

Influenza and Other Respiratory Diseases Surveillance Report 2014–2015 Season

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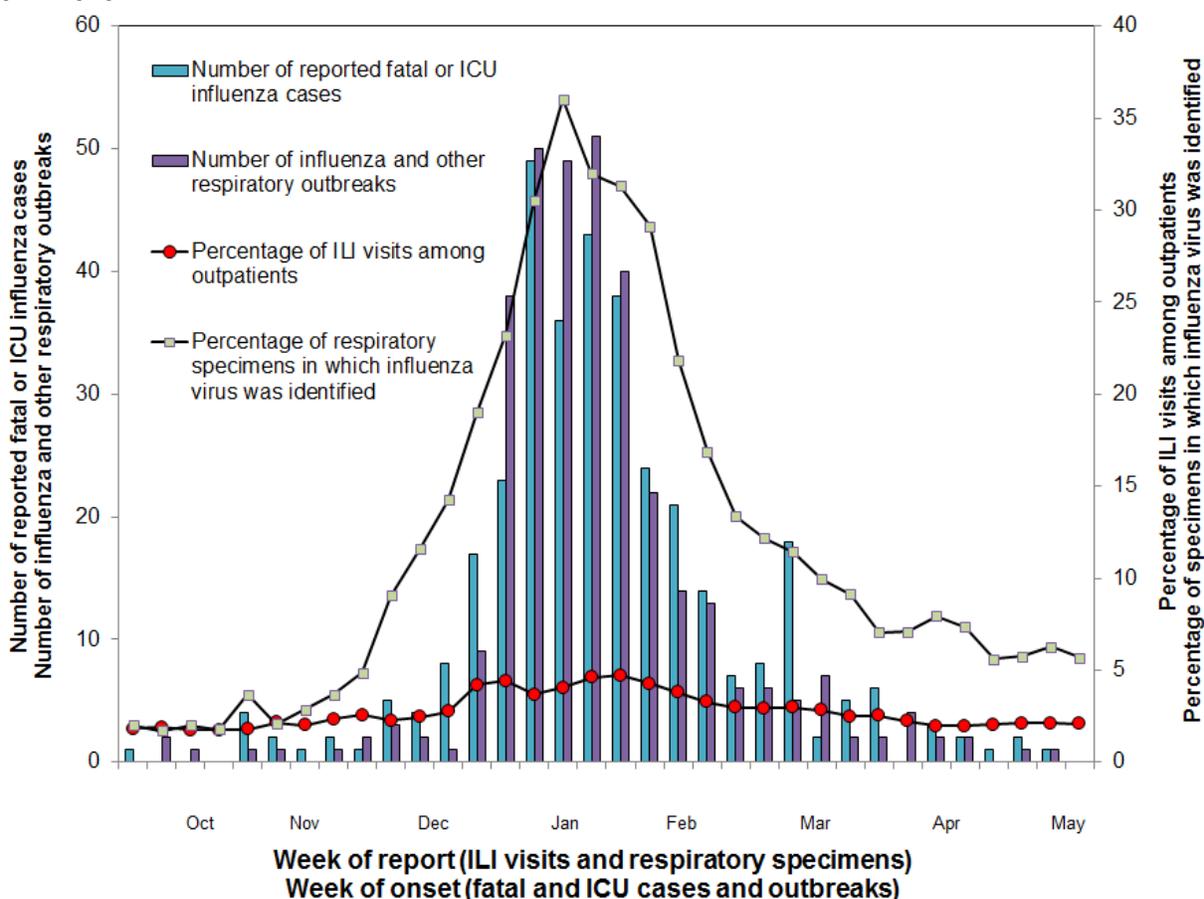
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Synopsis

The 2014–2015 influenza season was moderately severe with high levels of outpatient illness and influenza-associated hospitalizations, particularly among adults 65 years of age and older.¹ Nationally, influenza activity peaked during late December with the genetically drifted influenza A (H3N2) viruses predominating through the end of February 2015.^{1,2} Influenza activity in California, as measured by most clinical and laboratory parameters, began increasing in early December, peaking in early to mid-January (Figure 1). This timing is consistent with what has been seen in prior non-pandemic influenza seasons in California. The genetically drifted influenza A (H3N2) viruses were also the predominant viruses detected in California; influenza B and influenza 2009 A (H1N1) viruses were also detected to a lesser extent both in California and nationally.

Figure 1. Selected influenza surveillance parameters, California Department of Public Health, 2014–2015



The percentage of influenza-like illness (ILI) visits among outpatients peaked during the week ending January 31, 2015 and the percentage of laboratory detections for influenza peaked during the week ending January 17, 2015 (5.0% and 36.0%, respectively). These levels of activity were comparable to levels seen during the peak of the 2013–2014 influenza season, which also was considered to be moderately severe. A total of 338 confirmed respiratory outbreaks were reported during the 2014–2015 season; of these outbreaks, 275 were

associated with influenza, the majority were caused by influenza A (H3N2) viruses and occurred in residential healthcare facilities.

Nine laboratory-confirmed influenza-associated pediatric deaths were reported to the California Department of Public Health (CDPH) during the 2014–2015 season. This number is within the range (5 in 2007–2008 to 37 in 2008–2009) of past influenza seasons since fatal pediatric influenza surveillance began in 2003. A total of 350 cases of influenza-associated severe illness or death among persons less than 65 years of age were reported to CDPH, compared to 1,237 cases during the 2013–2014 season. However, these data may be incomplete, as surveillance for severely ill or fatal influenza cases <65 years of age was only initiated in California in 2009, and reporting of non-fatal ICU cases is voluntary.

Influenza Surveillance Data

A. CDPH Virologic Surveillance

CDPH obtains data on laboratory-confirmed influenza and other respiratory viruses from a number of laboratories throughout the state. These laboratories include 27 public health laboratories, collectively known as the Respiratory Laboratory Network (RLN), and 14 clinical, academic and hospital laboratories, which are referred to as sentinel laboratories.

During the 2014–2015 influenza season, these 41 participating laboratories tested 88,378 specimens for influenza. Of the 88,378 specimens tested, 16,361 (18.5%) were positive for influenza; of these, 14,313 (87.5%) were influenza A and 2,048 (12.5%) were influenza B. A total of 5,057 (35.3%) influenza A specimens were subtyped; 5,033 (99.5%) were seasonal A (H3N2) and 24 (0.5%) were 2009 A (H1N1).

While influenza A (H3N2) was the predominant influenza strain circulating in California during the 2014–2015 season, the proportion of influenza B viruses identified by RLN and sentinel laboratories increased toward the latter half of the season. These virologic surveillance data are similar to national findings.^{1,2} The proportion of specimens testing positive for all types of influenza first exceeded 10% - an indication that higher than normal levels of influenza virus were circulating - during the week ending December 13, 2014. The proportion of influenza-positive specimens peaked at 36.0% during the week ending January 7, 2015, and declined to less than 10% during the week ending March 21, 2015.

1. Respiratory Laboratory Network (RLN) Surveillance Results

The RLN laboratories offer polymerase chain reaction (PCR) testing for influenza A and B, including influenza A subtyping, and testing for respiratory syncytial virus (RSV), another common respiratory virus.

Of 10,832 specimens tested by the RLN from September 28, 2014 through May 23, 2015, 5,443 (50.2%) were positive for influenza; of these, 4,868 (89.4%) were influenza A and 575 (10.6%) were influenza B (Table 1). Of the 4,868 influenza A specimens, 4,778 (98.2%) were seasonal A (H3N2), 22 (0.5%) were 2009 A (H1N1), and 68 (1.4%) were not subtyped. In addition, 1,351 specimens were tested for RSV; of which 146 (10.8%) were positive.

Table 1. RLN surveillance results, September 28, 2014–May 23, 2015

	Total RLN* No. (%)	Northern CA No. (%)	Central CA No. (%)	Southern CA No. (%)
Number of specimens tested by PCR	10,832	4,561	1,446	4,825
Number of specimens negative for influenza	5,389 (49.8)[†]	3,228 (70.8)[†]	541 (37.4)[†]	1,620 (33.6)[†]
Number of specimens positive for influenza	5,443 (50.2)[†]	1,333 (29.2)[†]	905 (62.6)[†]	3,205 (66.4)[†]
Influenza A	4,868 (89.4) [‡]	1,244 (93.3) [‡]	886 (97.9) [‡]	2,738 (85.4) [‡]
<i>Seasonal A (H3N2)</i>	4,778 (98.2) [§]	1,179 (94.8) [§]	876 (98.9) [§]	2,723 (99.5) [§]
<i>2009 A (H1N1)</i>	22 (0.5) [§]	9 (0.7) [§]	2 (0.2) [§]	11 (0.4) [§]
<i>Subtyping not performed</i>	68 (1.4) [§]	56 (4.5) [§]	8 (0.9) [§]	4 (0.1) [§]
Influenza B	575 (10.6) [‡]	89 (6.7) [‡]	19 (2.1) [‡]	467 (14.6) [‡]
Number of specimens tested for RSV	1,351	787	301	263
RSV	146 (10.8)	69 (8.8)	66 (21.9)	11 (4.2)

* Participating laboratories:

Northern California: Alameda, Contra Costa, El Dorado, Humboldt, Placer, Sacramento, San Francisco, San Mateo, Santa Clara, Shasta, Solano, Sonoma

Central California: Fresno, Monterey, San Joaquin, Stanislaus, Tulare

Southern California: Kern, Long Beach, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Ventura

† Percent of total specimens tested for influenza by PCR

‡ Percent of specimens positive for influenza

§ Percent of influenza A positives

2. Sentinel Laboratory Surveillance

The sentinel laboratories use various methods to test for influenza, including rapid test, direct fluorescent assay, viral culture and PCR.

From September 28, 2014 through May 23, 2015, the sentinel laboratories tested a total of 77,546 specimens for influenza; 10,918 (14.1%) were positive. Of the 10,918 specimens that tested positive for influenza, 9,445 (86.5%) were influenza A and 1,473 (13.5%) were influenza B (Table 2). The highest weekly percentage of influenza detections in the sentinel laboratories occurred during the week ending January 17, 2015, when 28.5% (1,471/5,159) of specimens were positive for influenza. Of 67,887 specimens tested for RSV by the sentinel laboratories, 8,338 (12.3%) were positive.

Table 2. Influenza and other respiratory virus detections in Sentinel Laboratories*, September 28, 2014–May 23, 2015

	No. (%)
Total specimens tested for influenza	77,546
Number of specimens negative for influenza	66,628 (85.9)[†]
Number of specimens positive for influenza	10,918 (14.1)[†]
Influenza A	9,445 (86.5) [‡]
<i>Seasonal A (H3)</i>	255 (2.7) [§]
<i>2009 A (H1)</i>	2 (0.1) [§]
<i>Subtyping not performed</i>	9,188 (97.3) [§]
Influenza B	1,473 (13.5) [‡]
Total specimens tested for RSV	67,887
RSV	8,338 (12.3)

* Participating laboratories: Children's Hospital Central California, Children's Hospital Los Angeles, Children's Hospital Oakland, Imperial County Hospitals, Imperial County U.S.-Mexico Border Infectious Disease Surveillance (BIDS) Project Laboratories, Kaiser Permanente Northern California, Long Beach Memorial Medical Center, Rady Children's Hospital San Diego, San Francisco General Hospital, San Ysidro Health Center, Stanford University Medical Center, UCLA Medical Center, UCSF Medical Center

† Percent of total specimens tested for influenza

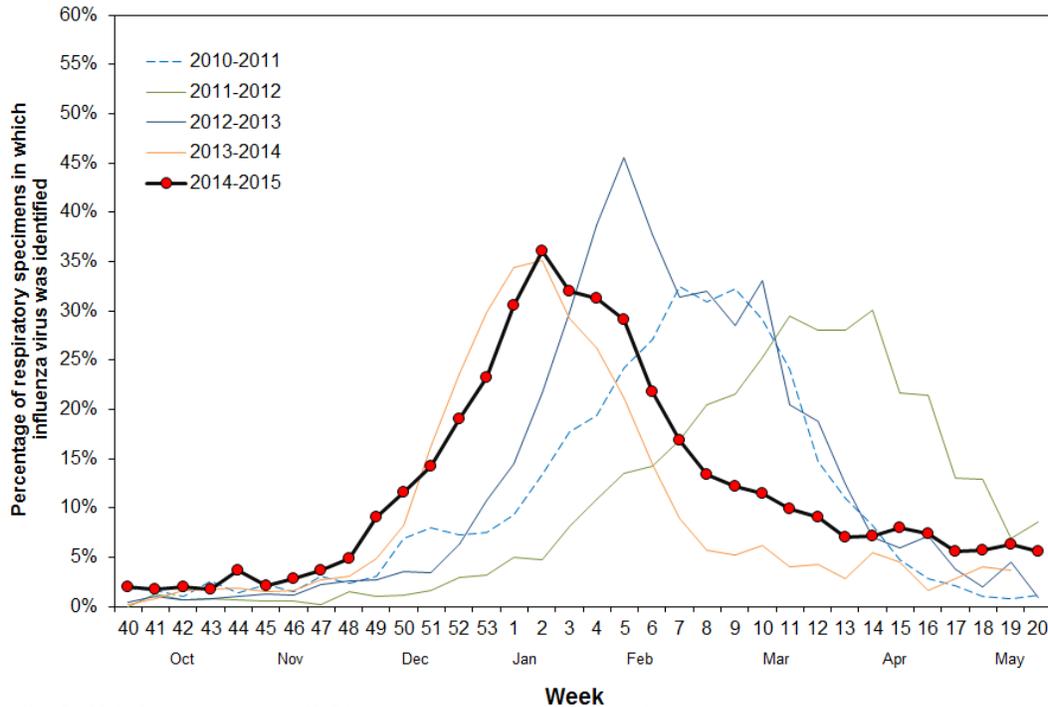
‡ Percent of specimens positive for influenza

§ Percent of influenza A positives

3. Combined RLN and Sentinel Laboratory Surveillance Results

Figures 2 and 3 summarize the combined laboratory data from both the RLN and the sentinel laboratories. The overall level of activity seen during the 2014–2015 season was comparable to that of the 2013–2014 season, which was also considered moderately severe (Figure 2). The majority of influenza detections identified by the RLN and sentinel laboratories during the 2014–2015 season were influenza A (H3N2) (Figure 3). This season, influenza activity preceded RSV activity (Figure 4). Rhinovirus and enterovirus were the most frequently detected viruses among the other tested respiratory viruses (Figure 5).

Figure 2. Percentage of specimens from which influenza was detected in Respiratory Laboratory Network and Sentinel Laboratories, 2010–2015



Note: The 2014–15 season contains a week 53. Prior years' data have been shifted so that week 1 aligns across years.

Figure 3. Percentage of influenza types and subtypes in Respiratory Laboratory Network and Sentinel Laboratories, 2014–2015

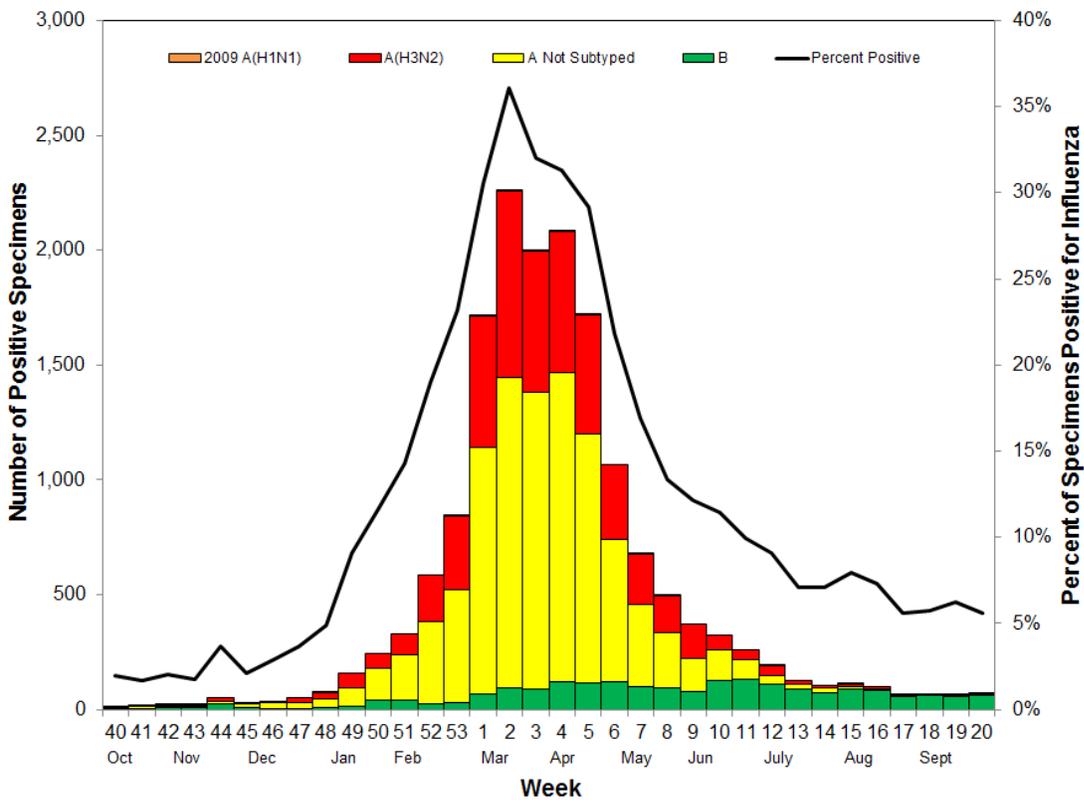


Figure 4. RSV detections in Respiratory Laboratory Network and Sentinel Laboratories, 2010–2015

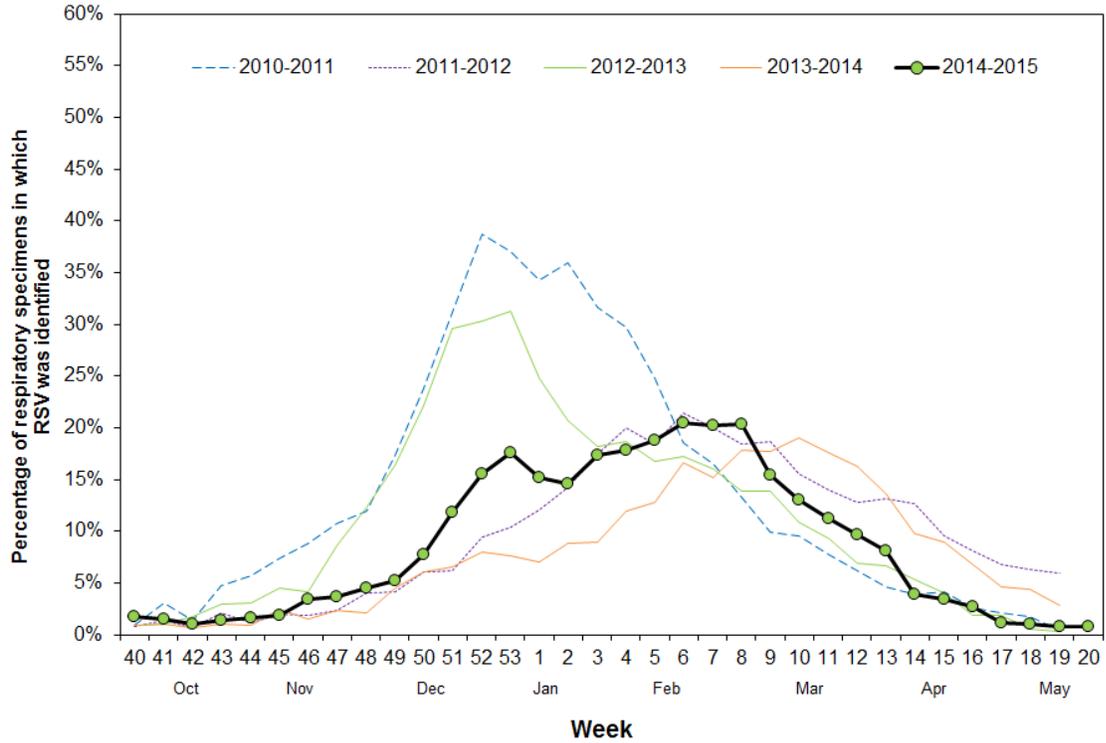
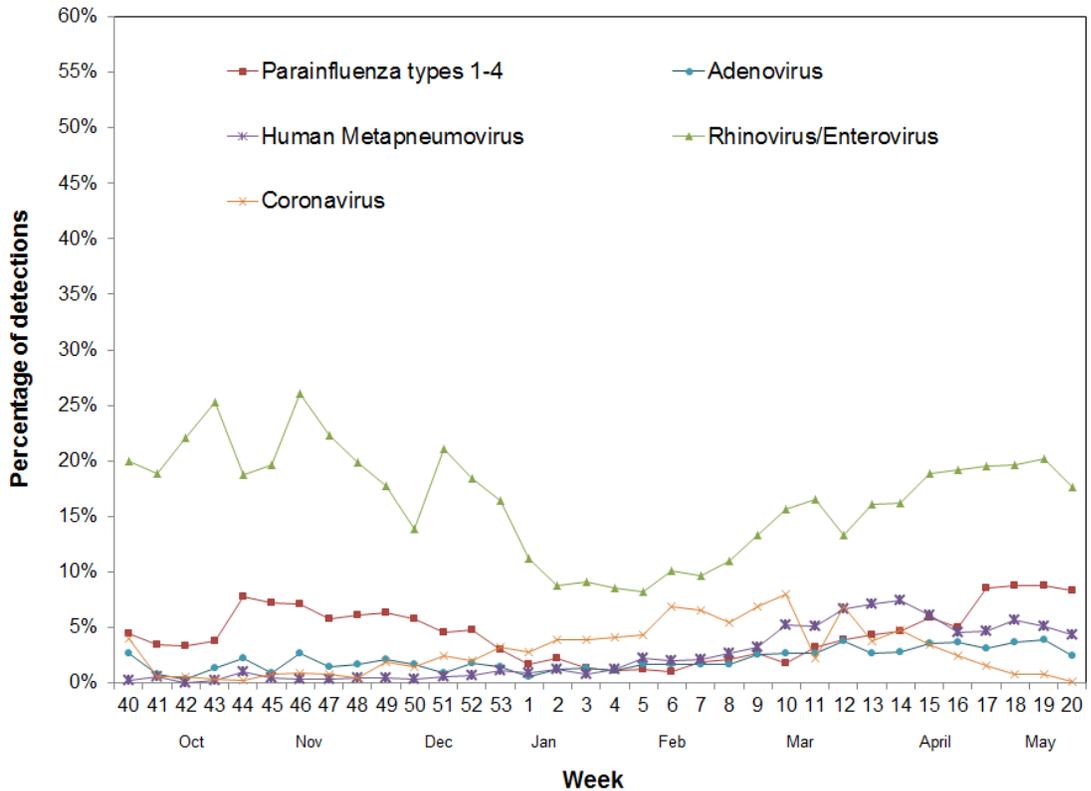


Figure 5. Non-influenza respiratory virus detections in Respiratory Laboratory Network and Sentinel Laboratories, 2014–2015



4. Influenza Virus Strain Characterization

A total of 139 influenza viruses from California were strain-typed by the Centers for Disease Control and Prevention (CDC) during the 2014–2015 influenza season (Table 3). All five (100%) 2009 A H1N1 samples and seven (30%) A (H3N2) samples were strain-typed as A/California/07/2009-like (H1N1) and A/Texas/50/2012-like (H3N2) respectively, the H1N1 and H3N2 components included in the 2014–2015 influenza vaccine for the North Hemisphere. Sixteen influenza A (H3N2) specimens were strain-typed as A/Switzerland/9715293/2013-like (H3N2) which will be included as the influenza A (H3N2) component for the 2015–2016 Northern Hemisphere vaccine formulation. Nationally, 100.0% of influenza 2009 A (H1N1) viruses and 18.6% of influenza A (H3N2) viruses submitted to CDC from U.S. laboratories were well-matched to the influenza A components of the trivalent and quadrivalent vaccines.

Among the 111 influenza B viruses characterized in California, 60 (54%) were characterized as B/Massachusetts/02/2012-like (Yamagata lineage), which matches components in both the quadrivalent and trivalent influenza vaccines for the Northern Hemisphere, and 51 (46%) were characterized as B/Brisbane/6/2008-like (Victoria lineage), the strain included in the quadrivalent 2014–2015 vaccine for the Northern Hemisphere. All strain-typed influenza B viruses were well-matched to the influenza B component in the quadrivalent vaccine, and 54% of influenza B viruses were well-matched to the influenza B component only included in the trivalent vaccine.

In California a higher proportion of influenza B viruses were Victoria lineage viruses compared to what was seen nationally, 46% vs 28%. Approximately 98% of influenza B submitted viruses in the US were well-matched to the influenza B component of the quadrivalent vaccine, and 70% of the influenza B viruses were well-matched to the influenza B component only included in the trivalent vaccine.^{1,2}

Table 3. Influenza virus antigenic characterization, 2014-2015 season

Influenza Subtype/Lineage	Vaccine Strain	Match Vaccine Strain	
		California	United States
Influenza A (H1N1)	A/California/7/2009-like (H1N1)	5/5	59/59
Influenza A (H3N2)	A/Texas/50/2012-like (H3N2)	7/23	246/1324
Influenza B Victoria*	B/Brisbane/60/2008-like	51/51	223/228
Influenza B Yamagata [†]	B/Massachusetts/02/2012-like	60/60	571/582

* The influenza B Victoria lineage virus is included in only the 2014–2015 quadrivalent influenza vaccine

[†] The influenza B Yamagata lineage virus is included in both the 2014–2015 trivalent and quadrivalent vaccine

5. Antiviral Resistance Testing

Currently there are two classes of FDA-approved antiviral drugs for the treatment and prophylaxis of influenza virus infections, M2 inhibitors and neuraminidase (NA) inhibitors (NAI). Since high levels of resistance to M2 inhibitors (amantadine and rimantadine) are observed among the circulating influenza A viruses, M2 resistance testing is not performed on a routine basis.

The CDPH Viral and Rickettsial Disease Laboratory (VRDL) tests for resistance to NAIs using two methodologies; pyrosequencing and the functional NA inhibition (NI) assay. Influenza 2009 A (H1N1) and influenza A (H3N2) clinical specimens are tested using pyrosequencing to detect a single known mutation that confers oseltamivir resistance (H275Y). Influenza 2009 A (H1N1), A (H3N2), and influenza B positive isolates are tested for resistance to NAIs (oseltamivir and zanamivir) using the NI assay. The NI assay is the preferred method for the detection of resistance to the NAI class of drugs caused by established (e.g., H275Y) or novel mutations. Combined antiviral resistance testing results for the 2014–2015 season are summarized below.

During the 2014–2015 influenza season, CDPH-VRDL tested 238 influenza isolates for antiviral resistance; all influenza viruses were sensitive to oseltamivir (Table 4).

Table 4. Number of specimens tested for antiviral resistance, California, 2014–2015 season

	Neuraminidase Inhibitors Resistance
Influenza 2009 A (H1N1)	0/7
Influenza A (H3N2)	0/122
Influenza B	0/109

CDC also performs antiviral resistance testing as part of routine surveillance. Influenza 2009 A (H1N1), influenza A (H3N2), and influenza B virus isolates are tested for resistance to oseltamivir, zanamivir, and peramivir. During the 2014–2015 influenza season, a total of 4,192 specimens were tested. All 896 influenza B viruses and 3,232 influenza A (H3N2) viruses tested were sensitive to both oseltamivir and zanamivir. Among the 64 influenza 2009 A (H1N1) viruses tested for resistance to oseltamivir and peramivir, 1 (1.6%) was resistant to oseltamivir and 1 (1.6%) was resistant to peramivir. All 58 influenza 2009 A (H1N1) viruses tested for resistance to zanamivir were sensitive.

6. Novel Influenza A Viruses

Neither the RLN nor the CDPH-VRDL identified any influenza viruses by polymerase chain reaction (PCR) typing or subtyping that were suggestive of a novel virus infection.

B. Case-Based Surveillance

1. Influenza-Associated Critical Illness and Mortality in Californians <65 years of age

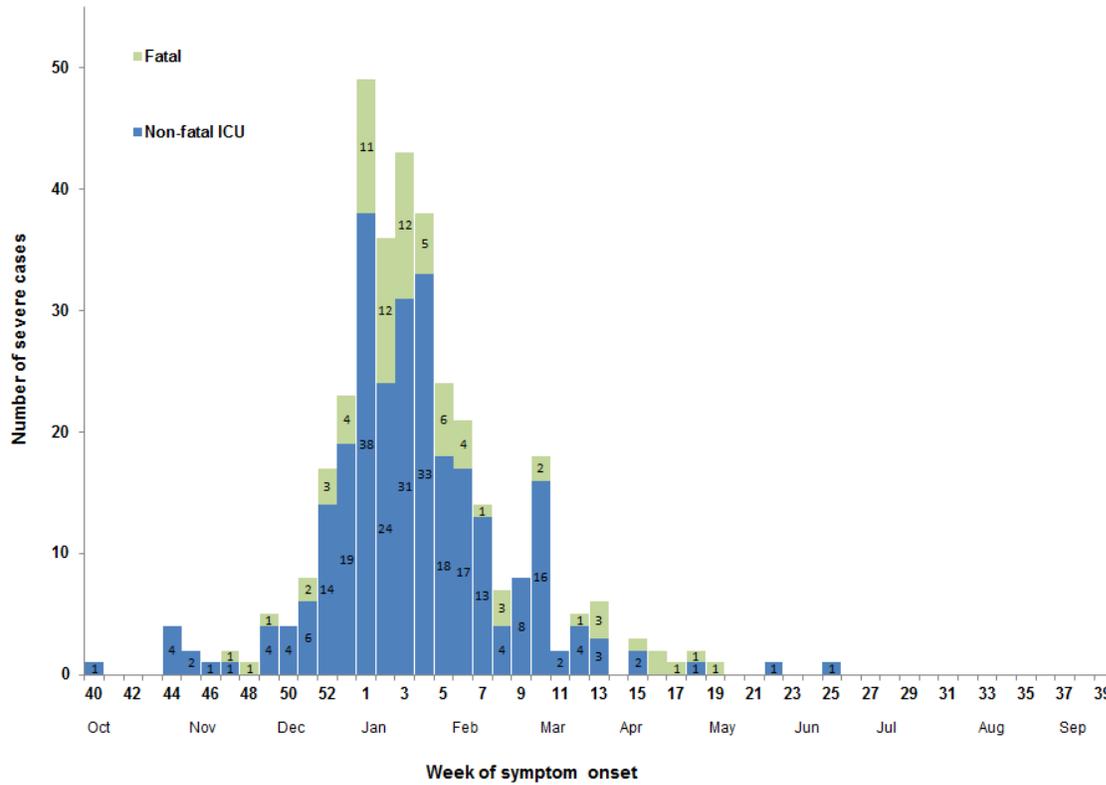
Laboratory-confirmed influenza-associated deaths among patients under 65 years of age are currently reportable in California [Title 17, California Code of Regulations (CCR) §2500]. Since the 2009 H1N1 influenza pandemic, LHJs have also voluntarily reported to CDPH all laboratory-confirmed influenza cases less than 65 years old requiring hospitalization in an intensive care unit (ICU).

Epidemiologic curve of ICU and fatal cases <65 years of age

During 2014–2015, CDPH received 350 reports of influenza-associated severe illness or deaths among persons less than 65 years old; 272 (77.7%) were non-fatal ICU cases and 78 (22.3%) were fatal cases. Figure 6 shows the number of fatal and non-fatal ICU cases by week of symptom onset during 2014–2015; if onset date was not available, then the earliest known date

associated with the illness was used. Severe influenza cases were identified throughout 2014–2015, including two non-fatal ICU cases during the summer months; however, the majority of patients became ill from early December through late February. Peak activity occurred during Weeks 1 through 4 (January 4, 2015–January 31, 2015). Severe influenza case counts by local health jurisdiction for the 2010–2011 through the 2014–2015 influenza season can be found in Appendix I.

Figure 6. Number of fatal and non-fatal ICU cases (<65 years of age) of laboratory-confirmed influenza reported to the California Department of Public Health, by week of symptom onset, September 28, 2014–October 3, 2015



Demographic characteristics and clinical features of ICU and fatal cases <65 years of age

The median age of the 350 patients who had severe illness or died from influenza during the 2014–2015 season was 44 years (range: <1 week–64 years); 187 (53.4%) were male. Fatal cases (median age: 51 years; range: 1 year–64 years) were significantly older than non-fatal ICU cases (median age: 42.5 years; range: <1 week–64 years) [p=0.004]. Pediatric cases under the age of 18 years accounted for 23.1% of all ICU and fatal cases (Table 5).

The CDPH case-based surveillance data should be interpreted with caution due to the following limitations: exclusion of cases 65 years of age and older, voluntary reporting of ICU cases, differing degrees of participation by the LHJs, and biases in testing practices (e.g. specimens may not be available for influenza testing). These data are also considered provisional as some cases may still be under investigation.

Table 5. Demographic characteristics of non-fatal ICU and fatal cases of laboratory-confirmed influenza reported to the California Department of Public Health, September 28, 2014–October 3, 2015

	Non-fatal ICU cases^a	Fatal cases
	No. (%)	No. (%)
Total	272	78
Sex		
Male	146 (53.7)	41 (52.6)
Median age, in years	42.5	51
Age group		
0-4	41 (15.1)	4 (5.1)
5-17	31 (11.4)	5 (6.4)
18-49	95 (34.9)	28 (35.9)
50-64	105 (38.6)	41 (52.6)

^a Reporting of influenza-associated ICU hospitalizations is voluntary and may not be complete for all counties.

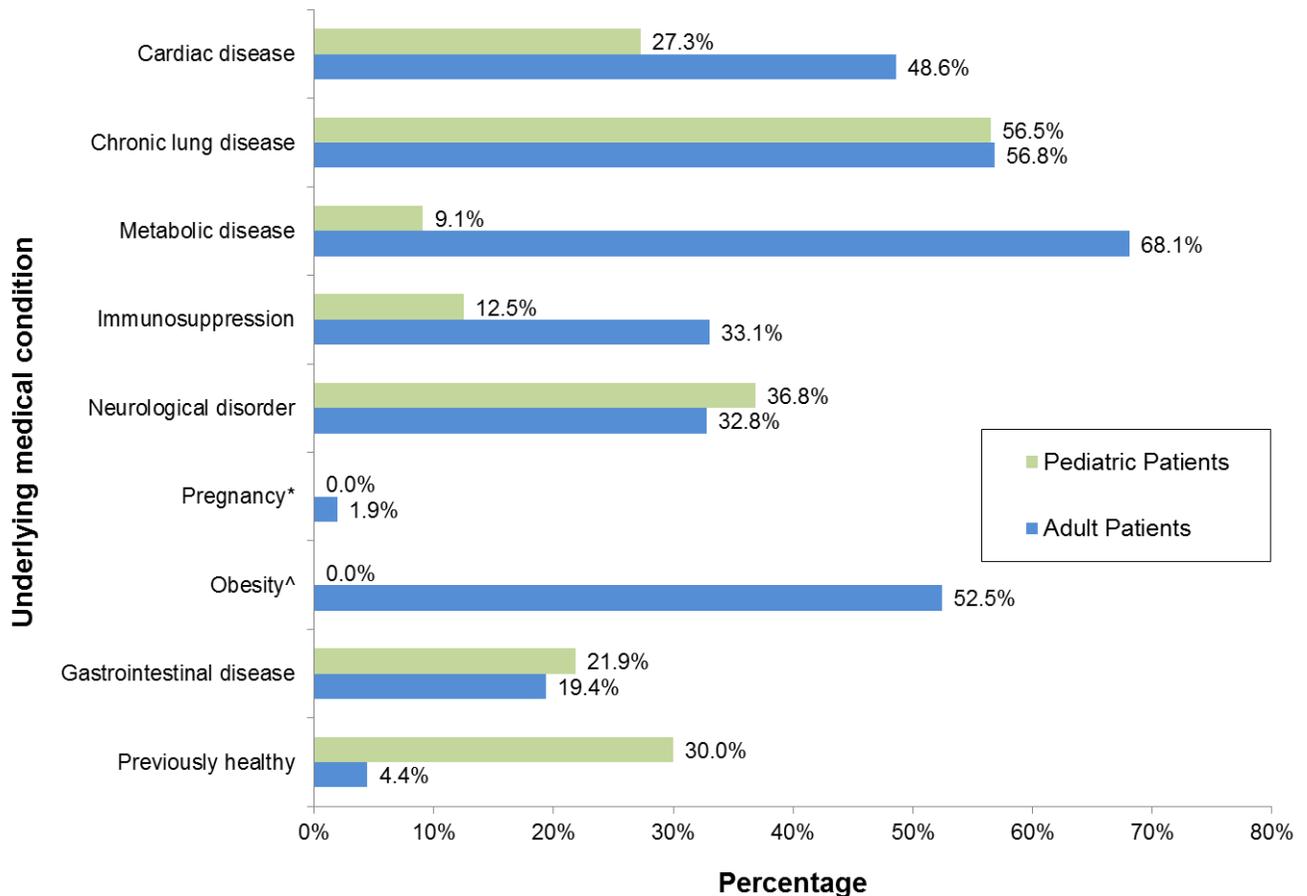
ICU - intensive care unit

Information on underlying medical conditions, including those conditions defined by the Advisory Committee for Immunization Practices (ACIP) as being associated with severe influenza, were also collected for severely ill and fatal influenza cases.³ The most frequently reported underlying medical conditions among adults aged 18–64 years with available information were metabolic disease (e.g., diabetes mellitus, renal disease, etc.; 113/166; 68.1%), chronic lung disease (e.g., asthma, chronic obstructive pulmonary disease, etc.; 83/146; 56.8%), and cardiac disease (e.g. coronary artery disease; 68/140; 48.6%) [Figure 7]. There were two pregnant women among the severe influenza cases, both of which were ICU cases.

Among pediatric patients with available information, the most frequently reported underlying medical conditions were chronic lung disease (26/46; 56.5%); 22 (84.6%) of the 26 children with chronic lung disease had underlying asthma. Other underlying medical conditions among pediatric patients include neurological disorders (e.g., seizure disorder, cerebral palsy, etc.; 14/38; 36.8%), and cardiac disease (9/33; 27.3%).

Twenty-one (30.0%) of the pediatric patients and 11 (4.4%) of the adult patients with information available were reported to be previously healthy. Information on influenza vaccination was available for 172 patients; 76 (44.2%) received the 2014–2015 influenza vaccine; among pediatric patients, 18 (41.9%) of 43 with known vaccination status had received the 2014–2015 influenza vaccine.

Figure 7. Selected underlying medical conditions in non-fatal ICU and fatal cases of laboratory-confirmed influenza reported to the California Department of Public Health, September 28, 2014–October 3, 2015



* Among women only

^ Excludes pediatric patients <2 years of age and pregnant women

Circulating influenza types and subtypes

Of the 350 severely ill and fatal influenza cases reported, 299 (85.4%) were influenza A, 50 (14.3%) were influenza B, and 1 (0.3%) was influenza with unknown type. Of the 299 influenza A detections, 151 (50.5%) were subtyped; 148 (98.0%) were A (H3N2) and 3 (2.0%) were 2009 A (H1N1). The majority of the 350 severe influenza cases reported during the 2014–2015 influenza season occurred among adults aged 18–64 years (261; 76.8%). In some previous seasons, the pediatric population has been disproportionately affected by influenza B, but during the 2014–2015 influenza season adults aged 18–64 years accounted for 63.3% (31/49) of the influenza B cases.

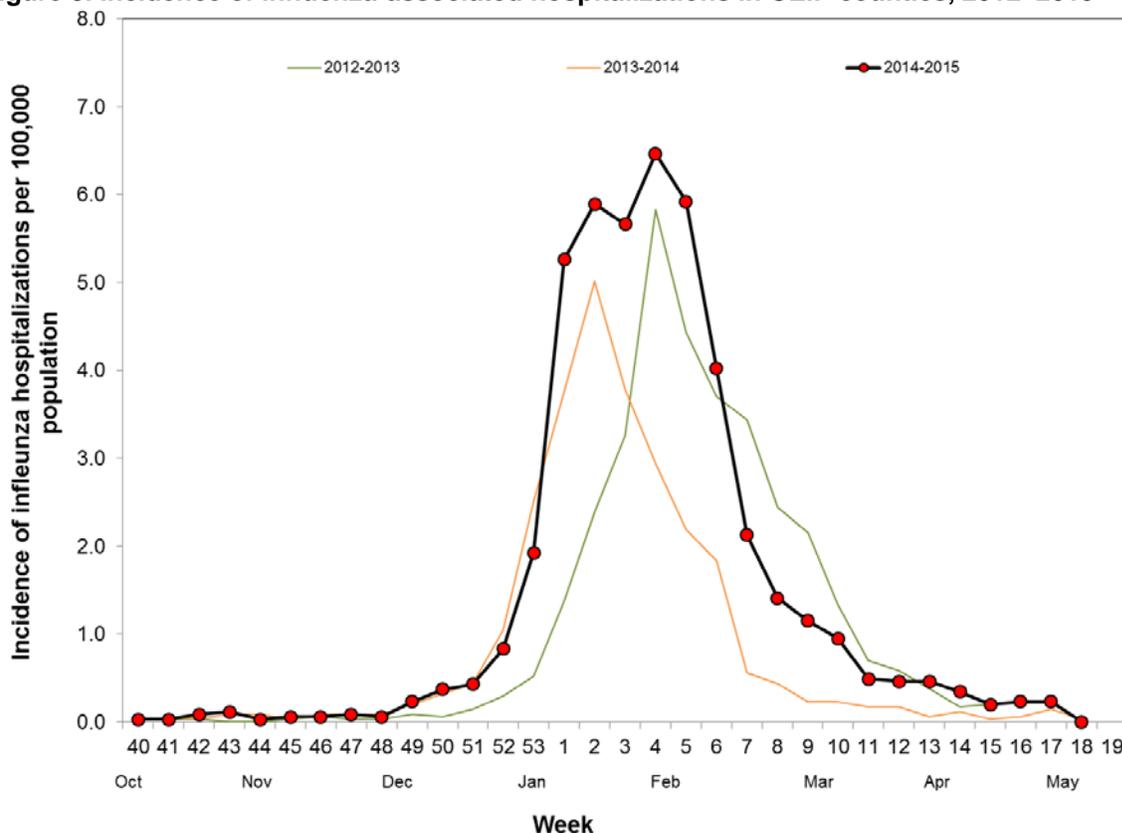
2. California Emerging Infections Program Data: Influenza-Associated Hospitalizations

The California Emerging Infections Program (CEIP), Influenza Surveillance Network (FluSurv-NET) conducts population-based surveillance for laboratory-confirmed influenza-associated hospitalizations in all ages in Alameda, Contra Costa and San Francisco counties. FluSurv-NET is a national network which covers over 80 counties in the 10 Emerging Infections Program (EIP) states (CA, CO, CT, GA, MD, MN, NM, NY, OR, and TN) and five additional states (IA, MI,

OH, RI, and UT). The network represents approximately 9% of the U.S. population (~28 million people).

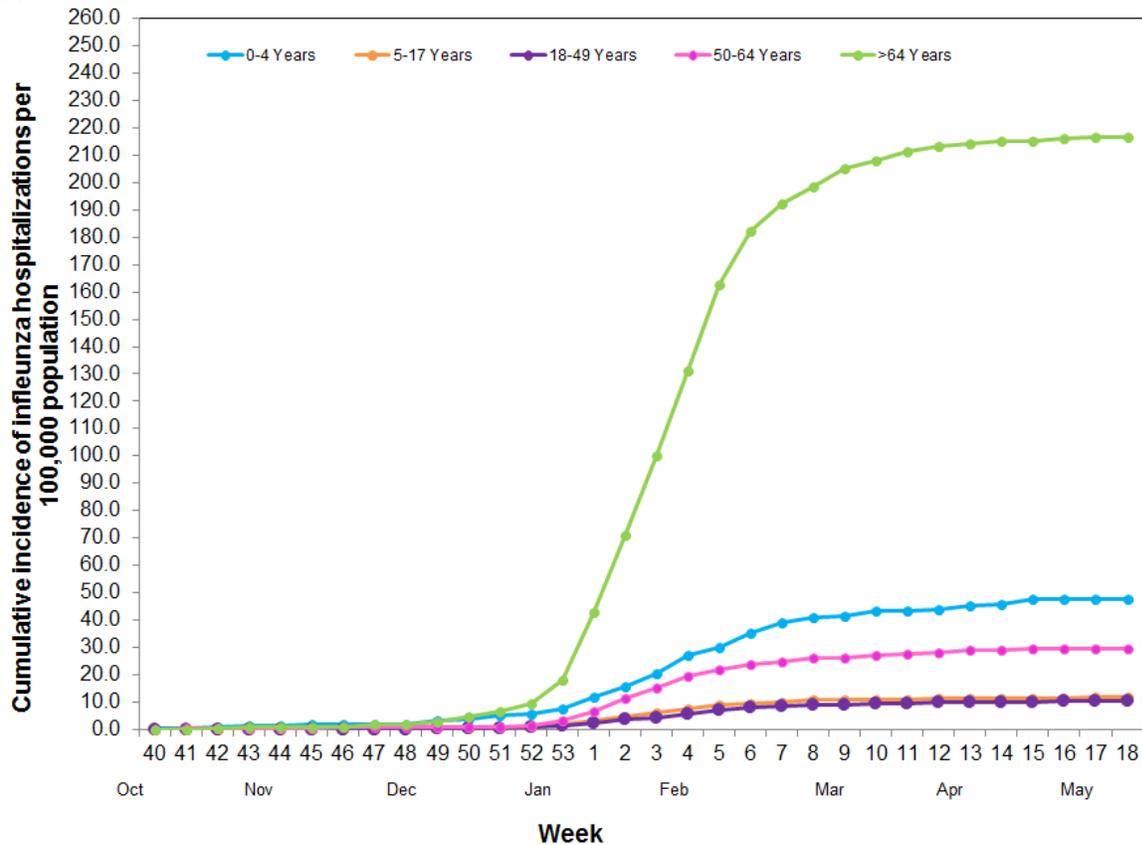
The incidence of influenza-associated hospitalizations per 100,000 population began increasing in mid-December and peaked during Week 4 (January 25–31, 2015) with an incidence of 6.5 influenza hospitalizations per 100,000 population (Figure 8). This rate was higher than the peak rate during the 2012–2013 and 2013–2014 influenza seasons (5.8 and 5.0 influenza hospitalizations per 100,000, respectively). Most patients had influenza A; of the influenza A specimens that were subtyped, the majority (98.9%; 356/360) were influenza A (H3N2). The highest cumulative rate of hospitalization was among adults aged >64 years, followed by the 0–4 year and 50–64 year age groups (Figure 9). Patients >64 years accounted for nearly two-thirds of the total reported hospitalized cases.

Figure 8. Incidence of influenza-associated hospitalizations in CEIP counties, 2012–2015



Note: The 2014-15 season contains a week 53. Prior years' data have been shifted so that week 1 aligns across years.

Figure 9. Cumulative incidence of influenza hospitalizations in CEIP counties by age group, 2014–2015



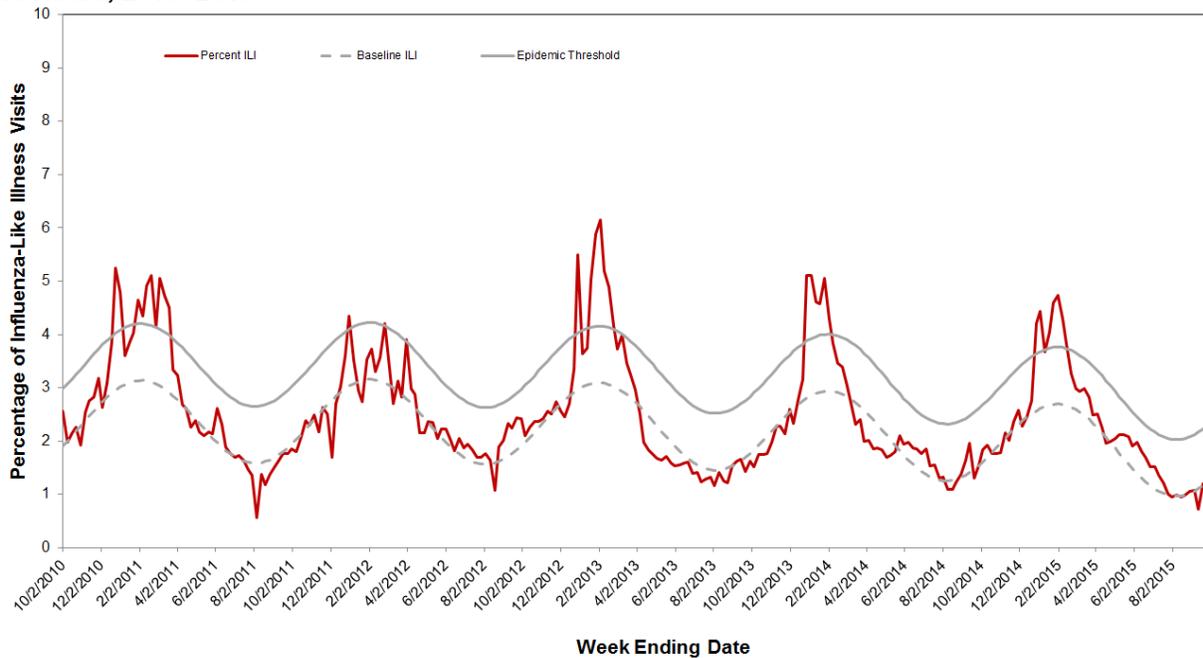
C. Syndromic Surveillance

1. Influenza-like Illness Outpatient Surveillance (Sentinel Providers)

In collaboration with CDC, CDPH works with volunteer sentinel providers throughout the state to conduct year-round surveillance for influenza-like illness (ILI) in outpatients. Sentinel providers may be individual practitioners or represent whole healthcare clinics in a variety of outpatient settings including, but not limited to hospital outpatient clinics, emergency departments, and student health services. Sentinel providers report on a weekly basis the number of patients with ILI and the total number of patients seen for any reason. ILI is defined as any illness with (1) fever ($\geq 100^{\circ}\text{F}$ or 37.8°C) and (2) cough and/or sore throat, in the absence of a known cause other than influenza.

In California this season, 155 sentinel providers reported ILI activity on a regular basis (i.e. at least 17 of the 34 weeks from September 28, 2014 to May 23, 2015). There was minimal ILI activity until late-December, when sentinel providers began reporting increases in patients with ILI (Figure 10). ILI activity peaked during the last week of January, remained elevated through mid-February, and returned to seasonal baseline levels in March. The percentage of visits for ILI exceeded the epidemic threshold during Week 52–Week 6 (December 21, 2014–February 14, 2015). The epidemic threshold is two standard deviations above the seasonal baseline and is the point at which the observed percentage of ILI is significantly higher than would be expected at that time of the year.

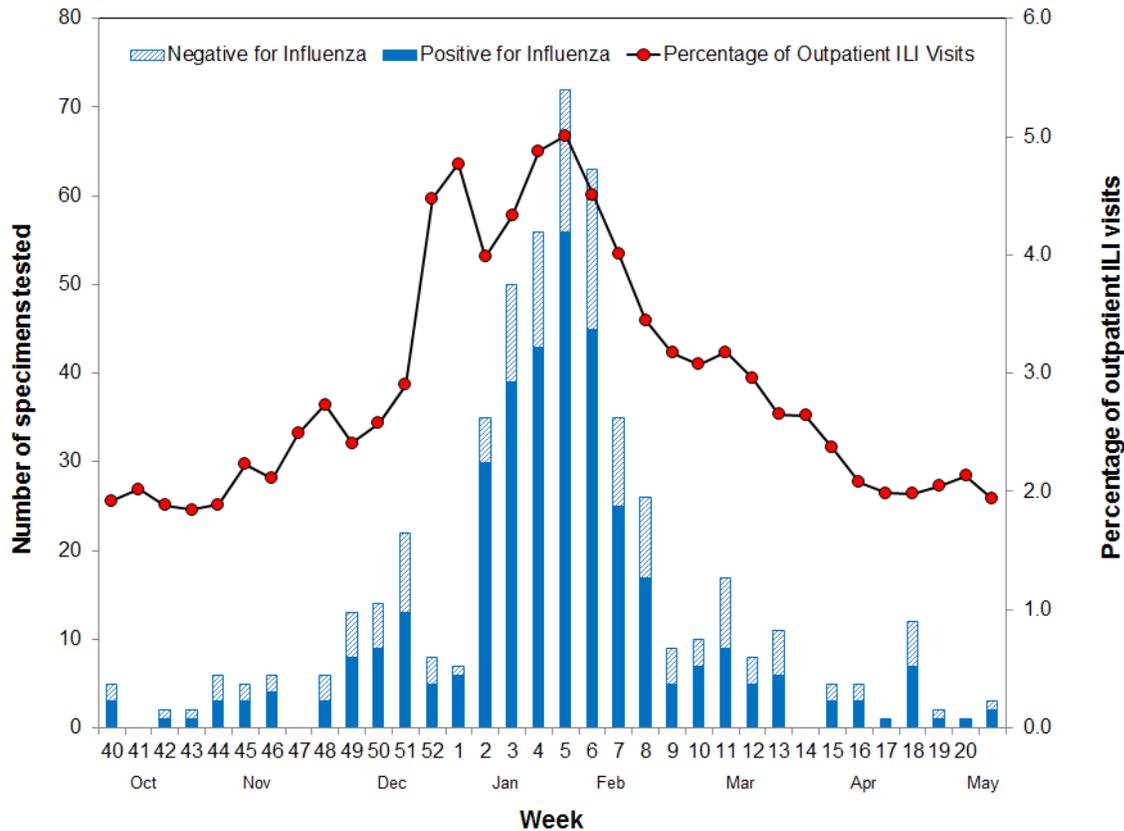
Figure 10. Percentage of influenza-like illness visits among patients seen by California Sentinel Providers, 2010–2015



The seasonal baseline was calculated using a regression model applied to data from the previous eight years. The epidemic threshold is two standard deviations above the seasonal baseline and is the point at which the observed percentage of ILI is significantly higher than would be expected at that time of the year.

Sentinel providers voluntarily submit specimens from patients with ILI to CDPH-VRDL for influenza testing. Many of these specimens are sent to CDC for further characterization, providing important information about what influenza virus strains are circulating in the community. A total of 364 respiratory specimens were submitted by sentinel providers from September 28, 2014 through May 23, 2015; 211 (58%) were positive for influenza. Of these, 175 (83%) were influenza A and 36 (17%) were influenza B. All of the 175 influenza A specimens were subtyped; 174 (99%) were A (H3N2) and 1 (1%) was 2009 A H1N1. The number of specimens submitted by sentinel providers that tested positive for influenza peaked in Week 5 (February 1, 2015 – February 7, 2015) coinciding with the period of increased reported ILI activity (Figure 11).

Figure 11. Sentinel Provider specimens tested by week of collection and influenza result, and percentage of influenza-like illness visits by week of visit, September 28, 2014–May 23, 2015

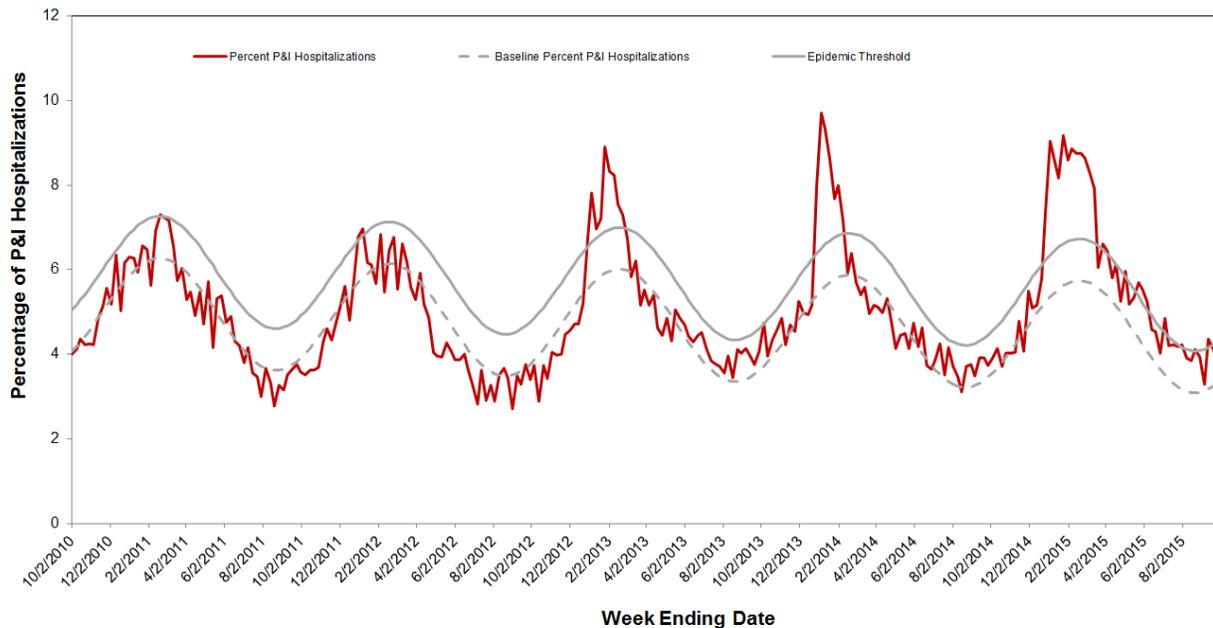


2. Kaiser Permanente Northern California and Southern California Pneumonia and Influenza Admission Data

CDPH collaborates with Kaiser Permanente Northern and Southern California to monitor trends in influenza-related hospitalizations. Patients with admission diagnoses of “flu,” “pneumonia,” or “influenza” are defined as pneumonia and influenza (P&I) admissions. The number of P&I admissions is divided by the total number of hospital admissions occurring in the same time period to estimate the percentage of P&I admissions. Admissions for pregnancy, labor and delivery, birth, and outpatient procedures are excluded from the denominator.

During the 2014–2015 influenza season, the percentage of P&I hospitalizations in Kaiser Permanente facilities in Northern California and Southern California first exceeded baseline levels in late December and peaked in mid-January (Figure 12). The proportion of P&I hospitalizations returned to baseline levels in late March. The burden of P&I hospitalizations in Kaiser Permanente Northern and Southern California hospitals during the 2014–2015 influenza season was comparable to the 2013-14 influenza season.

Figure 12. Percentage of pneumonia and influenza admissions in Kaiser Permanente hospitals, 2010–2015



The seasonal baseline was calculated using a regression model applied to data from the previous six years. The epidemic threshold is two standard deviations above the seasonal baseline and is the point at which the observed percentage of pneumonia and influenza hospitalizations in Kaiser Permanente hospitals in northern California is significantly higher than would be expected at that time of the year.

D. Outbreaks of Respiratory Illness, Including Influenza

Outbreaks are required to be reported to the local health authority under Title 17, CCR 2500. In general, respiratory, non-tuberculosis outbreaks are defined as a sudden increase of acute respiratory illnesses over the normal background rate. Additional information can be found [here](#). From September 28, 2014 to May 23, 2015 local health departments reported a total of 338 confirmed non-tuberculosis respiratory outbreaks to CDPH. The outbreaks were reported from 29 local health jurisdictions throughout the state. The number of outbreaks reported during the 2014–2015 season was considerably higher compared to the 2013-14 influenza season.

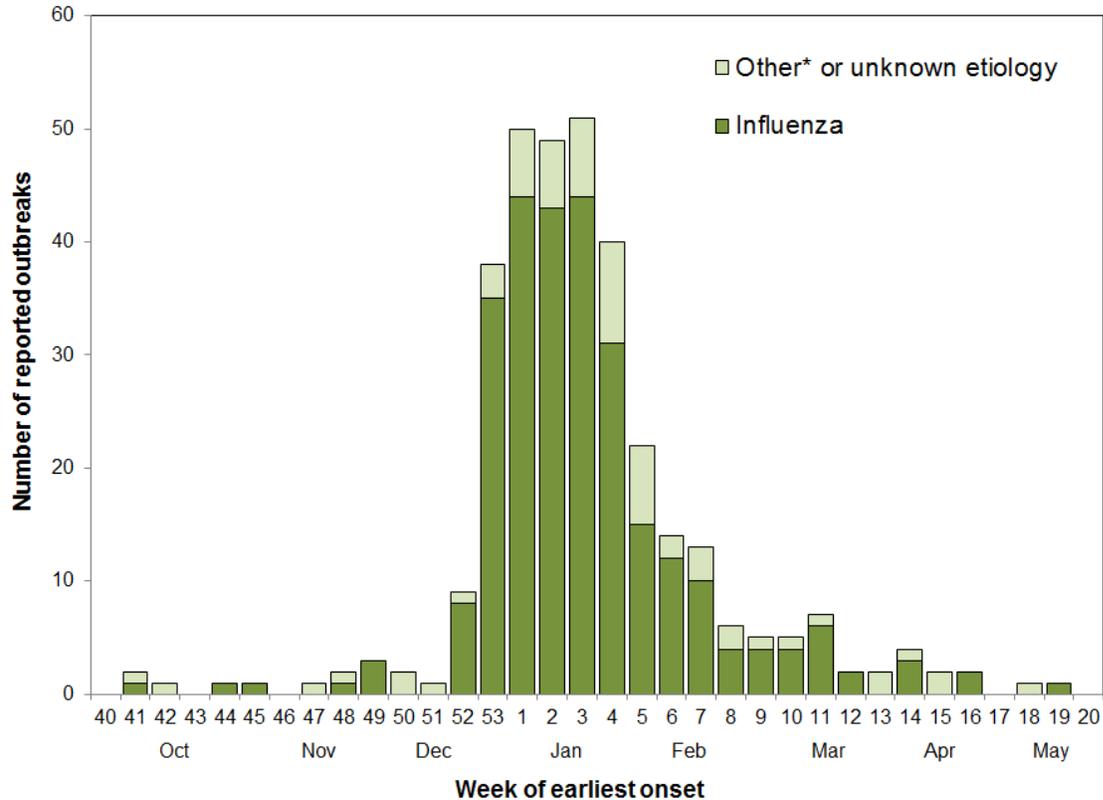
Of the 338 confirmed respiratory outbreaks, 46 (14%) had no identified etiology. Influenza was the most commonly identified pathogen in the remaining outbreaks (275; 82%). Outbreaks of laboratory-confirmed respiratory syncytial virus (6), pertussis (5), enterovirus and rhinovirus (1), rhinovirus (1), rhinovirus and respiratory syncytial virus (1), unspecified streptococcal infection (2), rhinovirus and parainfluenza type 3 (1) were also identified.

The majority (234; 85%) of the 275 influenza-associated outbreaks were associated with influenza A. An additional nine (3%) outbreaks were associated with both influenza A and influenza B, 14 (5%) outbreaks were associated with influenza B, and 18 (7%) outbreaks were associated with influenza but the type was not known. All 70 outbreak-related specimens that were subtyped were influenza A (H3N2).

Of the 275 influenza-associated outbreaks, 165 (60%) occurred in residential healthcare facilities such as skilled nursing facilities and 80 (29%) occurred in independent living facilities (congregate residential facilities not providing routine healthcare). Local health departments also reported influenza outbreaks in correctional facilities (5; 2%), schools (20; 7%), acute care healthcare facilities (2; 1%), and other congregate setting (3, 1%). The first influenza-associated

outbreak that was identified during the 2014–2015 influenza season occurred in mid-October 2014 (Figure 13). Influenza outbreaks continued to occur through the end of the season, with peak activity occurring in mid-January 2015. Since May 23, 2015, one confirmed influenza outbreak has been reported to CDPH (initial case onset date was June 25, 2015) in a residential healthcare facility.

Figure 13. Reported respiratory outbreaks by week of earliest onset, September 28, 2014–May 23, 2015



*Other etiologies identified by laboratory confirmation included respiratory syncytial virus (6), pertussis (5), enterovirus/rhinovirus (1), rhinovirus (1), rhinovirus and respiratory syncytial virus (1), unspecified streptococcal infection (2), rhinovirus and parainfluenza type 3 (1).

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Appendix I. Number of fatal and non-fatal ICU cases of laboratory-confirmed influenza reported to the California Department of Public Health, by local health jurisdiction, 2010-2011 influenza season through 2014–2015 influenza season

Jurisdiction	2010–2011*		2011–2012		2012–2013		2013–2014		2014–2015	
	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU	Fatal	Non-fatal ICU
CALIFORNIA	90	331	52	163	113	233	406	831	78	272
Alameda†	3	32	6	9	3	3	11	26	2	12
Berkeley City	0	0	0	0	0	0	0	1	0	0
Alpine	0	0	0	0	0	0	0	0	0	0
Amador	1	0	0	0	0	0	0	3	0	1
Butte	0	3	0	2	0	1	2	4	0	0
Calaveras	0	2	0	0	0	0	2	2	0	0
Colusa	0	0	0	0	0	0	0	1	0	0
Contra Costa	7	28	0	9	1	11	8	41	1	7
Del Norte	0	0	0	0	1	0	0	0	0	0
El Dorado	0	1	0	0	0	0	3	8	0	1
Fresno	2	14	3	10	6	15	22	18	4	14
Glenn	1	0	0	0	0	0	1	1	0	0
Humboldt	0	0	0	0	0	3	1	6	1	1
Imperial	0	3	0	0	0	0	2	6	0	0
Inyo	0	0	0	0	0	0	0	0	0	0
Kern	4	5	1	2	2	0	11	23	0	5
Kings	0	0	0	0	0	0	7	5	0	2
Lake	0	0	0	2	0	0	1	4	0	3
Lassen	0	0	0	0	0	0	1	1	0	0
Los Angeles†	8	2	12	0	33	0	75	22	16	7
Long Beach City	1	1	1	2	0	0	8	4	1	5
Pasadena City	1	0	0	0	0	0	0	0	0	0
Madera	0	0	0	0	2	1	3	6	1	1
Marin	1	2	0	0	0	1	2	1	0	2
Mariposa	0	0	0	0	0	0	0	0	0	1
Mendocino	1	1	0	1	0	1	4	13	0	0
Merced	0	5	0	1	0	0	5	6	0	0
Modoc	0	0	0	0	0	0	0	0	0	0
Mono	0	0	0	0	0	0	0	0	0	0
Monterey	0	4	0	1	0	4	7	12	2	6
Napa	0	1	0	0	0	0	0	7	1	1
Nevada	0	0	1	0	0	0	1	4	0	2
Orange	8	44	2	18	6	30	22	35	11	23
Placer	0	3	0	1	0	2	1	9	1	3
Plumas	0	0	0	0	0	0	0	0	0	1
Riverside	2	9	1	15	6	13	23	43	2	13
Sacramento	7	24	3	24	9	41	23	87	3	18
San Benito	0	0	0	0	0	1	0	0	0	0
San Bernardino	5	24	5	14	8	10	31	52	4	15
San Diego	16	50	5	10	17	43	44	112	8	59
San Francisco	1	19	0	1	2	1	3	29	1	0
San Joaquin	2	3	2	6	0	8	8	23	3	8
San Luis Obispo	0	1	0	0	2	2	1	7	0	3
San Mateo	1	11	2	10	1	3	6	18	5	12
Santa Barbara	0	5	0	2	1	3	3	9	2	6
Santa Clara	5	6	1	8	7	9	20	45	2	14
Santa Cruz	2	4	0	0	0	4	5	6	0	6
Shasta	0	1	0	0	0	0	3	10	0	1
Sierra	0	0	0	0	0	0	0	0	0	0
Siskiyou	0	0	0	0	0	0	2	5	0	0
Solano	1	2	0	1	0	7	3	14	2	3
Sonoma	2	4	0	0	0	0	7	19	1	2
Stanislaus	3	10	2	5	2	2	13	31	2	2
Sutter	0	0	0	0	0	1	1	3	0	0
Tehama	0	0	0	0	0	2	0	2	0	0
Trinity	0	0	0	0	0	0	0	0	1	0
Tulare	2	5	1	1	1	2	5	25	0	2
Tuolumne	0	0	0	0	0	0	1	1	0	0
Ventura	2	1	4	7	3	6	3	11	1	9
Yolo	0	1	0	1	0	3	1	10	0	1
Yuba	1	0	0	0	0	0	0	0	0	0

* 2010–2011: October 3, 2010–October 1, 2011; 2011–2012: October 2, 2011–September 29, 2012; 2012–2013: September 30, 2012–September 28, 2013; 2013–2014: September 29, 2013–September 27, 2014; 2014–2015: September 28, 2014–October 3, 2015

† Does not include city counts