

# **Influenza and Other Respiratory Diseases Surveillance Report 2013–2014 Season**

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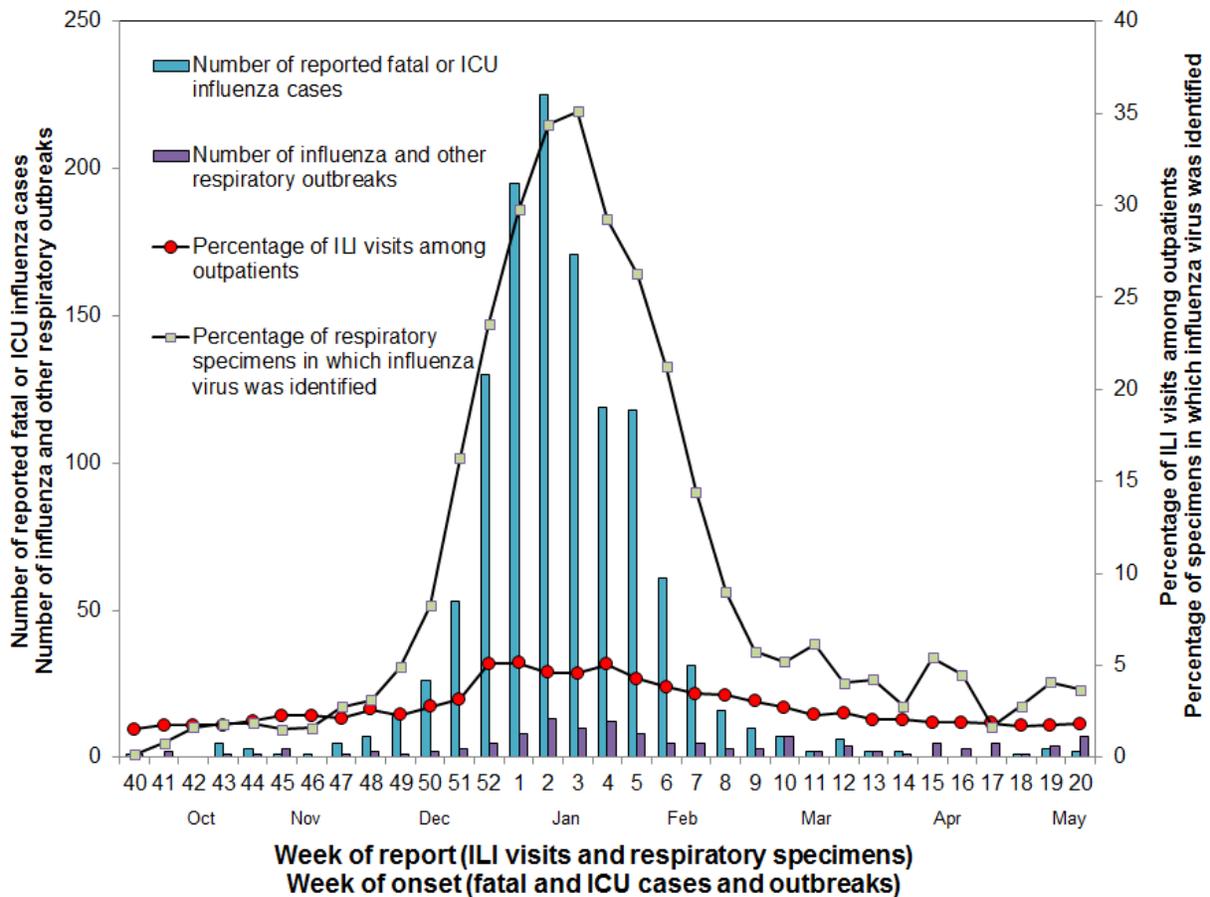
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# Synopsis

The 2013–14 influenza season was the first season since the 2009 H1N1 pandemic in which 2009 A (H1N1) viruses predominated nationally and was characterized overall by lower levels of outpatient illness than influenza A (H3N2) predominant seasons, but higher rates of hospitalization among adults aged 50–64 years.<sup>1,2</sup> 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. Influenza 2009 A (H1N1) viruses were also the predominant viruses detected in California; influenza B and influenza A (H3N2) viruses were also detected to a lesser extent both in California and nationally.

**Figure 1. Selected influenza surveillance parameters, California Department of Public Health, 2013–14**



The percentage of influenza-like illness (ILI) visits among outpatients peaked during the week ending January 4, 2014 and the percentage of laboratory detections for influenza peaked during the week ending January 18, 2014 (5.1% and 35.1%, respectively). These levels of activity were comparable to levels seen during the peak of the 2012–13 influenza season, which was considered to be moderately severe. A total of 130 confirmed respiratory outbreaks were reported during the 2013–14 season; of those associated with influenza, the majority were influenza 2009 A (H1N1) and occurred in residential healthcare facilities.

Ten laboratory-confirmed influenza-associated pediatric deaths were reported to the California Department of Public Health during the 2013–14 season. This number is within the range (5 in 2007–08 to 37 in 2008–09) reported since surveillance for fatal pediatric influenza cases was first initiated in 2003. A total of 1,224 cases of influenza-associated severe illness or death among persons less than 65 years of age were reported to CDPH, compared to 346 cases during the 2012–13 season. Two thousand ten cases of influenza-associated severe illness or death among persons less than 65 years of age were reported to CDPH during the 2009 H1N1 pandemic (April 23, 2009–October 2, 2010); this was the last season in which the influenza 2009 (H1N1) virus predominated. However, more data are needed to interpret these numbers, 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 13 clinical, academic and hospital laboratories, which are referred to as sentinel laboratories.

During the 2013–14 influenza season, these 40 participating laboratories tested 66,087 specimens for influenza. Of the 66,087 specimens tested, 11,532 (17.4%) were positive for influenza; of these, 10,215 (88.6%) were influenza A and 1,317 (11.4%) were influenza B. A total of 4,748 (46.5%) influenza A specimens were subtyped; 294 (6.2%) were seasonal A (H3N2) and 4,454 (93.8%) were 2009 A (H1N1).

While influenza 2009 A (H1N1) was the predominant influenza strain circulating in California during the 2013–14 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.<sup>1,2</sup> 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 21, 2013. The proportion of influenza-positive specimens peaked at 35.1% during the week ending January 18, 2014, and declined to less than 10% during the week ending February 22, 2014.

#### 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 using the R-Mix shell vial culture system to identify five other common respiratory viruses [respiratory syncytial virus (RSV), adenovirus, and parainfluenza virus types 1-3].

Of 11,178 specimens tested by the RLN from September 29, 2013 through May 17, 2014, 4,781 (42.8%) were positive for influenza; of these, 4,549 (95.1%) were influenza A and 232 (4.9%) were influenza B (Table 1). Of the 4,549 influenza A specimens, 263 (5.8%) were seasonal A (H3N2), 4,206 (92.5%) were 2009 A (H1N1), and 80 (1.8%) were not subtyped. In addition, 909 specimens were tested using R-Mix; 60 (6.6%) were positive for non-influenza respiratory viruses, including RSV.

**Table 1. RLN surveillance results, September 29, 2013–May 17, 2014**

	Total RLN*	Northern CA	Central CA	Southern CA
	No. (%)	No. (%)	No. (%)	No. (%)
<b>Number of specimens tested by PCR</b>	<b>11,178</b>	<b>4,479</b>	<b>2,695</b>	<b>4,004</b>
<b>Number of specimens negative for influenza</b>	<b>6,397 (57.2)<sup>†</sup></b>	<b>3,059 (68.3)<sup>†</sup></b>	<b>1,222 (45.3)<sup>†</sup></b>	<b>2,116 (52.8)<sup>†</sup></b>
<b>Number of specimens positive for influenza</b>	<b>4,781 (42.8)<sup>†</sup></b>	<b>1,420 (31.7)<sup>†</sup></b>	<b>1,473 (54.7)<sup>†</sup></b>	<b>1,888 (47.2)<sup>†</sup></b>
Influenza A	4,549 (95.1) <sup>‡</sup>	1,360 (95.8) <sup>‡</sup>	1,398 (94.9) <sup>‡</sup>	1,791 (94.9) <sup>‡</sup>
<i>Seasonal A (H3)</i>	263 (5.8) <sup>§</sup>	81 (6.0) <sup>§</sup>	60 (4.3) <sup>§</sup>	122 (6.8) <sup>§</sup>
<i>2009 A (H1)</i>	4,206 (92.5) <sup>§</sup>	1,231 (90.5) <sup>§</sup>	1,311 (93.8) <sup>§</sup>	1,664 (92.9) <sup>§</sup>
<i>Subtyping not performed</i>	80 (1.8) <sup>§</sup>	48 (3.5) <sup>§</sup>	27 (1.9) <sup>§</sup>	5 (0.3) <sup>§</sup>
Influenza B	232 (4.9) <sup>‡</sup>	60 (4.2) <sup>‡</sup>	75 (5.1) <sup>‡</sup>	97 (5.2) <sup>‡</sup>
<b>Number of specimens tested by R-mix</b>	<b>909</b>	<b>255</b>	<b>392</b>	<b>262</b>
RSV	26 (2.9) <sup>¶</sup>	8 (3.1) <sup>¶</sup>	15 (3.8) <sup>¶</sup>	3 (1.1) <sup>¶</sup>
Other respiratory viruses	34 (3.7) <sup>¶,††</sup>	9 (3.5) <sup>¶</sup>	11 (2.8) <sup>¶</sup>	14 (5.3) <sup>¶</sup>

\* 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

¶ Percent of total specimens tested by R-mix

†† Parainfluenza type 3 (4), parainfluenza type 1 (15), adenovirus (15)

## 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 29, 2013 through May 17, 2014, the sentinel laboratories tested a total of 54,909 specimens for influenza; 6,760 (12.3%) were positive. Of the 6,760 specimens that tested positive for influenza, 5,675 (83.9%) were influenza A and 1,085 (16.1%) were influenza B (Table 2). The highest weekly percentage of influenza detections in the sentinel laboratories occurred during Week 2 (January 5–January 11, 2014), when 27.3% (1125/4114) of specimens were positive for influenza. Of 45,153 specimens tested for RSV by the sentinel laboratories, 4,391 (9.7%) were positive.

**Table 2. Influenza and other respiratory virus detections in Sentinel Laboratories\*, September 29, 2013–May 17, 2014**

	No. (%)
<b>Total specimens tested for influenza</b>	<b>54,909</b>
<b>Number of specimens negative for influenza</b>	<b>48,149 (87.7)<sup>†</sup></b>
<b>Number of specimens positive for influenza</b>	<b>6,760 (12.3)<sup>†</sup></b>
Influenza A	5,675 (83.9) <sup>‡</sup>
<i>Seasonal A (H3)</i>	31 (0.5) <sup>§</sup>
<i>2009 A (H1)</i>	248 (4.4) <sup>§</sup>
<i>Subtyping not performed</i>	5,396 (95.1) <sup>§</sup>
Influenza B	1,085 (16.1) <sup>‡</sup>
<b>Total specimens tested for RSV</b>	<b>45,153</b>
RSV	4,391 (9.7)

\* 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

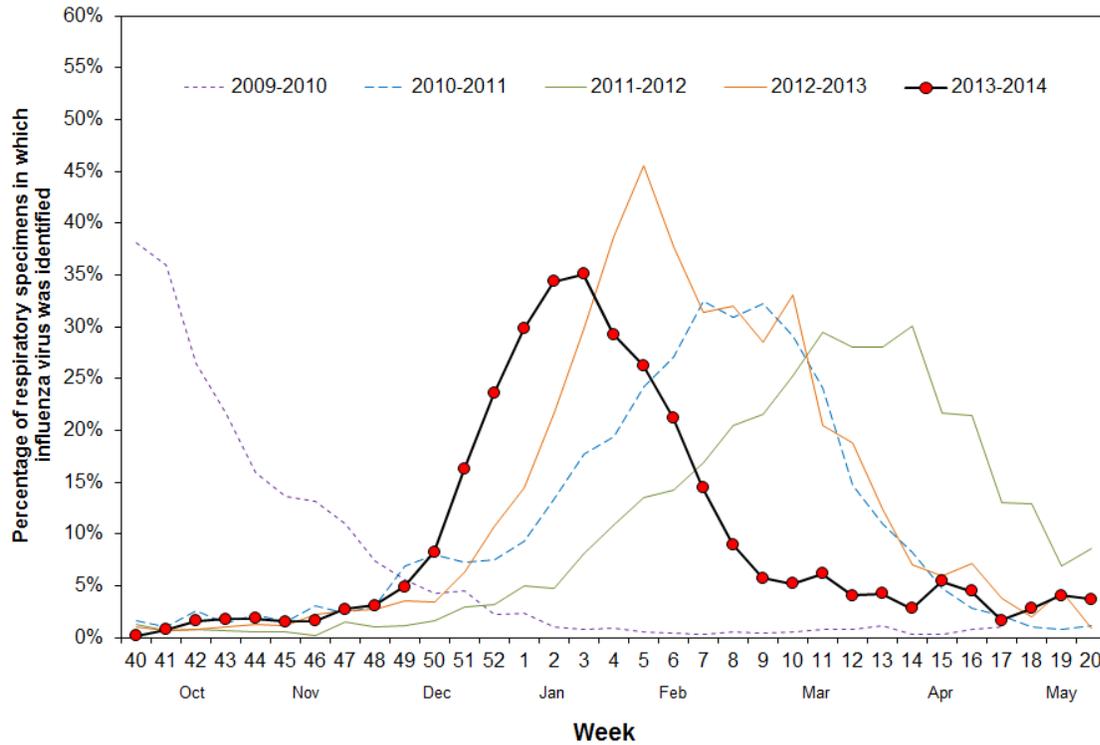
‡ Percent of specimens positive for influenza

§ Percent of influenza A positives

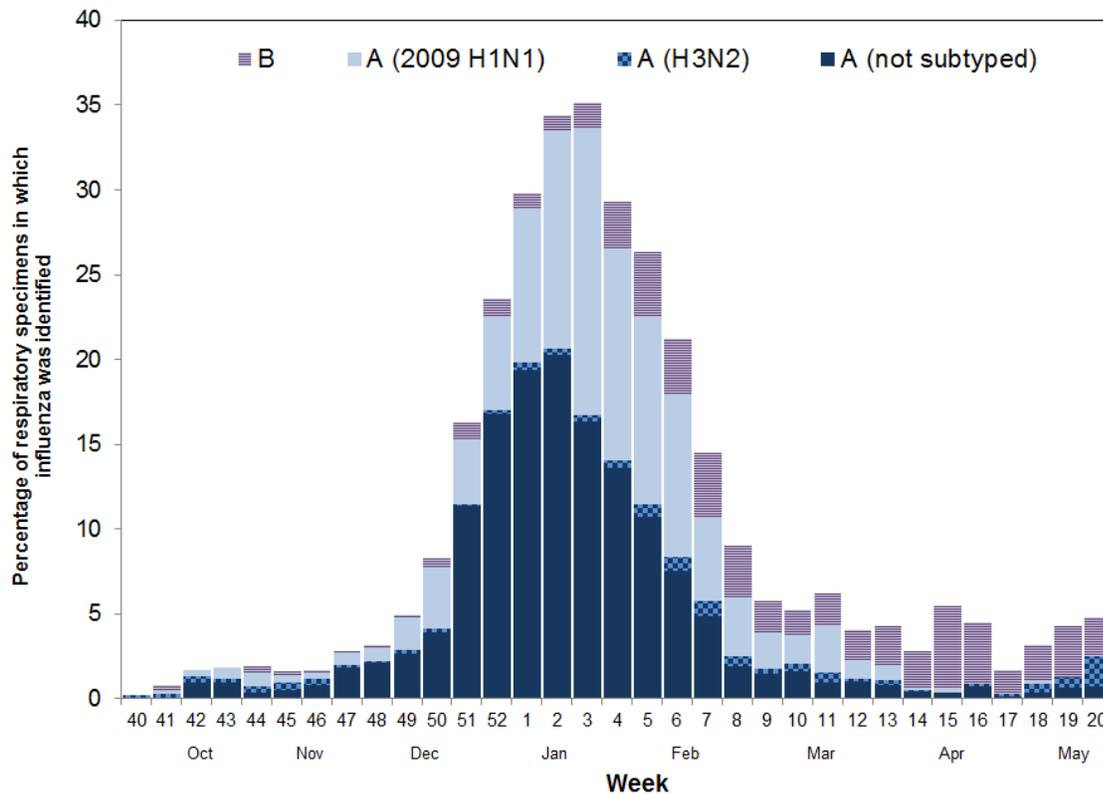
### 3. Combined RLN and Sentinel Laboratory Surveillance Results

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 2013–14 season was comparable to that of the 2010–11 season, which was considered moderate (Figure 2). The majority of influenza detections identified by the RLN and sentinel laboratories during the 2013–14 season were seasonal influenza 2009 A (H1N1) (Figure 3). This season, influenza activity preceded RSV activity (Figure 4). RSV and rhinovirus were the most frequently detected viruses among non-influenza respiratory viruses (Figure 5).

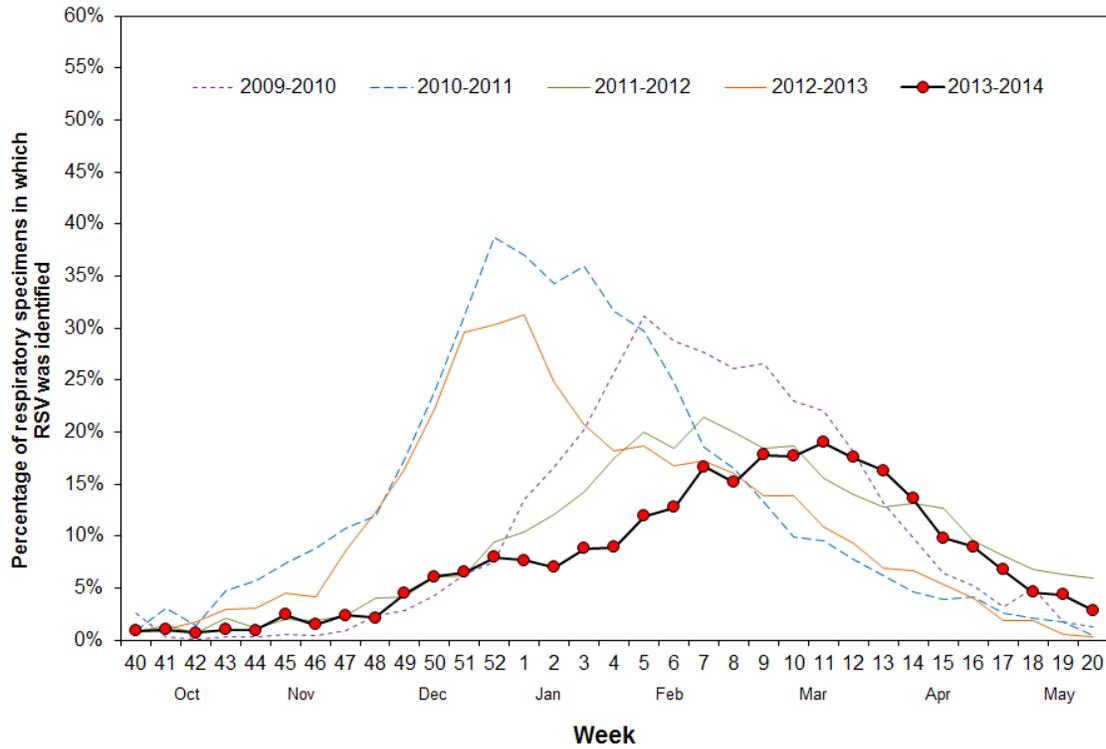
**Figure 2. Percentage of specimens from which influenza was detected in Respiratory Laboratory Network and Sentinel Laboratories, 2009–14**



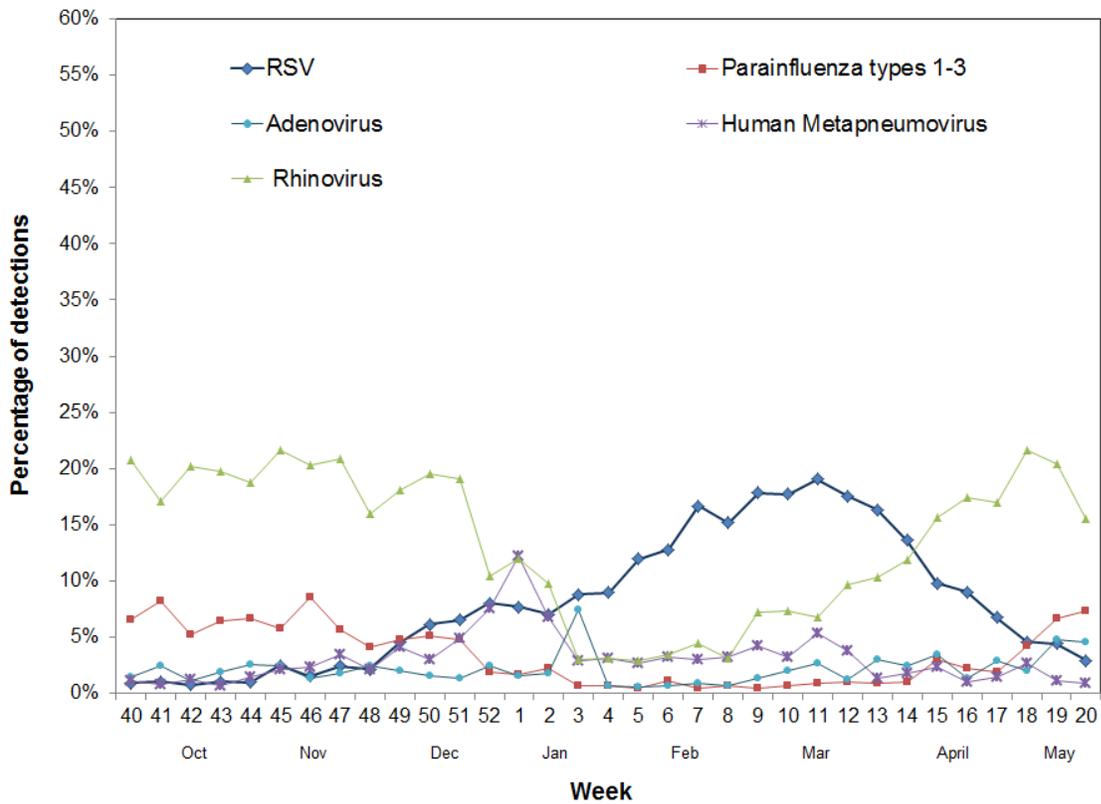
**Figure 3. Percentage of influenza types and subtypes in Respiratory Laboratory Network and Sentinel Laboratories, 2013–14**



**Figure 4. RSV detections in Respiratory Laboratory Network and Sentinel Laboratories, 2009–14**



**Figure 5. Non-influenza respiratory virus detections in Respiratory Laboratory Network and Sentinel Laboratories, 2013–14**



#### 4. Influenza Virus Strain Characterization

A total of 175 influenza viruses from California were strain-typed by the Centers for Disease Control and Prevention (CDC) during the 2013–14 influenza season (Table 3). All of the 112 influenza A viruses were characterized as A/California/7/2009-like or A/Texas/50/2012-like, which matched the vaccine viruses contained in both the quadrivalent and trivalent influenza vaccines for the Northern Hemisphere.

Among the 63 influenza B viruses characterized, 11 (17.5%) were characterized as B/Massachusetts/2/2012-like (Yamagata), which matches components in both the quadrivalent and trivalent influenza vaccines for the Northern Hemisphere, and 52 (82.5%) were characterized as B/Brisbane/6/2008-like, which matched a component in only the quadrivalent influenza vaccine for the Northern Hemisphere.

These findings were similar to what was seen nationwide; however, a higher proportion of influenza B Victoria lineage viruses were characterized in California compared to a higher proportion of influenza B Yamagata lineage viruses characterized nationally. Nationally, 99.9% of influenza 2009 A (H1N1) viruses, 95.3% of influenza A (H3N2) viruses, and 72.7% of influenza B viruses submitted to CDC from U.S. laboratories were well-matched to the influenza A and B components of the trivalent and quadrivalent vaccines, while 27.1% of the influenza B viruses were well-matched to an influenza B component only included in the quadrivalent vaccine.<sup>1,2</sup>

**Table 3. Influenza virus antigenic characterization, 2013–14 season**

	<b>California (N=175)</b>	<b>United States (N=2,905)</b>
<b>Influenza A (2009 H1N1)</b>	<b>52</b>	<b>2,036<sup>‡</sup></b>
A/California/7/2009-like* <sup>†</sup>	52 (100.0%)	2,033 (99.9%)
<b>Influenza A (H3N2)</b>	<b>60</b>	<b>426<sup>^</sup></b>
A/Texas/50/2012-like* <sup>†</sup>	60 (100.0%)	406 (95.3%)
<b>Influenza B</b>	<b>63</b>	<b>443</b>
B/Massachusetts/2/2012-like (Yamagata)* <sup>†</sup>	11 (17.5%)	322 (72.7%) <sup>§</sup>
B/Brisbane/60/2008-like (Victoria)*	52 (82.5%)	120 (27.1%)

\* Matches component of the 2013-14 quadrivalent influenza vaccine for the Northern Hemisphere.

<sup>†</sup> Matches component of the 2013-14 trivalent influenza vaccine for the Northern Hemisphere

<sup>‡</sup> An additional 3 viruses showed reduced titers with antiserum produced against A/California/7/2009

<sup>^</sup> An additional 20 viruses showed reduced titers with antiserum produced against A/Texas/50/2012

<sup>§</sup> 1 additional Yamagata lineage virus showed reduced titers with antiserum produced against B/Massachusetts/2/2012

#### 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 selected influenza positive original clinical specimens and isolates 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 AVR testing results for the 2013–14 season are summarized below.

During the 2013–14 influenza season, CDPH-VRDL tested 212 influenza isolates for antiviral resistance; three influenza 2009 A (H1N1) viruses were resistant to oseltamivir (Table 4).

**Table 4. Number of specimens tested for antiviral resistance, California, 2013–14 season**

	<b>Neuraminidase Inhibitors Resistance</b>
<b>Influenza 2009 A (H1N1)</b>	3/89
<b>Influenza A (H3N2)</b>	0/60
<b>Influenza B</b>	0/63

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 and zanamivir. During the 2013–14 influenza season, a total of 6,294 specimens were tested. All 508 influenza B viruses and 683 influenza A (H3N2) viruses tested were sensitive to both oseltamivir and zanamivir. Among the 5,103 influenza 2009 A (H1N1) viruses tested for resistance to oseltamivir, 59 (1.2%) were resistant, and all of the 1,890 viruses tested for resistance to zanamivir, including the 59 oseltamivir-resistant viruses, were sensitive to zanamivir.

## 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

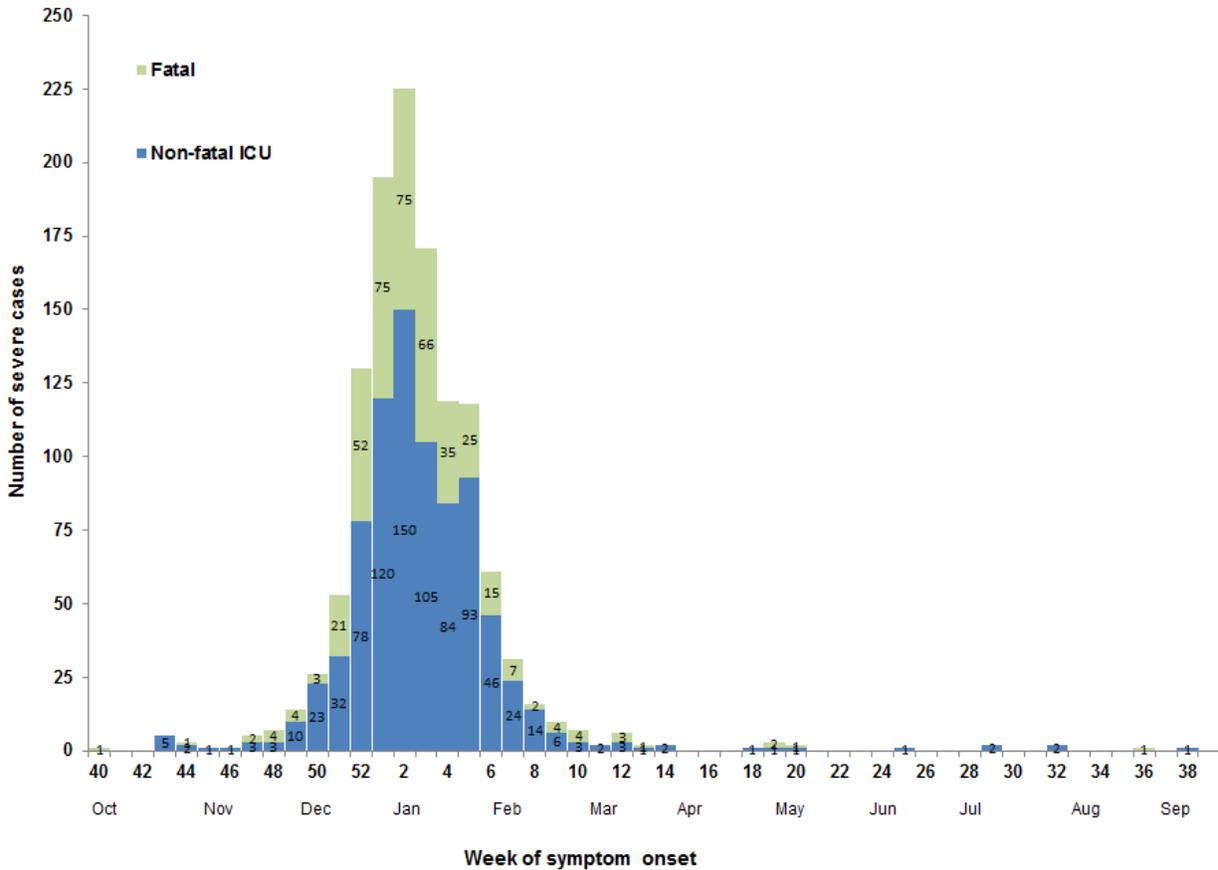
Laboratory-confirmed influenza-associated deaths among patients under 65 years of age are currently reportable in California [Title 17, California Code of Regulations (CCR) §2500]. Since the 2009 H1N1 influenza pandemic, LHJs have also voluntarily reported to CDPH all laboratory-confirmed influenza cases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

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

During 2013–14, CDPH received 1,224 reports of influenza-associated severe illness or deaths among persons <65 years old; 820 (67.0%) were non-fatal ICU cases and 404 (33.0%) were fatal cases. Figure 6 shows the number of fatal and non-fatal ICU cases by week of symptom onset during 2013–2014; if onset date was not available, then the earliest known date

associated with the illness was used. Severe influenza cases were identified throughout 2013–14, including six non-fatal ICU cases and one fatality during the summer months; however, the majority of patients became ill from early December through late February. Peak activity occurred during Weeks 1 through 3 (December 29, 2013–January 18, 2014). Severe influenza case counts by local health jurisdiction for the 2009 influenza pandemic through the 2013–14 influenza season can be found in Appendix I.

**Figure 6. Number of fatal and non-fatal ICU cases of laboratory-confirmed influenza reported to the California Department of Public Health, by week of symptom onset, September 29, 2013 – September 27, 2014**



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

The median age of the 1,224 patients who had severe illness or died from influenza during the 2013–14 season was 44 years (range: <1 week–64 years); 665 (54.3%) were male. Fatal cases (median age: 48 years; range: <1 week–64 years) were significantly older than non-fatal ICU cases (median age: 41 years; range: 1 week–64 years) [p<0.001]. Pediatric cases under the age of 18 years accounted for 10.8% 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. 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 29, 2013– September 27, 2014**

	<b>Non-fatal ICU cases<sup>a</sup></b>	<b>Fatal cases</b>
	<b>No. (%)</b>	<b>No. (%)</b>
Total	820	404
Sex		
Male	442 (53.9)	223 (55.2)
Median age, in years	41	48
Age group		
0-4	69 (8.4)	3 (0.7)
5-17	53 (6.5)	7 (1.7)
18-49	338 (41.2)	170 (42.1)
50-64	360 (43.9)	224 (55.5)

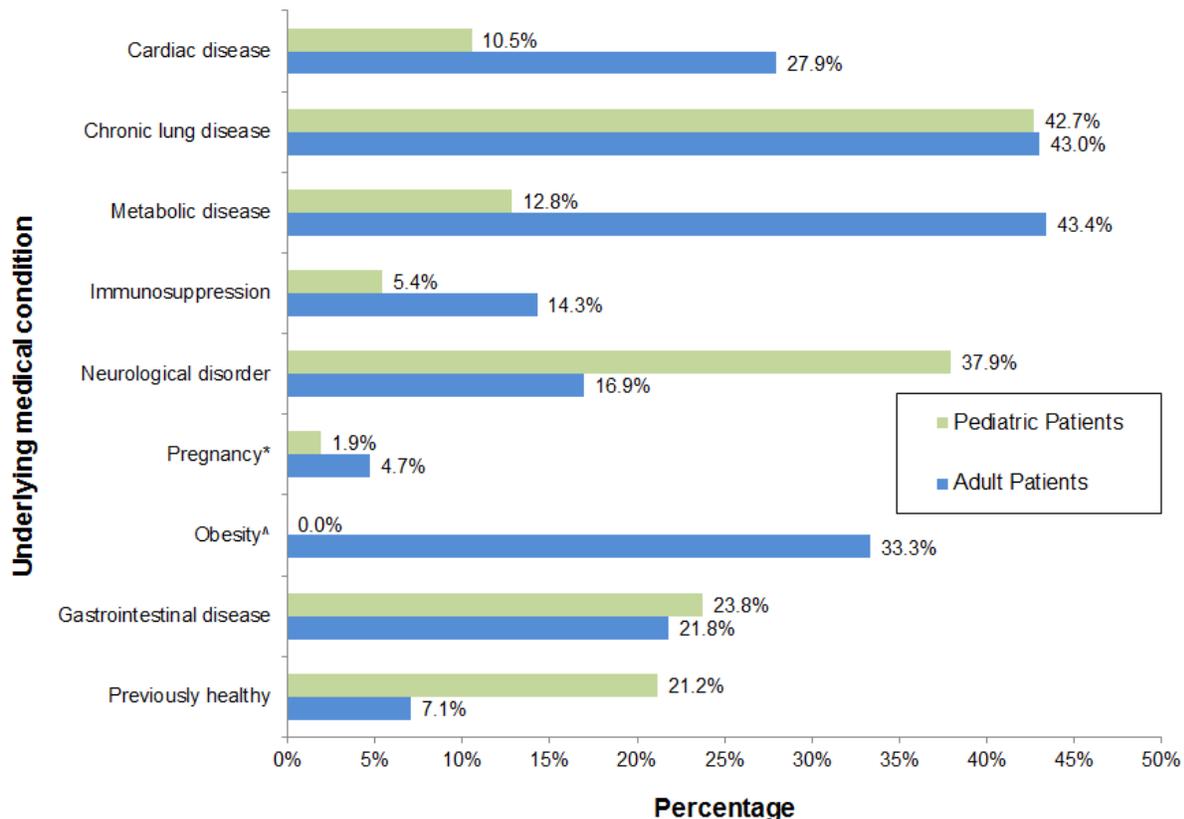
<sup>a</sup> Reporting of influenza-associated ICU hospitalizations is voluntary and may not be complete for all counties.

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.<sup>3</sup> 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.; 351/809; 43.4%), chronic lung disease (e.g., asthma, chronic obstructive pulmonary disease, etc.; 343/797; 43.0%), and obesity (body mass index  $\geq 30$ ; 240/720; 33.3%) [Figure 7].

Among pediatric patients with available information, the most frequently reported underlying medical conditions were chronic lung disease (35/82; 42.7%), neurological disorders (e.g., seizure disorder, cerebral palsy, etc.; 33/87; 37.9%), and gastrointestinal disease (e.g. gastroesophageal reflux, etc.; 19/80; 23.8%); 19 (23.2%) of the 82 children with chronic lung disease had underlying asthma. Twenty-two (21.2%) of the pediatric patients and 68 (7.1%) of the adult patients with information available were reported to be previously healthy. Information on influenza vaccination was available for 610 patients; 125 (20.5%) received the 2013–14 influenza vaccine; among pediatric patients, 24 (29.6%) of 81 with known vaccination status had received the 2013–14 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 29, 2013 – September 27, 2014**



\* Among women of childbearing age (15-44 years)

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

### Circulating influenza types and subtypes

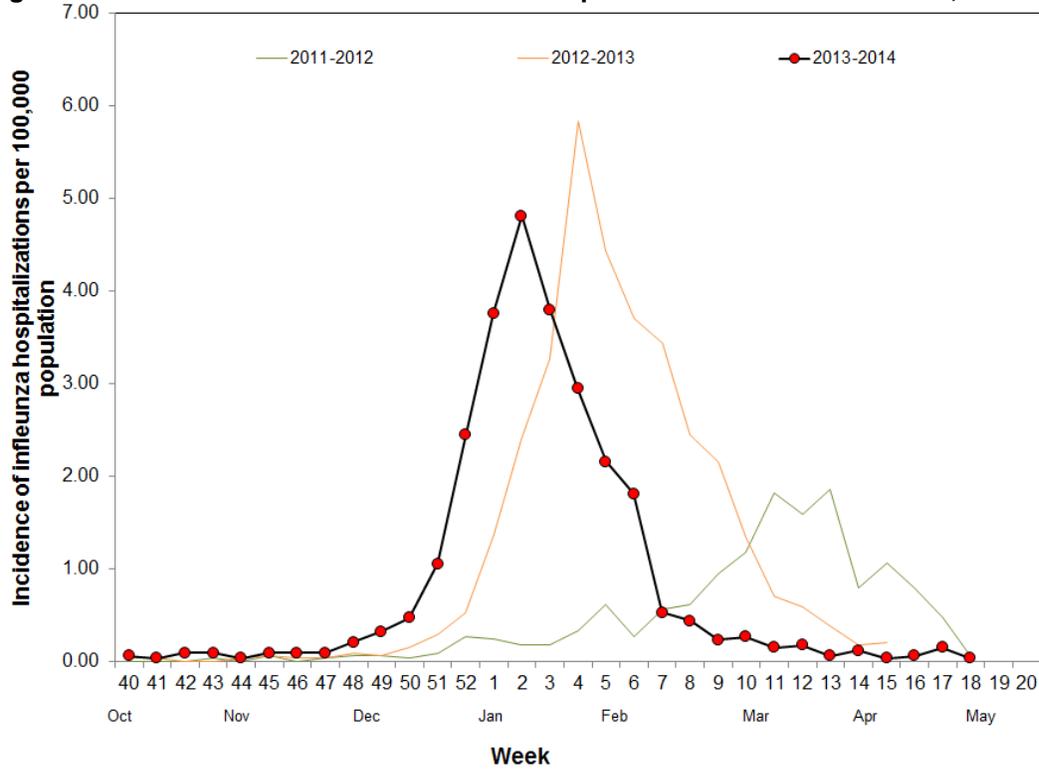
Of the 1,224 severely ill and fatal influenza cases reported, 1,166 (95.3%) were influenza A, 38 (3.1%) were influenza B, and 20 (1.6%) were influenza but the type was not known. Of the 1,166 influenza A detections, 783 (67.2%) were subtyped; 22 (2.8%) were seasonal A (H3N2) and 761 (97.2%) were 2009 A (H1N1). The majority of the 1,224 severe influenza cases reported during the 2013–14 influenza season occurred among adults aged 18–64 years (1,092; 89.2%). In some previous seasons, the pediatric population has been disproportionately affected by influenza B, but adults aged 18–64 years accounted for 78.9% of the influenza B cases during the 2013–14 influenza season.

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

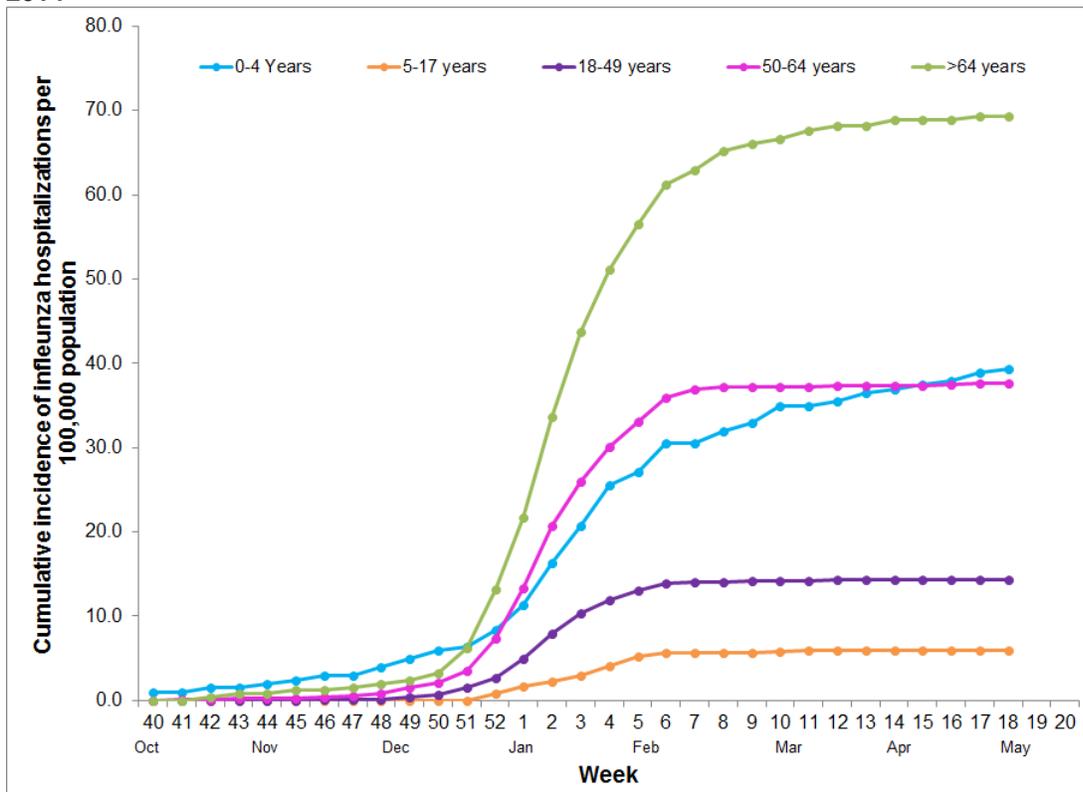
The California Emerging Infections Program (CEIP), Influenza Surveillance Network (FluSurvNET) conducts population-based surveillance for laboratory-confirmed influenza-associated hospitalizations in all ages in Alameda, Contra Costa and San Francisco counties. FluSurvNET is a national network which 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 late December and peaked during Week 2 (January 5–11, 2014) with an incidence of 4.8 influenza hospitalizations per 100,000 population (Figure 8). This rate was higher than the peak rate during the 2011–12 influenza season (1.8 influenza hospitalizations per 100,000), but lower than the peak rate during the 2012–13 influenza season (5.8 influenza hospitalizations per 100,000). Most patients had influenza A; of the influenza A specimens that were subtyped, the majority were influenza 2009 A (H1N1). 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 18–64 years accounted for more than 50% of the total reported hospitalized cases.

**Figure 8. Incidence of influenza-associated hospitalizations in CEIP counties, 2011–2014**



**Figure 9. Cumulative incidence of influenza hospitalizations in CEIP counties by age group, 2013–2014**



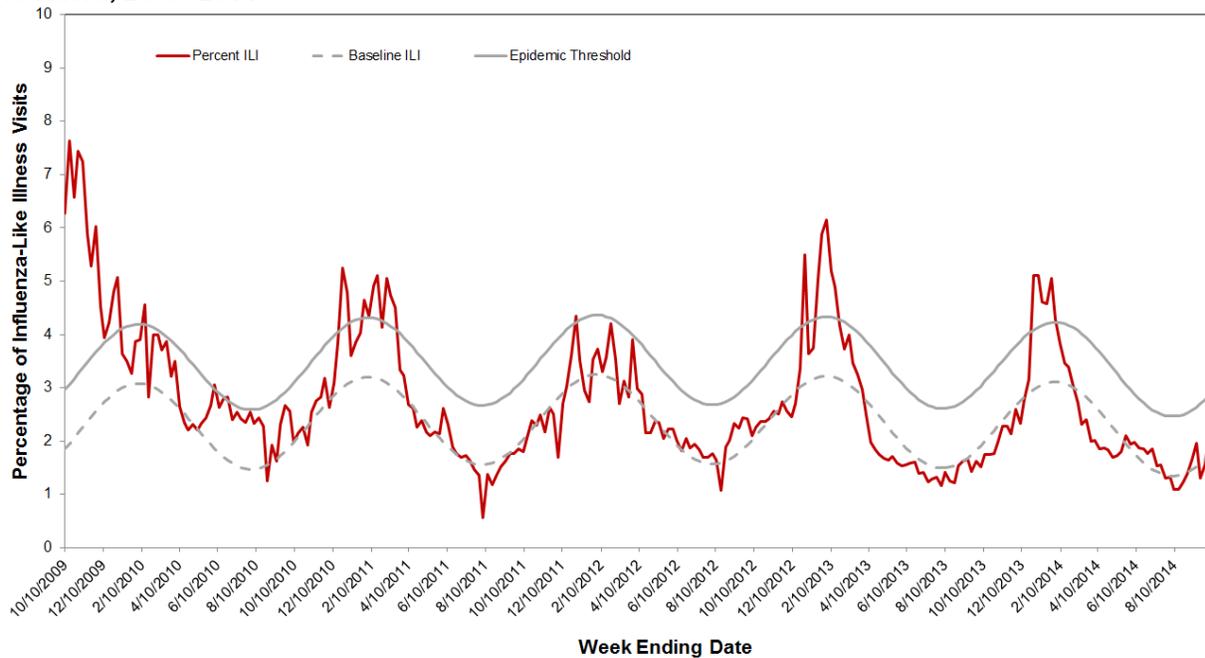
## C. Syndromic Surveillance

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

In collaboration with CDC, CDPH works with sentinel providers throughout the state to conduct year-round surveillance for influenza-like illness (ILI) in outpatients. 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  $37.8^{\circ}\text{C}$ ) and (2) cough and/or sore throat, in the absence of a known cause other than influenza.

In California this season, 133 sentinel providers reported ILI activity on a regular basis (i.e. at least 17 of the 33 weeks from September 29, 2013 to May 17, 2014). 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 first week of January, remained elevated through early February, and returned to seasonal baseline levels in March. The percentage of visits for ILI exceeded the epidemic threshold during Week 52–Week 5 (December 22, 2013–February 1, 2014).

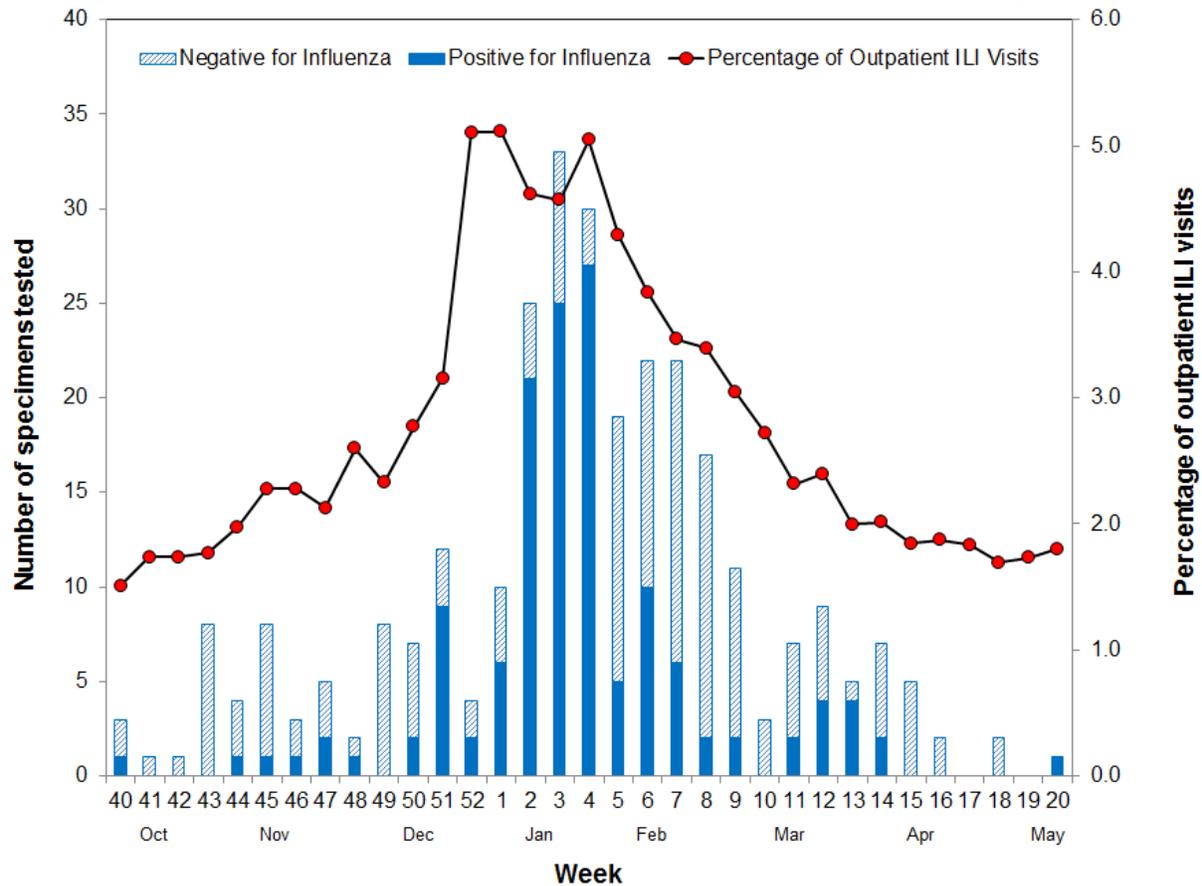
**Figure 10. Percentage of influenza-like illness visits among patients seen by California Sentinel Providers, 2009–2014**



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 296 respiratory specimens were submitted by sentinel providers from September 29, 2013 through May 17, 2014; 137 (46%) were positive for influenza. Of these, 118 (86%) were influenza A and 19 (14%) were influenza B. Of the 118 influenza A specimens, 111 were subtyped; 101 (91%) were 2009 A (H1N1) and 10 (9%) were A (H3N2). Figure 11 shows that the number of specimens submitted by sentinel providers that tested positive for influenza peaked in Week 5 (January 26–February 1, 2014), which coincides with the period of increased reported ILI activity.

**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 29, 2013–May 17, 2014**

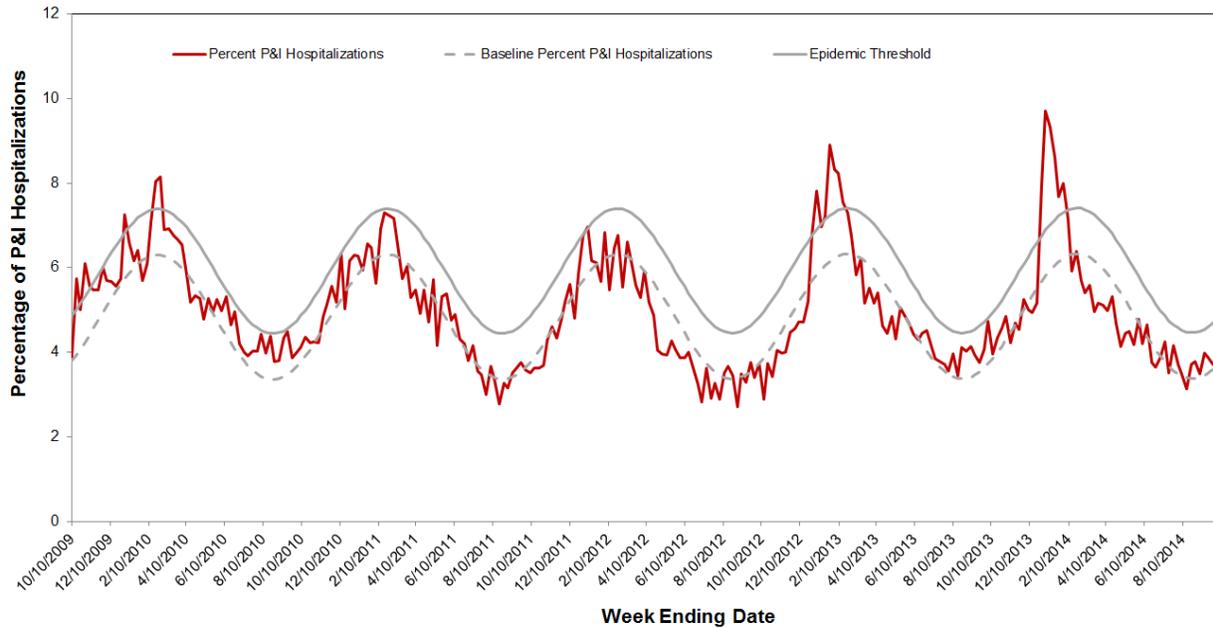


## 2. Kaiser Permanente Northern California Pneumonia and Influenza Admission Data

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 2013–14 influenza season, the percentage of P&I hospitalizations in Kaiser Permanente facilities in Northern California began first exceeded baseline levels in late December and peaked the first week of January (Figure 12). The proportion of P&I hospitalizations returned to baseline levels in February. The burden of P&I hospitalizations in Kaiser Permanente Northern and Southern California hospitals was greater during the 2013–14 influenza season compared to the four previous influenza seasons from 2009 to 2013.

**Figure 12. Percentage of pneumonia and influenza admissions in Kaiser Permanente hospitals, 2009–2014**

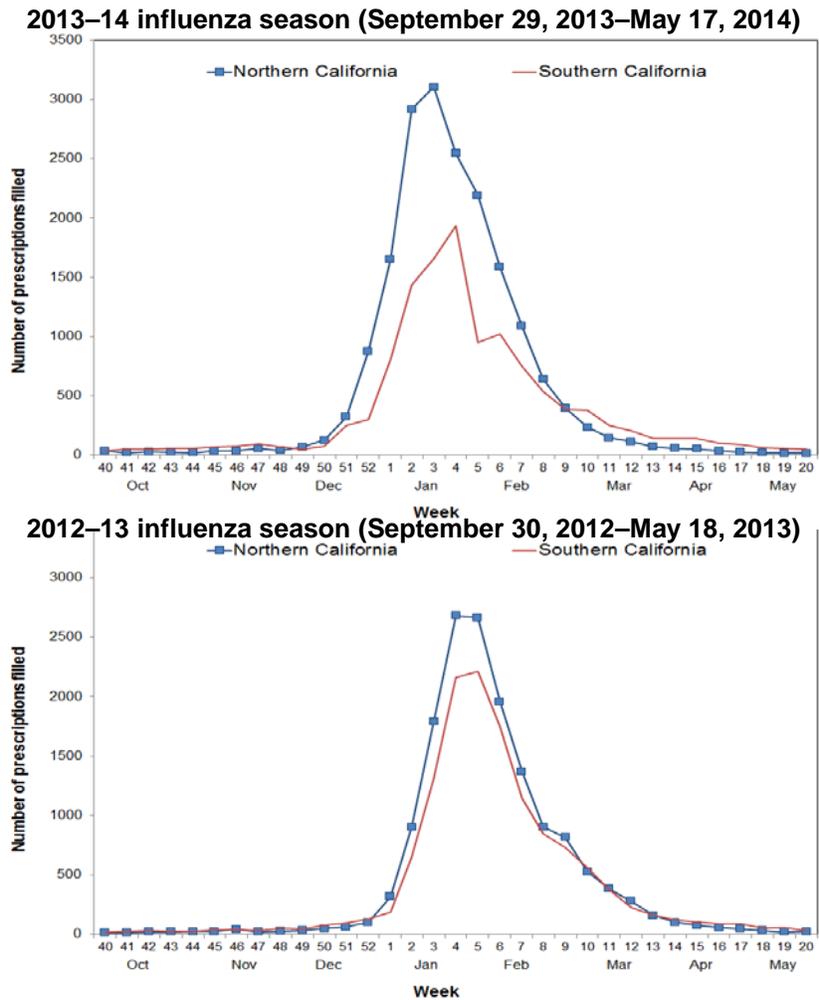


The seasonal baseline was calculated using a regression model applied to data from the previous six years. The epidemic threshold is two standard deviations above the seasonal baseline and is the point at which the observed percentage of pneumonia and influenza hospitalizations in Kaiser Permanente hospitals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

### 3. Kaiser Permanente Pharmacy Data

CDPH collaborates with Kaiser Permanente to monitor the number of prescriptions filled in outpatient pharmacies for antiviral medications used to treat influenza. The number of oseltamivir prescriptions filled each week serves as an indicator of influenza activity. During the 2013–14 influenza season, the number of oseltamivir prescriptions in both Northern and Southern California pharmacies began to increase significantly in late December (Figure 13), concurrent with a statewide increase in laboratory detections of influenza and reports of outpatient ILI. The number of prescriptions may have also increased as a result of treatment recommendations distributed by Kaiser Permanente to its healthcare providers. At the peak of activity in mid-January, Kaiser Permanente outpatient pharmacies in Northern California were filling over 2,900 oseltamivir prescriptions per week, while Southern California pharmacies were filling over 1,600 prescriptions per week. From September 29, 2013 through May 17, 2014, a total of 30,920 prescriptions for oseltamivir were filled by Kaiser Permanente outpatient pharmacies statewide. In comparison, a total of 28,975 oseltamivir prescriptions were filled statewide during the 2012–13 influenza season.

**Figure 13. Number of Oseltamivir prescriptions filled in Kaiser Permanente outpatient pharmacies by region and week, 2012–13 and 2013–14 influenza seasons**



#### D. Outbreaks of Respiratory Illness, Including Influenza

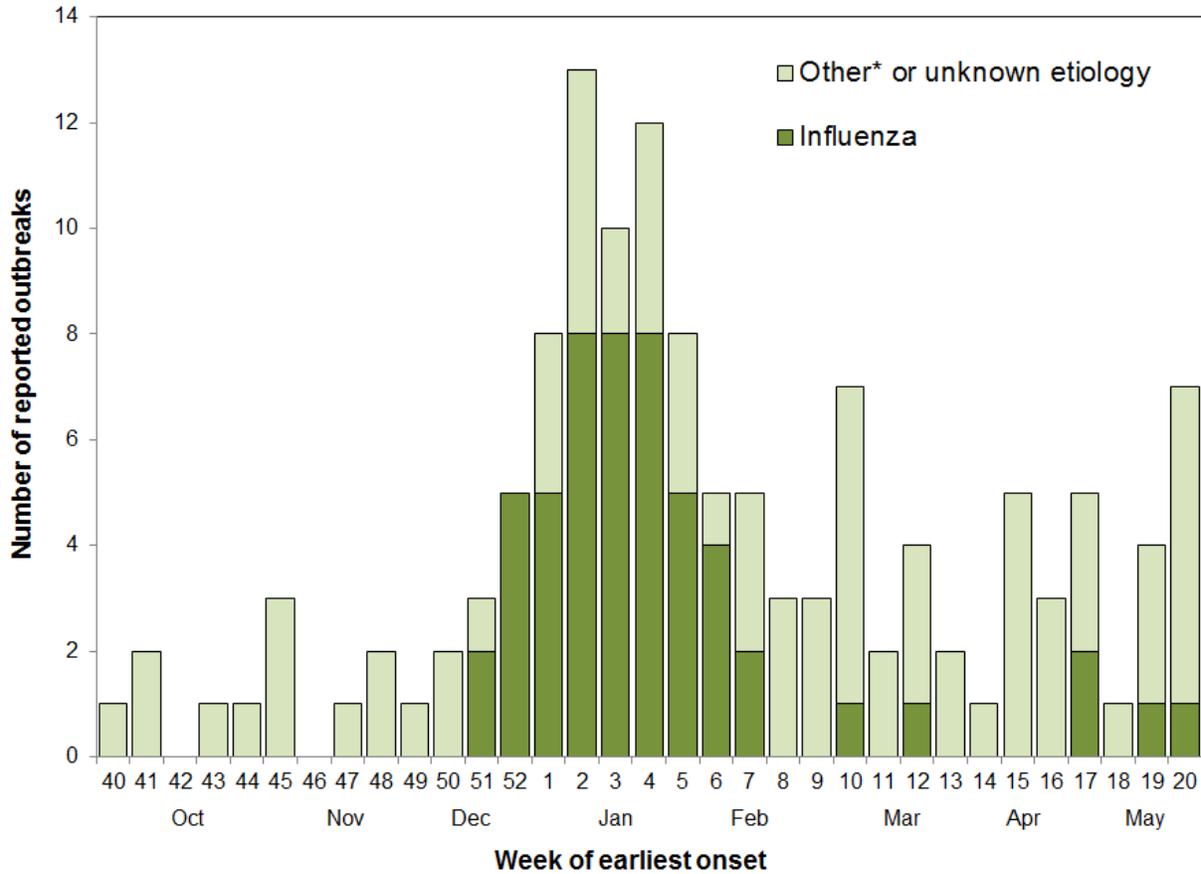
Local health departments reported a total of 130 confirmed non-tuberculosis respiratory outbreaks to CDPH from September 29, 2013 to May 17, 2014. The outbreaks were reported from 26 local health jurisdictions throughout the state. Of the 130 confirmed respiratory outbreaks, 34 (26%) had no identified etiology. Influenza was the most commonly identified pathogen in the remaining outbreaks (53; 41%). Outbreaks of laboratory-confirmed pertussis (37), adenovirus (1), coronavirus (1), human metapneumovirus (1), respiratory syncytial virus (1), group A *Streptococcus* (1), and unspecified streptococcal infection (1) were also identified.

The majority (47; 89%) of the 53 influenza-associated outbreaks were associated with influenza A. An additional 5 (9%) outbreaks were associated with influenza B, and 1 (2%) outbreak was associated with influenza but the type was not known. Of the 28 influenza A specimens that were subtyped, influenza 2009 A (H1N1) was most frequently identified (22; 79%).

Of the 53 influenza-associated outbreaks, 41 (77%) occurred in residential healthcare facilities such as skilled nursing facilities. Local health departments also reported influenza outbreaks in

correctional facilities (7; 13%), schools (3; 6%), military facilities (1; 2%), and acute care healthcare facilities (1; 2%). The first influenza-associated outbreak that was identified during the 2013–14 influenza season occurred in mid-December 2013 (Figure 14). Influenza outbreaks continued to occur through the end of the season, with peak activity occurring in mid-January 2014. Since May 17, 2014, six confirmed influenza outbreaks have been reported to CDPH (initial case onset dates ranged from June 3–August 18, 2014); five occurred in residential healthcare facilities and one occurred in an acute care healthcare facility. Five were due to influenza A (H3N2) and one was due to influenza A, subtype unknown.

**Figure 14. Reported respiratory outbreaks by week of earliest onset, September 29, 2013–May 17, 2014**



\*Other etiologies identified by laboratory confirmation included pertussis (36), adenovirus (1), coronavirus (1), human metapneumovirus (1), respiratory syncytial virus (1), group A *Streptococcus* (1), unspecified streptococcal infection (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, 2009 influenza pandemic through 2013–2014 influenza season**

Jurisdiction	Pandemic*		2010–2011		2011–2012		2012–2013		2013–2014	
	Fatal	Non-fatal ICU								
CALIFORNIA	542	1468	90	331	52	163	113	233	404	820
Alameda <sup>†</sup>	28	92	3	32	6	9	3	3	9	26
Berkeley City	1	1	0	0	0	0	0	0	0	1
Alpine	0	0	0	0	0	0	0	0	0	0
Amador	0	0	1	0	0	0	0	0	0	3
Butte	1	15	0	3	0	2	0	1	2	4
Calaveras	0	0	0	2	0	0	0	0	2	2
Colusa	0	2	0	0	0	0	0	0	0	1
Contra Costa	11	40	7	28	0	9	1	11	7	42
Del Norte	0	0	0	0	0	0	1	0	0	0
El Dorado	1	2	0	1	0	0	0	0	3	8
Fresno	17	33	2	14	3	10	6	15	22	18
Glenn	0	2	1	0	0	0	0	0	1	1
Humboldt	2	10	0	0	0	0	0	3	1	6
Imperial	2	6	0	3	0	0	0	0	2	6
Inyo	0	2	0	0	0	0	0	0	0	0
Kern	19	42	4	5	1	2	2	0	11	23
Kings	2	7	0	0	0	0	0	0	7	5
Lake	1	2	0	0	0	2	0	0	1	4
Lassen	0	0	0	0	0	0	0	0	1	1
Los Angeles <sup>†</sup>	129	219	8	2	12	0	33	0	75	22
Long Beach City	6	27	1	1	1	2	0	0	8	5
Pasadena City	0	1	1	0	0	0	0	0	0	0
Madera	4	9	0	0	0	0	2	1	3	6
Marin	3	10	1	2	0	0	0	1	2	1
Mariposa	0	1	0	0	0	0	0	0	0	0
Mendocino	4	8	1	1	0	1	0	1	4	13
Merced	5	8	0	5	0	1	0	0	5	6
Modoc	0	0	0	0	0	0	0	0	0	0
Mono	0	0	0	0	0	0	0	0	0	0
Monterey	3	16	0	4	0	1	0	4	7	12
Napa	1	5	0	1	0	0	0	0	0	7
Nevada	1	1	0	0	1	0	0	0	1	4
Orange	47	166	8	44	2	18	6	30	20	28
Placer	5	14	0	3	0	1	0	2	1	9
Plumas	0	0	0	0	0	0	0	0	0	0
Riverside	43	74	2	9	1	15	6	13	23	44
Sacramento	20	89	7	24	3	24	9	41	27	81
San Benito	0	3	0	0	0	0	0	1	0	0
San Bernardino	40	110	5	24	5	14	8	10	30	52
San Diego	52	167	16	50	5	10	17	43	44	112
San Francisco	6	38	1	19	0	1	2	1	4	28
San Joaquin	3	14	2	3	2	6	0	8	8	23
San Luis Obispo	1	3	0	1	0	0	2	2	1	7
San Mateo	11	19	1	11	2	10	1	3	6	18
Santa Barbara	5	18	0	5	0	2	1	3	3	9
Santa Clara	17	70	5	6	1	8	7	9	20	45
Santa Cruz	2	7	2	4	0	0	0	4	5	6
Shasta	0	9	0	1	0	0	0	0	3	10
Sierra	0	0	0	0	0	0	0	0	0	0
Siskiyou	0	1	0	0	0	0	0	0	2	5
Solano	7	20	1	2	0	1	0	7	3	14
Sonoma	7	14	2	4	0	0	0	0	6	19
Stanislaus	11	32	3	10	2	5	2	2	13	31
Sutter	0	3	0	0	0	0	0	1	1	3
Tehama	1	2	0	0	0	0	0	2	0	2
Trinity	1	1	0	0	0	0	0	0	0	0
Tulare	6	16	2	5	1	1	1	2	5	25
Tuolumne	1	3	0	0	0	0	0	0	1	1
Ventura	9	8	2	1	4	7	3	6	3	11
Yolo	3	2	0	1	0	1	0	3	1	10
Yuba	3	4	1	0	0	0	0	0	0	0

\* Pandemic: April 23, 2009–October 2, 2010; 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

<sup>†</sup> Does not include city counts