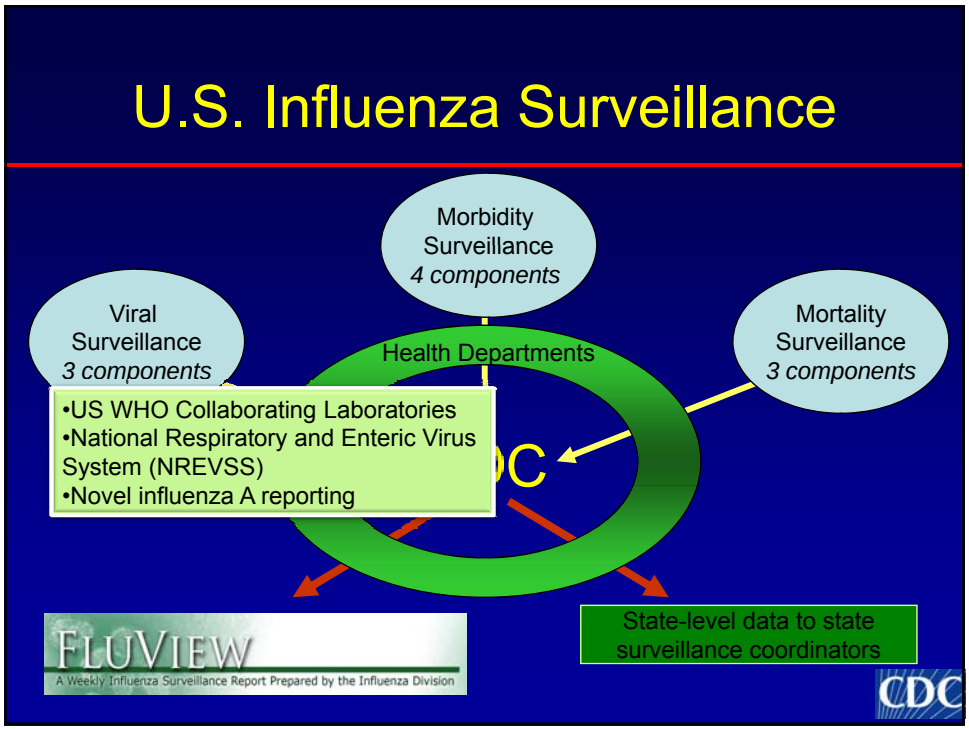
Health Departments
CDC
FLUVIEW
A Weekly Influenza Surveillance Report Prepared by the Influenza Division
State-level data to state surveillance coordinators
CDC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•National Respiratory and Enteric Virus System (NREVSS)
•Novel influenza A reporting
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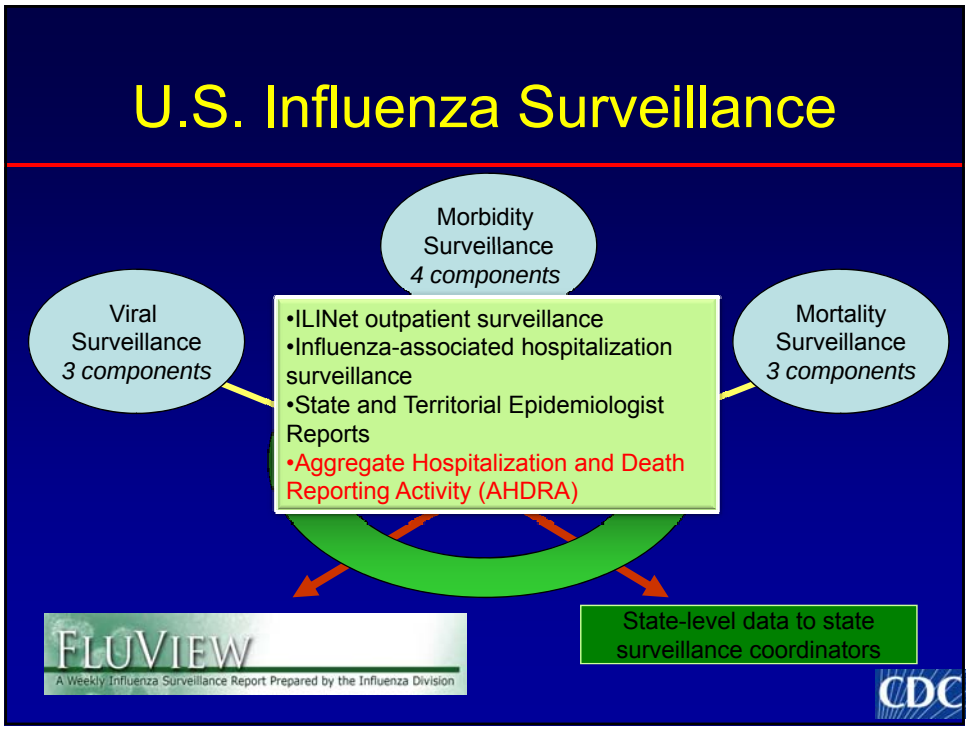
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•ILINet outpatient surveillance
•Influenza-associated hospitalization surveillance
•State and Territorial Epidemiologist Reports
•Aggregate Hospitalization and Death Reporting Activity (AHDRA)
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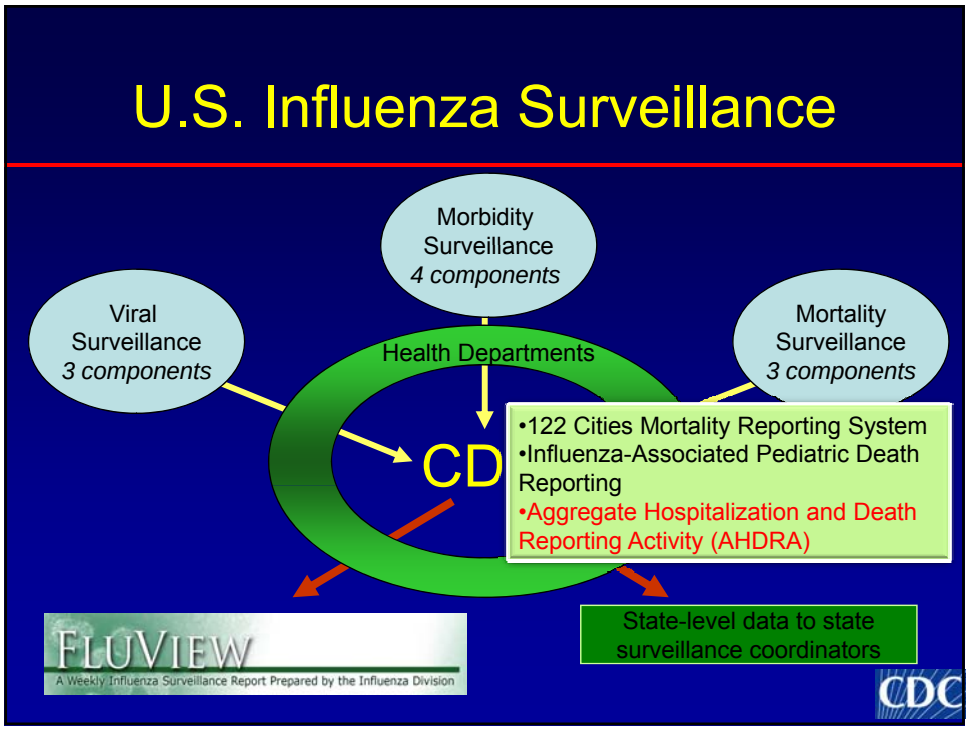
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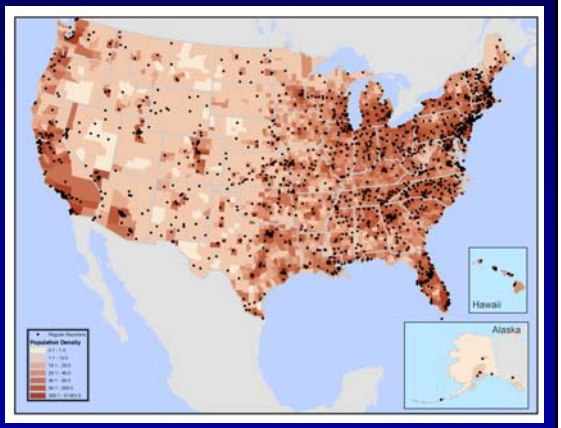
Outpatient Surveillance for Influenza-like Illness

- Monitor Influenza-like Illness (ILI)
  - >3,300 healthcare providers in 50 states
  - >30 million patient visits each year
  - Report total # visits and # ILI by age group
  - Submit clinical specimens

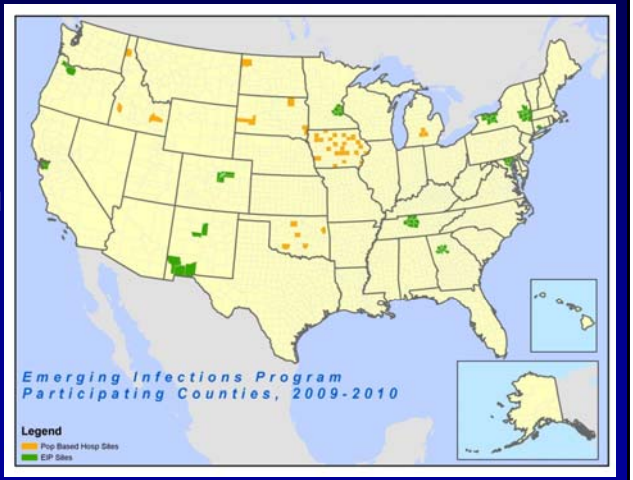
Regularly Reporting Sites 2009-10



CDC

Hospitalization Surveillance

- Emerging Infections Program (EIP) – 12 sites in 10 states
  - children and adults hospitalized with laboratory-confirmed influenza infection
- EIP-like sites in 6 states
  - Added in 2009
- Population based
- Detailed data collection



CDC

Pandemic Surveillance Plan

- Use seasonal surveillance system as the foundation
- Increase the frequency of data collection from a subset of data providers for some systems
- Discontinue use of some systems at the peak of activity
- Supplement surveillance with special studies

Challenges and Changes

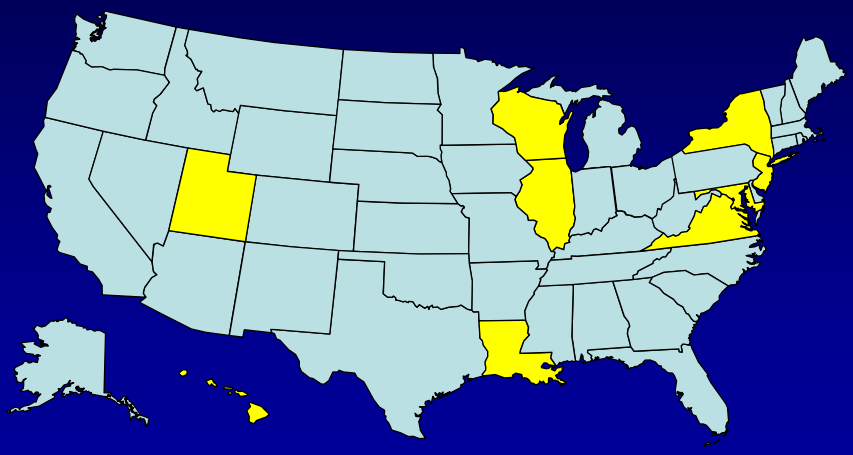
- The US pandemic plan was focused for an H5N1 outbreak starting somewhere else
- The virus was 1st identified in N. America
  - We also assumed:
    - We would have time to prepare
    - Basic epidemiology of the virus would be known
  - Instead, everything had to occur at once
    - Conduct studies to understand the basic epidemiology of the new virus

Challenges and Changes

- Because we planned for a more severe H5-like scenario:
  - ILI surveillance was to be discontinued during the peak of influenza activity
  - Surveillance was going to focus on hospitalizations and deaths
- Actual: Moderate activity with focal outbreaks

CDC

Heavily Affected States during Spring 2009 As Determined by ILI Data



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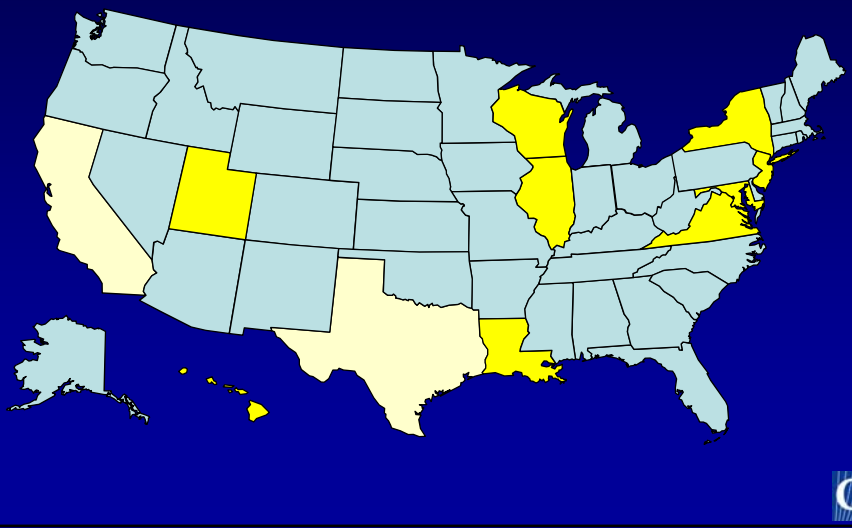

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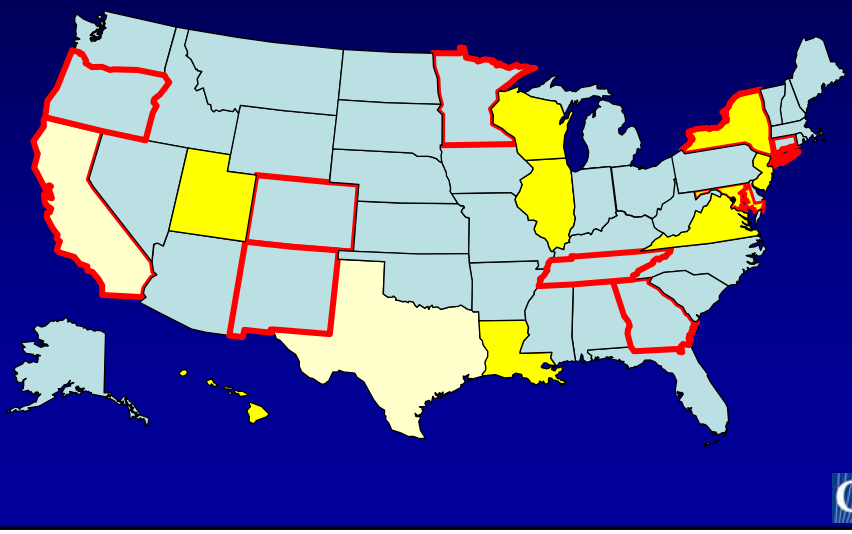


Surveillance Changes

- ILI surveillance became our most frequently used component
- Increased frequency of reporting
  - Weekly to daily for a subset of sites
    - No historical data and no experience with analysis
- Improved analysis and visualization of data
  - Use of age data
  - Analysis of state and local level data

CDC

ILINet Baselines

- Mean % ILI during low influenza weeks (<10% of lab specimens testing positive) plus 2 standard deviations
- Designed to indicate when influenza was circulating
- National and region specific baselines calculated

CDC

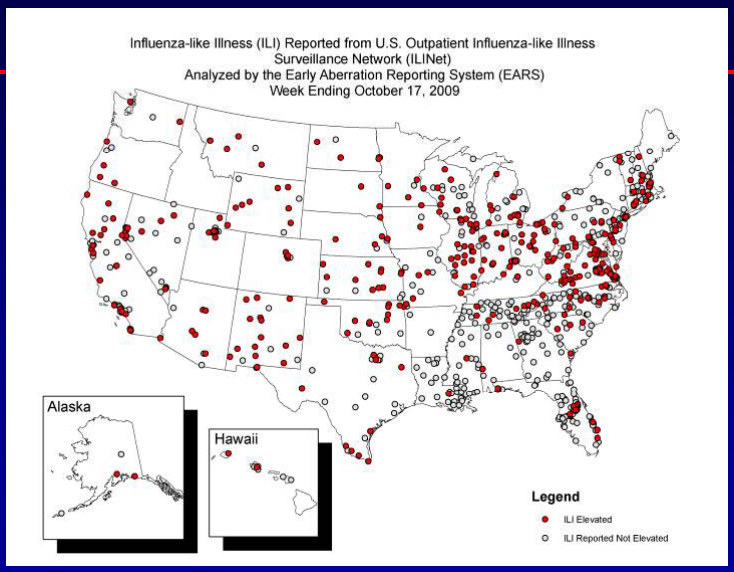
Regional ILI Baselines

Region	Baseline
National	2.5
Region 1	1.4
Region 2	2.4
Region 3	2.6
Region 4	2.3
Region 5	1.8
Region 6	4.9
Region 7	2.3
Region 8	1.4
Region 9	4.1
Region 10	2.7

EARS Sentinel Provider Analysis

- Early Aberration Reporting System
- 3 outbreak detection algorithms
- Data from each site is compared to its own baseline
  - Method we used calculates the mean of 7 previous weeks lagged by 2 plus 3 standard deviations
- Can use count data rather than % ILI
- Display each site on a map
- Doesn't work well when looking at many sites combined if reporting is incomplete
- Only detects increasing activity – doesn't show sustained high levels

Epidemiology/Surveillance



Local Level Provider Adjusted Model Methods

- Extension of the standard baseline method
- Step One: Establish provider level baselines
  - Trusted Providers
    - Non-zero patient visits for at least 10 weeks during the last season
    - Non-zero ILI counts for 10 weeks during the baseline period
    - Baseline mean ratio over last three seasons when ILI count was >0 (week when regional laboratory data was <10% positive for influenza)
  - Non-Established Providers (provider type method)
    - Assigned the baseline and standard deviation of their type grouped as:
      - 0='Unknown'
      - 1='Emergency Medicine'
      - 2='Family Practice,Infectious Disease'
      - 3='Internal Medicine,OB/GYN,Other'
      - 4='Pediatrician'
      - 5='Student Health'
      - 6='Urgent Care'

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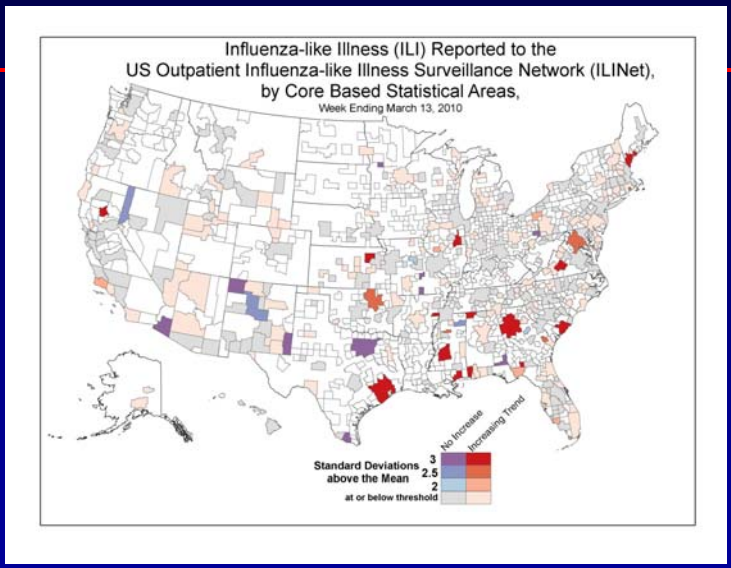
Methods

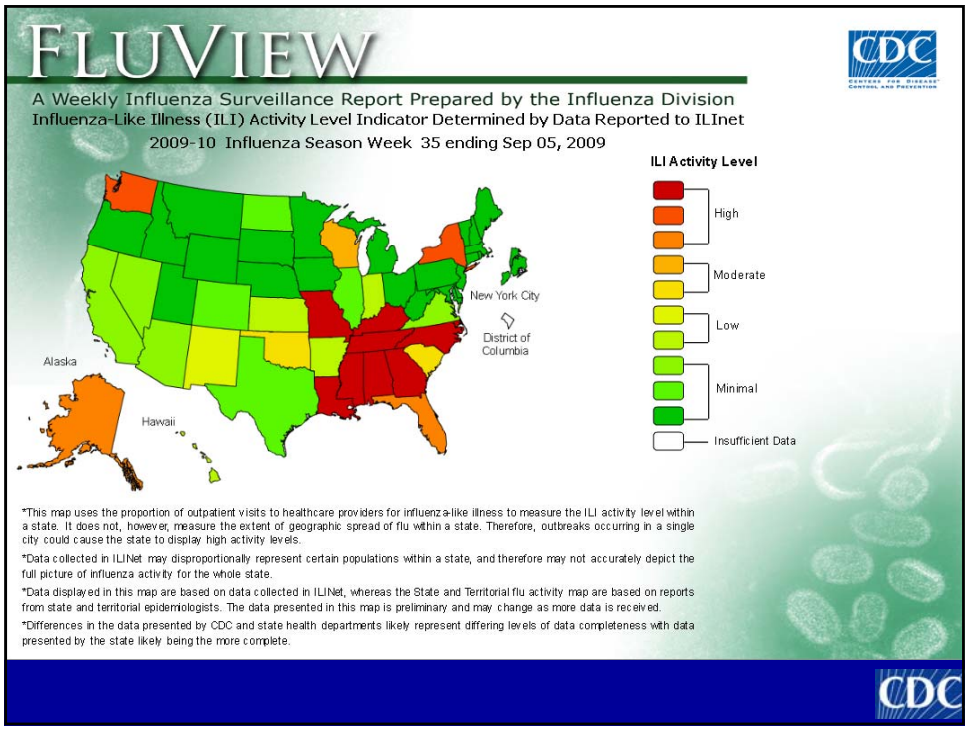
- Step Two: Establish weekly state level baseline means and std devs
  - The baseline ratio for a state is calculated using a weighted sum of the baseline ratios for each contributing provider for the week
  - Standard deviations are calculated by taking the std dev of the binomial distribution centered at the baseline ratio
    - stdev=sqrt(ratio*(1-ratio)/N)
      - N =(total weekly visits) or if this value is too large
      - N=round((3.0^2)* ratio*(1-ratio)/(0.01^2)))
        - Requires areas with large total visits to have at least a 1% increase above the mean to be above threshold
    - If ratio = 0 then the std dev = 1
    - If ratio = 1 then std dev = 0.01
- Step Three: Calculate Weekly Statistics
  - Statistic= (observed ILI ratio – baseline ratio) / (baseline standard deviation)
  - Statistics calculated for areas with >=20 patient visits

Epidemiology/Surveillance



Local Data Display

- CDC internal display only
  - Attempted to show both degree of elevation and direction
- Useful but states were not comfortable showing publicly
- States did approve use of this method for state level data



Advantages of State Level Analysis

- Doesn't use fixed baselines
  - Uses # standard deviations away from a mean adjusted for each week's mix of reporting sites
- Doesn't present numbers that can differ on national vs state data displays
- Does make state to state comparisons valid and easier to understand

Conclusions

- This is only one of many modifications made to surveillance in response to the pandemic
- Emergencies aren't the best time to make major changes to systems
  - Limited personnel with subject matter expertise and many more tasks

Conclusions

- Emergencies offer the resources to make changes – funding, personnel with different types of expertise, cooperation from partners
- Seasonal flu surveillance benefits from improvements made in response to the pandemic

Thank you