California Influenza Surveillance Project

2007-2008 Influenza Season Summary

Overall the influenza season was moderate in severity, with high levels of activity in January, February and early March. The magnitude of influenza activity as described by the multiple parameters measured (percentages of Kaiser Permanente inpatient admissions for influenza and pneumonia, Kaiser Permanente antiviral prescriptions, CDC sentinel provider outpatient visits for influenza-like illnesses (ILI), laboratory detections for influenza, and severe pediatric influenza illnesses) was comparable to previous years, roughly peaking during weeks 2-12 of the influenza season (January 21, 2006- March 17, 2007). This season there was marked regional variation, with Northern California having an overall higher level of activity compared to Southern California, this is similar to the 2006-07 season.

Highlights from the 2007-08 season include:

- **Influenza-associated pediatric deaths:**

This season 6 fatal cases of pediatric influenza were reported. This is comparable to the number of fatal cases in previous years: 6 (2006-07), 13 (2005-06), 5 (2004-05) and 8 (2003-04). This season two of the deaths were due to influenza A and four due to influenza B. Two cases presented with severe encephalitis. No fatal cases had secondary bacterial infection. Only one case had been vaccinated for influenza.

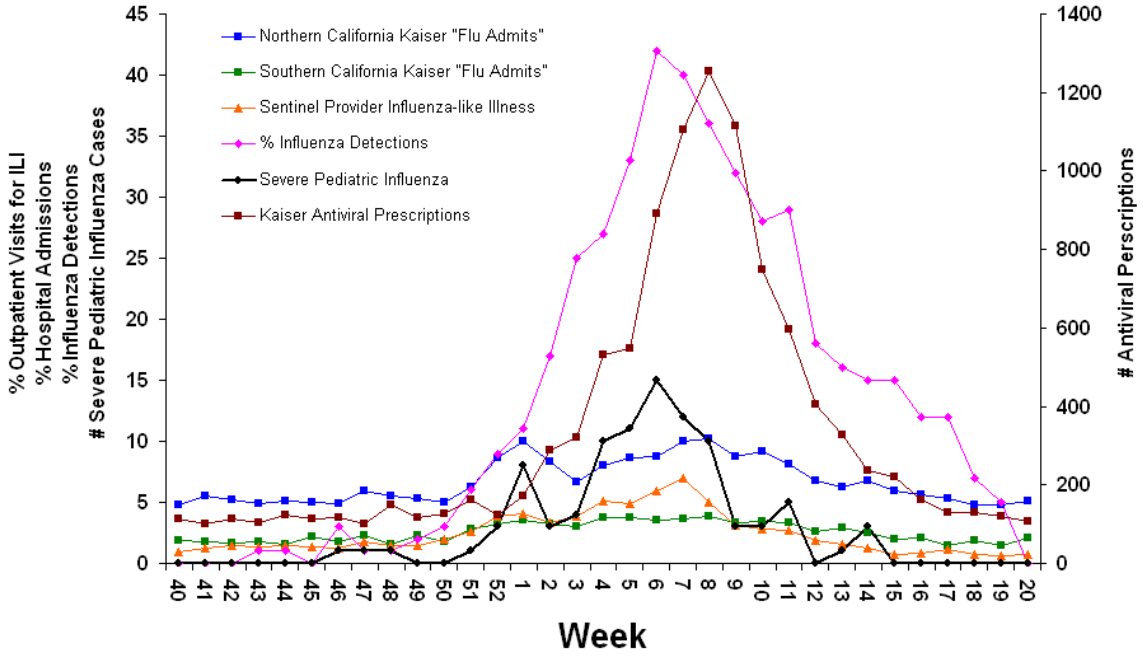
- **Strain typing and vaccine mismatch**

Over 1008 respiratory specimens were tested at VRDL this season; 409 were positive for influenza, including 288 (70%) influenza A and 121 (30%) influenza B. As the season evolved laboratory strain typing data began to show that there was a vaccine mismatch occurring between two of the three components of the influenza vaccine: the H3 subtype and the B subtype (the H1 subtype still matched fairly well). Interim results from a study carried out in Wisconsin found vaccine effectiveness of 58% against circulating influenza A/H3 viruses, based on data collected from Jan 21 through Feb 8, 2008. No vaccine effectiveness against influenza B viruses was found. The new strains circulating have been identified as A/Brisbane/10/2007-like and B/Florida/04/2006-like by both CDC and VRDL. Both these new strains will be included in the 2008-09 influenza vaccine.

- **Antiviral resistance testing**

Two drugs are available to treat influenza: amantadine and oseltamivir. Antiviral resistance monitoring was instituted at VRDL following the emergence in 2005-06 of new drug resistance to amantadine, a drug that was previously commonly used for both treatment and prophylaxis of influenza. In addition, both at CDC and VRDL, this season the emergence of resistance to oseltamivir was identified. This season, 157 influenza-confirmed specimens were tested for antiviral resistance. 100% (87/87) of influenza A/H3 viruses and 4% (3/70) of influenza A/H1 viruses had the S31N mutation consistent with adamantane resistance. No mutations consistent with resistance to the neuraminidase inhibitors were seen in A/H3 viruses (0/87). Ten percent (7/70) of A/H1 viruses had the H274Y mutation associated with oseltamivir resistance.

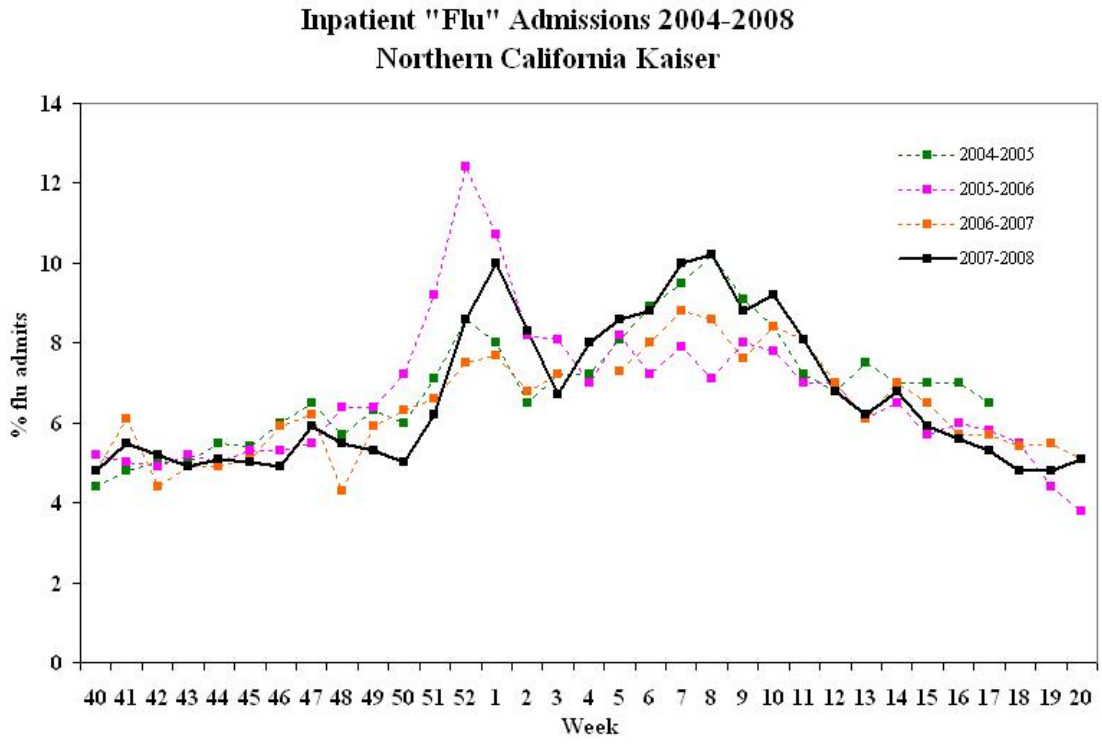
2007-2008 Influenza Surveillance Overview

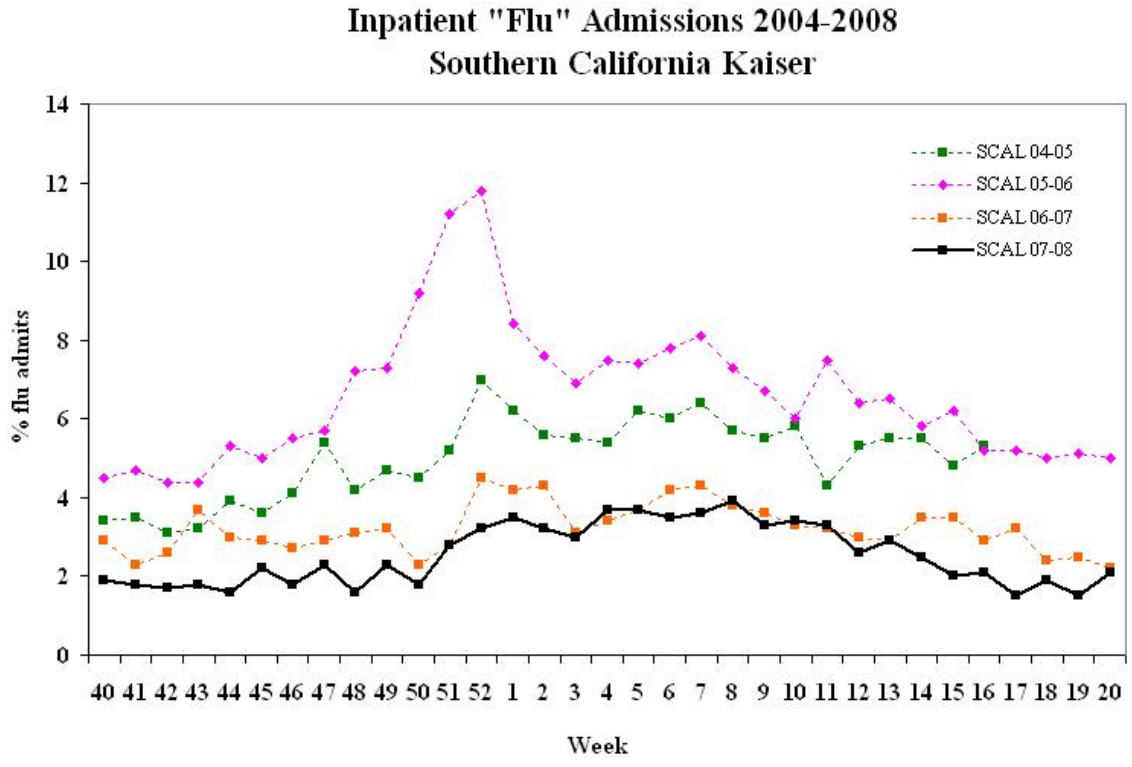


A breakdown of the individual parameters used and their comparison to previous years of data is shown below:

<u>Kaiser Permanente Inpatient Data</u>

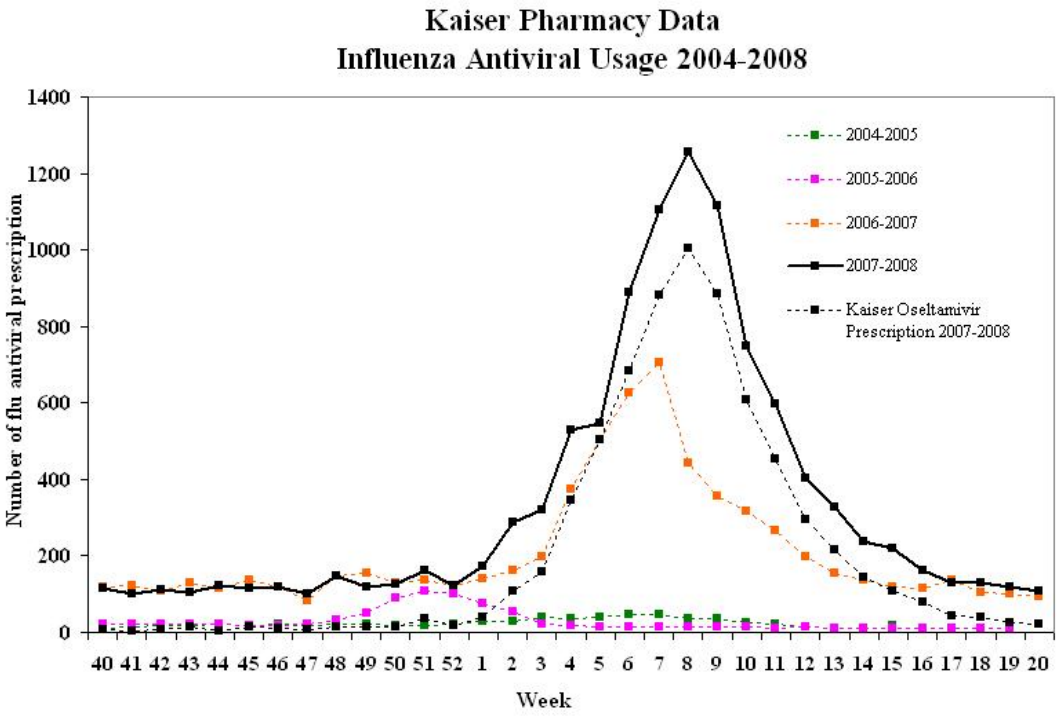
"Flu admits" were defined as inpatient hospital admissions for the diagnoses of pneumonia or influenza. ICD-9 discharge codes 480-487 are well known to correlate with influenza activity but are not useful for tracking activity in real time. Based on data collected in previous years, admitting diagnoses of "flu", 'influenza" and "pneumonia" approximate ICD-9 codes 480-487, and were used to track influenza activity. "Flu admits" are present year-round because of baseline pneumonia admissions. The estimated baseline rate for the off-season is approximately 3-5%. The percentage of "Flu admits" was calculated by dividing the number of flu admissions by the total number of hospital admissions for the same day. Admissions for pregnancy, labor and delivery, birth, and same day surgery procedures were excluded from the denominator.


Inpatient "Flu" Admissions 2004-2008
Northern California Kaiser
% flu admits
Week
2004-2005
2005-2006
2006-2007
2007-2008


Inpatient "Flu" Admissions 2004-2008
Southern California Kaiser
% flu admits
Week
SCAL 04-05
SCAL 05-06
SCAL 06-07
SCAL 07-08

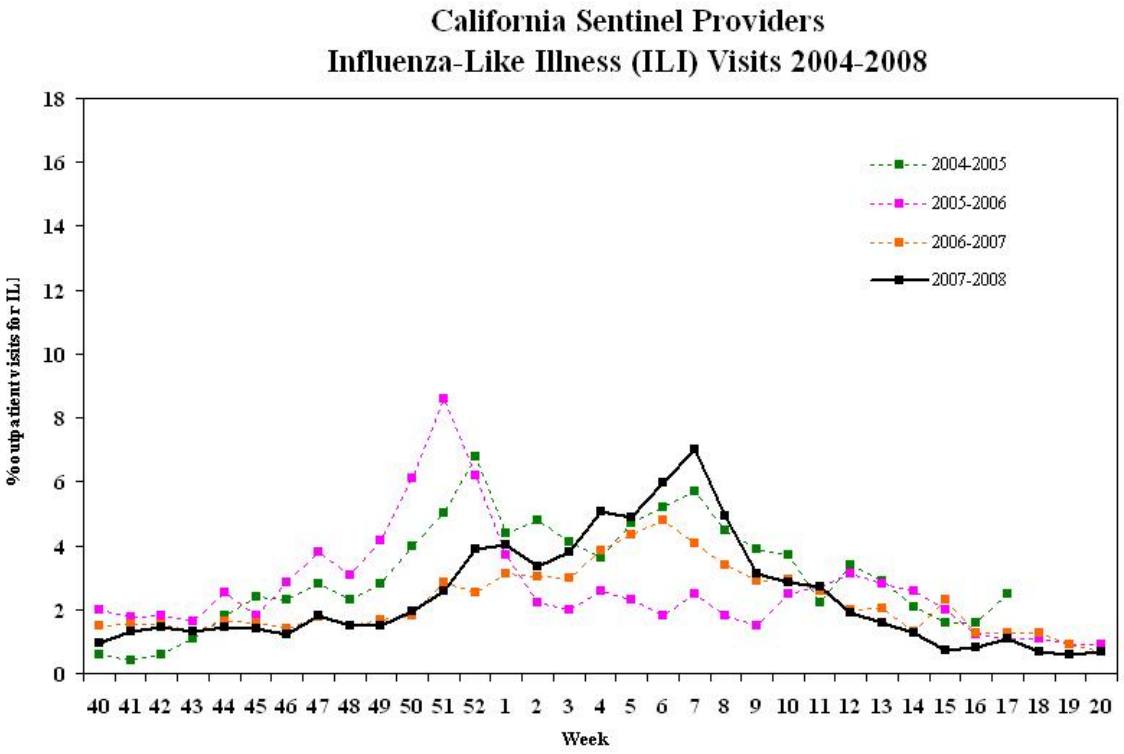
Kaiser Permanente Antiviral Usage Data

The number of prescriptions filled for the antiviral drugs used to treat influenza (amantadine, rimantadine, zanamivir and oseltamivir) by Kaiser outpatient pharmacies in California is reported to us weekly. Baseline amantadine usage is present year-round for disorders such as Parkinson's disease. Because of reports of widespread resistance to the adamantine drugs, oseltamivir was the main drug prescribed for treatment of influenza in the 2007-08 season.



Sentinel Physician Influenza-Like Illness Data

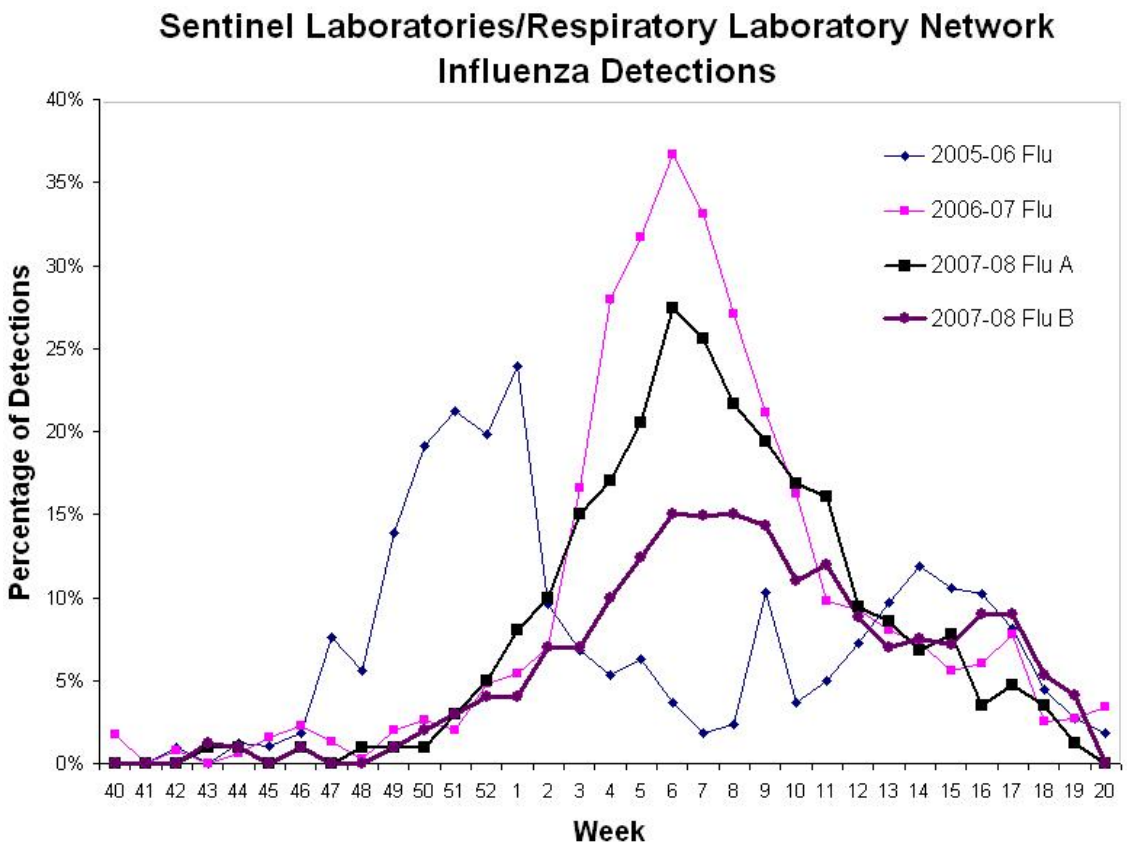
Over 150 sentinel providers located throughout California participate in the CDC Sentinel Provider Influenza Surveillance Program. These sentinel providers report weekly data on the percentage of outpatient visits seen for influenza-like illness, calculated by dividing the number of influenza-like illness visits by the total number of outpatient visits per week. Influenza-like illness is defined as fever (> 100° F [37.8° C], oral or equivalent) AND cough and /or sore throat (in the absence of a KNOWN cause other than influenza). One hundred fourteen providers were "active", reporting ILI more than 50% (16 weeks) of the time during the 2007-08 influenza season.



Respiratory Virus Isolation/Detection Data

During the 2007-2008 influenza season, CISP received weekly reports of laboratory detections and isolations of influenza and other respiratory viruses (predominantly RSV) from 22 participating sites situated throughout California, including hospital, academic, public health, and private laboratories. The CDPH Viral and Rickettsial Disease Laboratory (VRDL) also encouraged submission of clinical respiratory specimens and isolates from a wide variety of settings, including local public health and clinical laboratory partners, hospitalized cases of severe respiratory illness, outpatient clinics and outbreak settings. Selected isolates were forwarded to CDC for confirmation and further analysis

In the 2007-08 season, a total of 1008 clinical specimens were tested at VRDL using R-mix shell vial testing and viral isolation in primary monkey kidney and human fetal diploid cells; 505 (50%) had positive yield by isolation. 409 isolates were positive for influenza: a majority (288/409; 70%) were identified as influenza A compared to influenza B (121/409; 30%). These results are comparable to those reported by the World Health Organization National Respiratory and Enteric Virus Surveillance System (NREVSS) laboratory network, where across the US, of the 39,453 influenza viruses isolated, 28,105 (71.2%) were influenza A viruses and 11,348 (28.8%) were influenza B viruses. Ninety-six of the 505 isolates had non-influenza viral pathogens diagnosed, including rhinovirus (34); parainfluenza (26); adenovirus (20), RSV (4), coxsackievirus (4); echovirus (4); herpes (3); human metapneumovirus (1).



VRDL Subtyping and Strain-typing:

Influenza A

This season, 290 influenza A isolates were characterized, including 138 subtyped as H3, 76 subtyped as H1, and 76 that were unable to be subtyped by cell culture. PCR is pending in the subset on which culture was not able to discriminate as H1 or H3.

To date, 82 type A viruses have been characterized antigenically by hemagglutination inhibition assay (HIA) at the VRDL to determine strain type; among these, 65 (79%) were subtype A/H1 and 17 (21%) were A/H3. Of the subtype A/H1 isolates characterized, 52 (80%) were A /Solomon Islands/3/6-like and 13 (20%) had low titers against A/Solomon Islands/3/6-like ferret antisera. Of the subtype A/H3 isolates characterized, 14 (82%) of the A/H3 isolates were A/Brisbane/10/07 and 3 (18%) were A/Wisconsin/67/2005 -like strain. Both A /Solomon Islands/3/6-like (H1) and A/Wisconsin/67/2005 -like (H3) were recommended as components of the 2007-08-influenza vaccine for the Northern Hemisphere. The A/Brisbane/10/07-like virus was recommended as the H3 component for the 2008-09 influenza vaccine for the Northern Hemisphere.

Influenza B

Among 93 B isolates characterized, 87 (94 %) were characterized as B/Yamagata lineage-like and 6 (6%) as B/Victoria lineage-like.

Among the B/Yamagata lineage viruses, 76 (87%) were characterized as B/Florida/4/6-like and 11(13%) had low titers against B/Florida/4/6 ferret antisera. Among the

B/Victoria lineage viruses, 3 (50%) were characterized as B/Ohio/1/5-like and 3 (50%) had low titers against B/Ohio/1/5 ferret antisera.

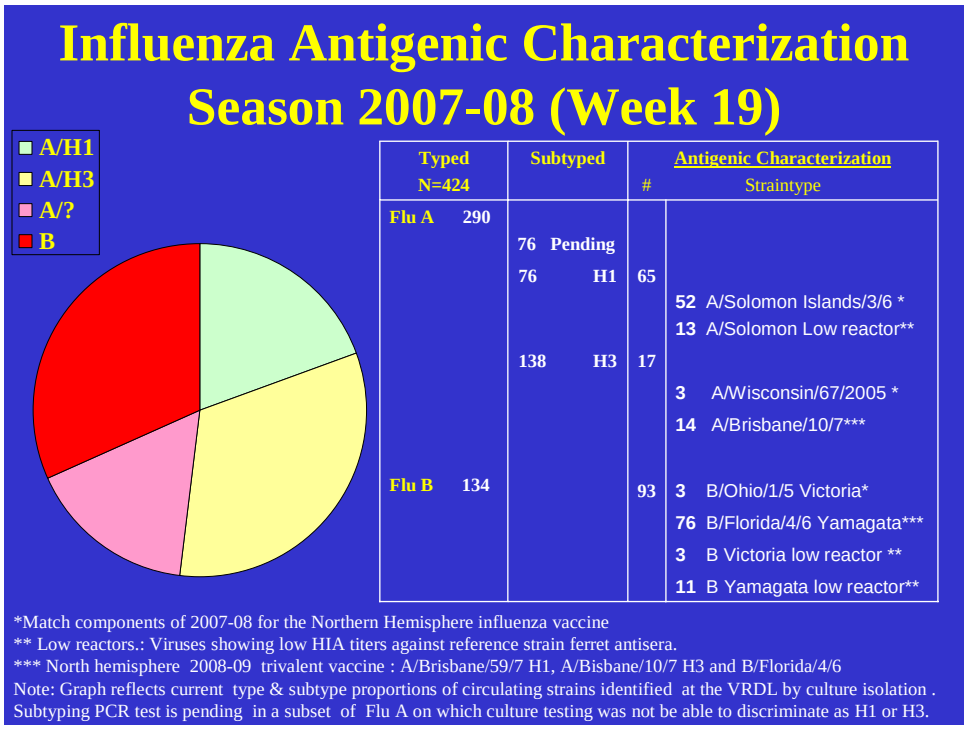
The B/Ohio/1/5-like virus of the B/Victoria lineage was recommended as the B component of the 2007-08 influenza vaccine for the Northern Hemisphere. For the 2008-09 influenza vaccine for the Northern Hemisphere, the B/Florida/4/6-like virus of the B/Yamagata lineage has been recommended.

Comparison of VRDL findings with national laboratory surveillance

Similar to our findings, in the US most influenza viruses tested were characterized as A/Solomon Islands/3/6 (H1)-like, A/Brisbane/10/07(H3)-like and B/Florida/4/6-like.

The VRDL strain-typing preliminary percentage results differ only slightly from national results: A/Solomon Islands/3/6 (H1)-like (80% vs. 68%), A/Brisbane/10/07(H3)-like (82% vs. 65%) and B/Florida/4/6-like (87% vs. 92%). Since the VRDL strain typing testing for the majority of flu A/H3 isolates is still in progress that percentage may change.

Summary of all isolates strain typed

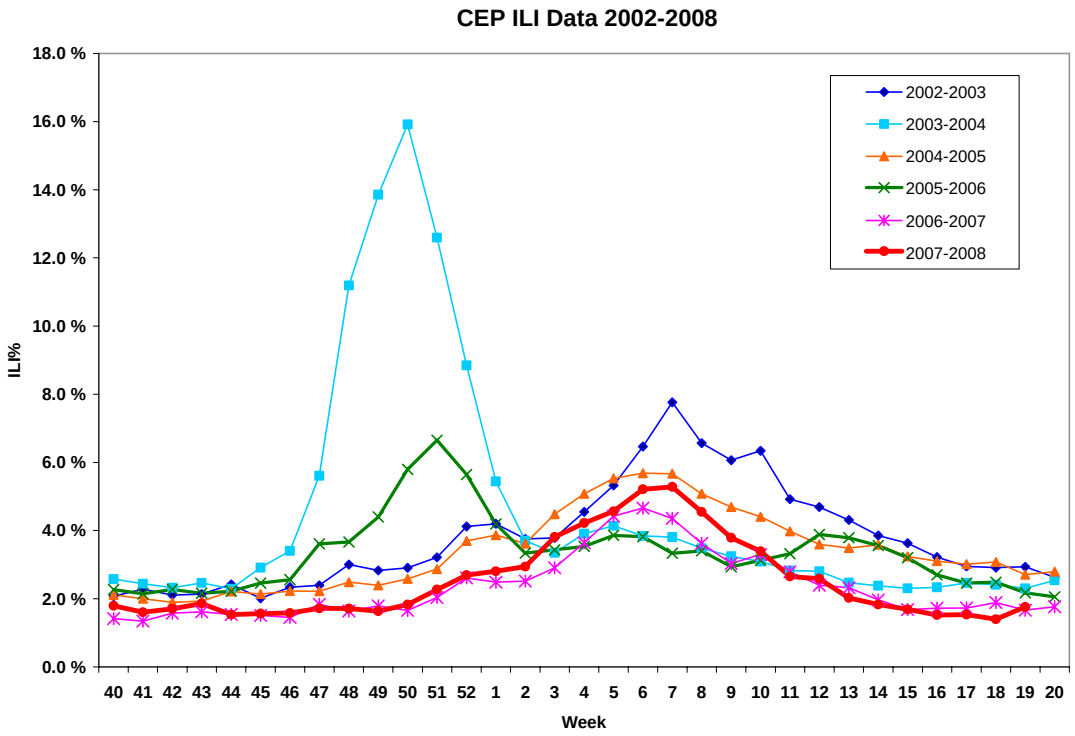


• It is important to note that our surveillance system does not receive data from ALL labs, physicians, hospitals, or pharmacies in California; therefore our numbers reported do not represent all cases of influenza, but are intended to demonstrate trends in influenza activity.

Emergency Room Visit Data [data supplied by California Emergency Physicians (CEP)]:

Influenza-like illnesses (ILI) activity is monitored by over 1,100 providers in 58 emergency departments throughout the state by use of electronic billing data that captures specific codes which may identify ILI, including patients with either an influenza

diagnosis, or fever in combination with one or more of the following: cough, throat pain, acute pharyngitis or acute respiratory infection*. The CEP data is not collected by CDPH; further information is available at www.cep.com.



*These symptoms are not part of the CDC sentinel provider definition for ILI.

Contact us:

For questions about the California Influenza Surveillance Project, please contact Janice Louie (janice.louie@cdph.ca.gov) or Erica Boston (erica.boston@cdph.ca.gov).