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Summary

This report summarizes influenza activity for the 2010-2011 season (end of September 2010 through September 2011). This season is the first full surveillance season after the 2009 H1N1 pandemic. A few surveillance activities developed during the pandemic response were sustained as part of routine influenza surveillance activities. For example, death certificate data for pneumonia and influenza mortality continue to be analyzed. High levels of participation in surveillance activities among the health community, such as laboratory reporting of positive tests and outpatient sentinel surveillance, also appear to have continued.

The first case of influenza with apparent in-state acquisition was confirmed at the Arizona State Public Health Laboratory in week 39 (last week of September), with activity increasing rapidly during December and peaking during February. The season was unusual for the cocirculation throughout the season of three viruses: influenza A (H3), which appeared to be the dominant strain in Arizona, the pandemic strain (2009 influenza A (H1N1)*), and influenza B.

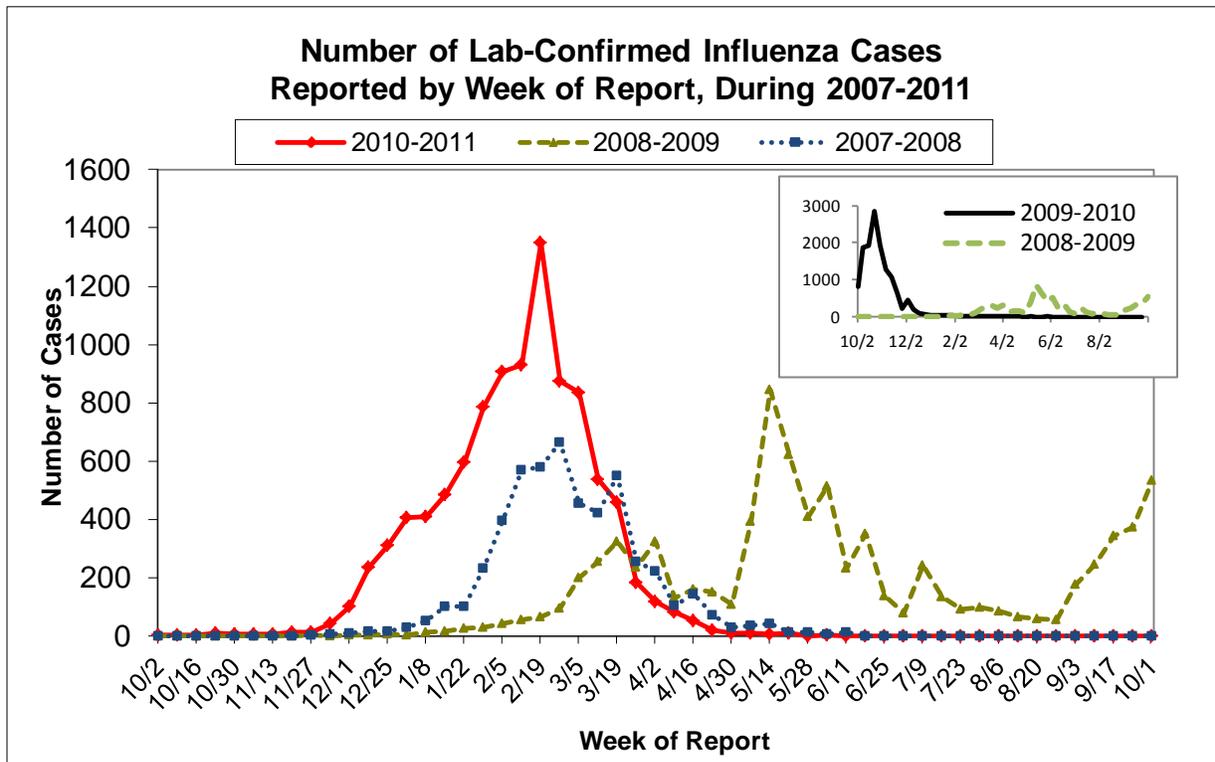
**Note: The nomenclature for the pandemic virus was later changed to influenza A(H1N1)pdm09. The name 2009 influenza A (H1N1) is used throughout this report, consistent with its usage during the 2010-2011 season.*

Laboratory-Confirmed Influenza Activity

Positive influenza tests are reported to ADHS by laboratories under Arizona Administrative Code R9-6-204. This reporting includes many types of tests, such as rapid antigen tests, direct fluorescent antigen tests, viral cultures, or molecular testing.

While the weekly number of laboratory-confirmed influenza cases reported during the height of the 2009 pandemic continues to far exceed any other period since laboratory surveillance started in 2004, several weeks during the 2010-2011 season reflected higher numbers of case reports than non-pandemic weeks in other seasons, and the season total was higher than other non-pandemic seasons. It is unclear whether this reflects higher levels of disease in the community, or changes in testing, reporting, or other surveillance factors. It is likely that the popularity of rapid diagnostic tests plays a role in these higher numbers.

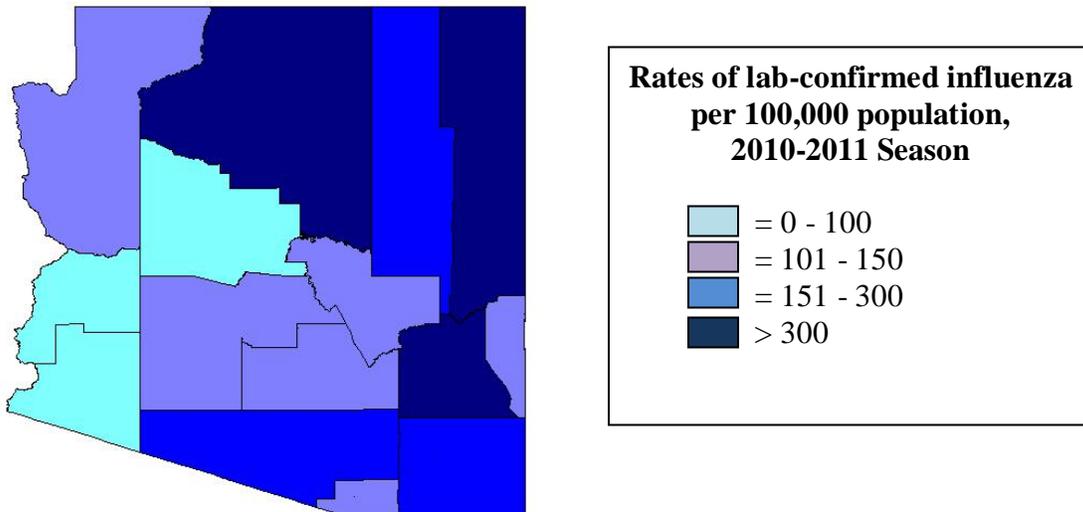
Arizona began its influenza surveillance season one week earlier than usual, in week 39 (September 25th – October 2nd, 2010), with the confirmation of influenza A (H3) at the Arizona State Public Health Laboratory in a case with no recent travel history. Reporting of laboratory-confirmed cases began to increase in December, with peak activity in February.



Laboratory-Confirmed Cases Reported, by County

The table below includes all reported laboratory-confirmed influenza reports, regardless of testing method. While Maricopa and Pima Counties have the most cases, Graham, Apache, and Coconino Counties reported the highest population rates. Differences in rates may reflect not only differences in the level of influenza virus circulating in the community, but also testing and reporting practices.

| County | Number of Laboratory-Confirmed Cases | Rate per 100,000 population |
|--------------|--------------------------------------|-----------------------------|
| Apache | 307 | 429 |
| Cochise | 298 | 227 |
| Coconino | 544 | 405 |
| Gila | 61 | 114 |
| Graham | 343 | 922 |
| Greenlee | 9 | 107 |
| La Paz | 12 | 59 |
| Maricopa | 5,128 | 134 |
| Mohave | 301 | 150 |
| Navajo | 321 | 299 |
| Pima | 1,644 | 168 |
| Pinal | 547 | 146 |
| Santa Cruz | 67 | 141 |
| Yavapai | 162 | 77 |
| Yuma | 78 | 40 |
| Total | 9,822 | 154 |



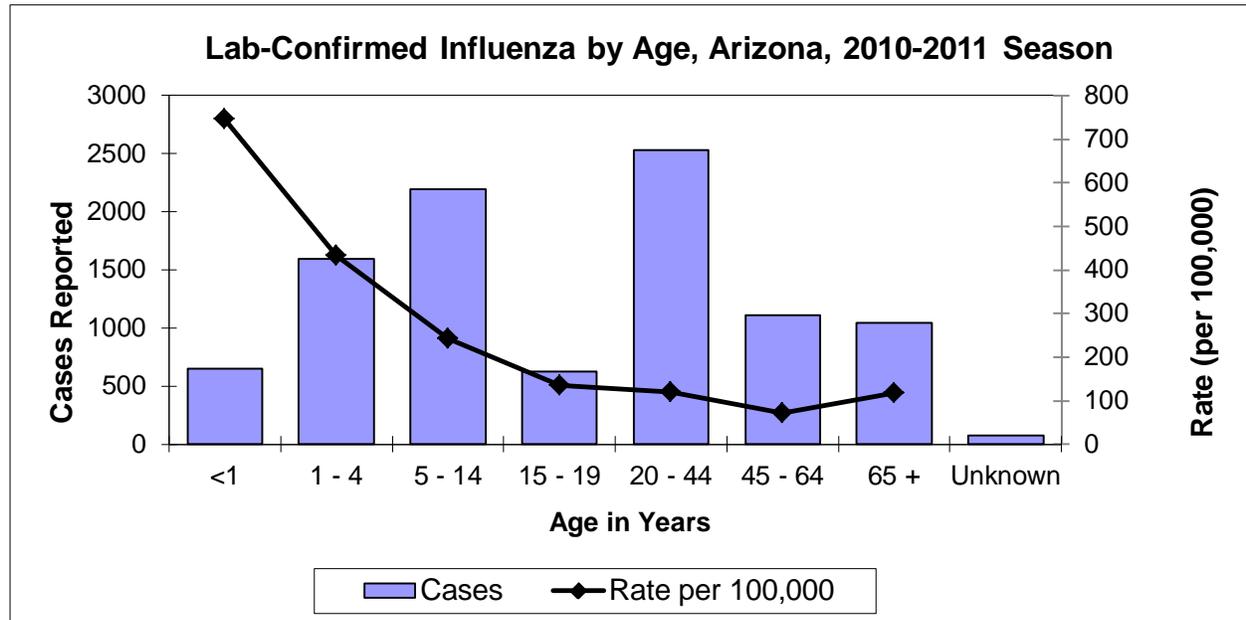
Influenza Activity by Age

The age groups affected by influenza vary somewhat season-to-season, depending in part on the circulating influenza types and subtypes and any previous immunity in the community. Variations in age groups of reported influenza cases can also be caused by differences in laboratory testing and reporting practices year-to-year. A higher proportion of reported cases were under the age of five years in the 2010-2011 season than in other recent years.

Age Group of Reported Influenza Cases, 2007-2008 through 2010-2011 Seasons

| Age Group | 2010-2011 Season (N=9,822) | 2009-2010 Season (N=13,030) | 2008-2009 Season (N=9,159) | 2007-2008 Season (N=5,175) |
|-------------------|-------------------------------|--------------------------------|-------------------------------|-------------------------------|
| 0 to 4 years | 2,244 (23%) | 2,531 (19%) | 1,444 (16%) | 933 (18%) |
| 5 to 18 years | 2,677 (27%) | 4,943 (38%) | 4,220 (46%) | 906 (18%) |
| 19 to 49 years | 2,982 (30%) | 4,137 (32%) | 2,695 (29%) | 1,922 (37%) |
| 50 to 64 years | 799 (8%) | 951 (7%) | 459 (5%) | 526 (10%) |
| 65 years or older | 1,043 (11%) | 315 (2%) | 271 (3%) | 752 (15%) |
| Unknown age | 77 (1%) | 153 (1%) | 70 (1%) | 136 (3%) |

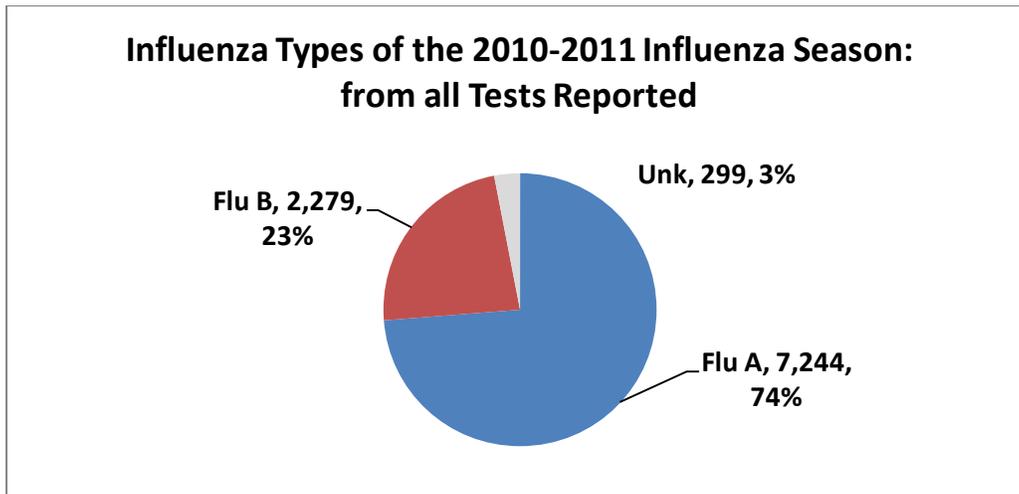
While large numbers of laboratory-confirmed cases were reported among older children and young adults, the rate of reported influenza cases was by far highest in children less than one year of age and decreased with age, increasing slightly among adults 65 years or older.



Influenza Types and Subtypes

There are two main types of influenza – Type A and Type B – that cause illness in people. Influenza A viruses can be further divided into subtypes such as A (H1) or A (H3). While most tests can distinguish between influenza A and B, only specialized testing such as that done at the State Public Health Laboratory can differentiate subtypes.

Approximately three-fourths of reported influenza during the 2010-2011 season was influenza A, similar to the overall numbers for the 2008-2009 season. Influenza B cases were somewhat more likely to be of younger age than influenza A cases, with 63% of influenza B cases under the age of 19 years, compared to 45% of influenza A cases.



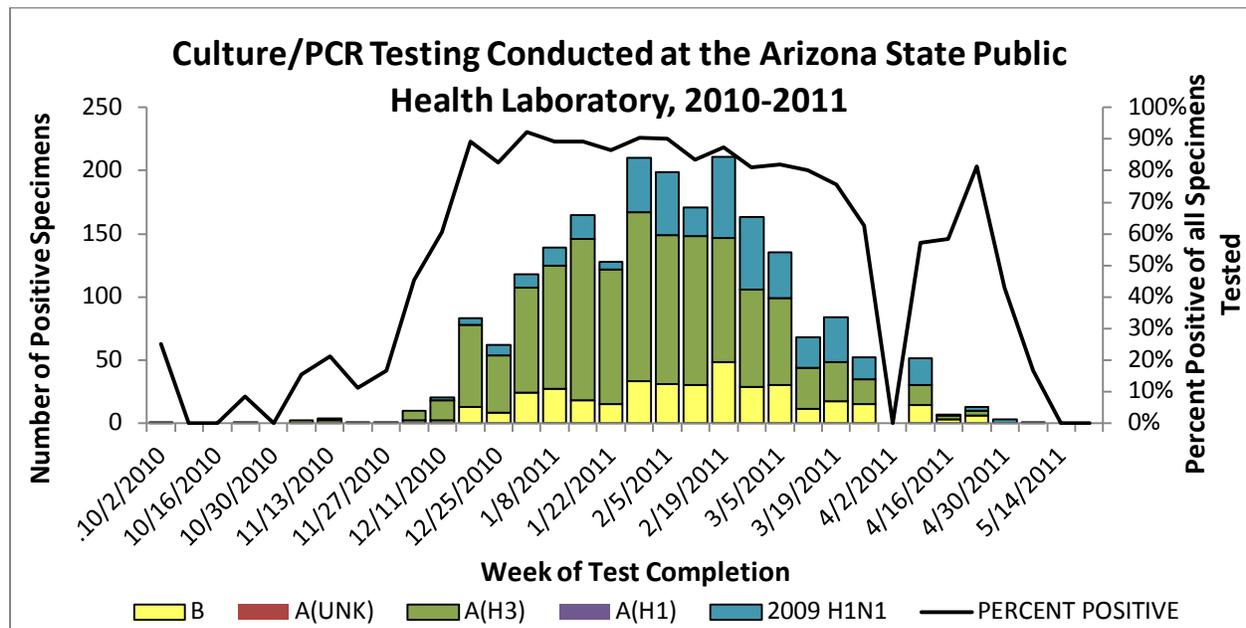
Influenza Type, by Season

| | 2010-2011 Number (Percent) | 2009-2010 Number (Percent) | 2008-2009 Number (Percent) | 2007-2008 Number (Percent) |
|--------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Total | 9,822 (100%) | 13,032 (100%) | 9,149 (100%) | 5,168 (100%) |
| Influenza A | 7,244 (74%) | 12,954 (99%) | 7,262 (79%) | 2,898 (56%) |
| Influenza B | 2,279 (23%) | 33 (0.3%) | 1,691 (18%) | 1,900 (37%) |
| Unknown | 299 (3%) | 45 (0.3%) | 196 (2%) | 370 (7%) |

Influenza Type, by Age Group, 2010-2011 Influenza Season

| Age Group | All Confirmed Cases (N=9,822) | Influenza A (N=7,244) | Influenza B (N=2,279) | Unknown Type (N=299) |
|--------------------------|----------------------------------|--------------------------|--------------------------|-------------------------|
| 0 to 4 years | 2,244 (23%) | 1,687 (23%) | 485 (21%) | 73 (24%) |
| 5 to 18 years | 2,677 (27%) | 1,583 (22%) | 966 (42%) | 127 (42%) |
| 19 to 49 years | 2,982 (30%) | 2,314 (32%) | 595 (26%) | 73 (24%) |
| 50 to 64 years | 799 (8%) | 688 (9%) | 93 (4%) | 18 (6%) |
| 65 years or older | 1,043 (11%) | 924 (13%) | 112 (5%) | 7 (2%) |
| Unknown age | 77 (1%) | 48 (1%) | 28 (1%) | 1 (0.3%) |

Viral culture and molecular testing (reverse transcriptase polymerase chain reaction or RT-PCR) are the methods used to identify subtypes of circulating influenza viruses, which can help health professionals make the best treatment and vaccination decisions. The influenza subtype can be determined by a test called hemagglutination inhibition (HI) using viral isolates or by using subtype-specific primers for RT-PCR. Another indicator used to evaluate the level of influenza activity is the percent of specimens submitted for influenza testing that are positive for influenza; during the peak of an influenza season, high percentages of specimens are positive.



Sixty-one percent of positive specimens at ASPHL were influenza A (H3), 21% were 2009 influenza A (H1N1), and 18% were influenza B. This season was unusual for the prolonged cocirculation of three viruses. RT-PCR and culture data from all laboratories that perform these tests are shown in the table below.

After week 18, through the end of the 2010-2011 season, only three cases were confirmed at ASPHL. They are described in the Summer Laboratory-Reported Influenza section of this report.

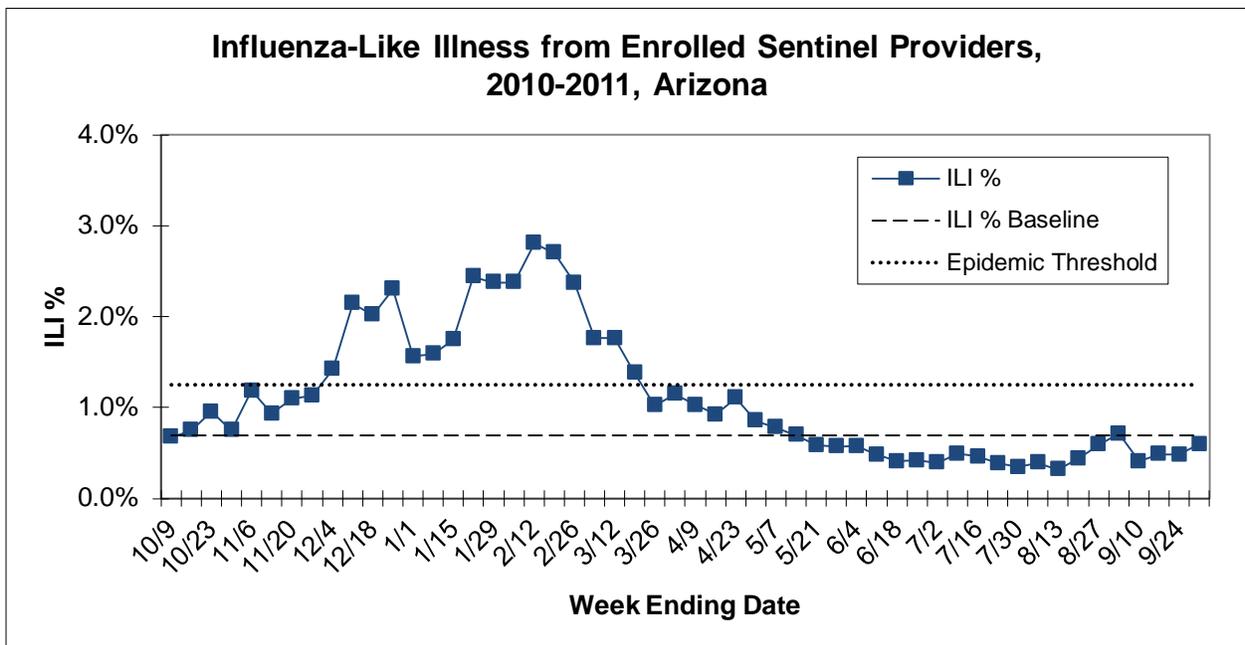
Influenza confirmed by RT-PCR or culture, by season, from any laboratory

| | 2010-2011 Number (Percent) | 2009-2010 Number (Percent) | 2008-2009 Number (Percent) | 2007-2008 Number (Percent) |
|-------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Influenza Type/Subtype | 3,176 (100%) | 7,497 (100%) | 3,767 (100%) | 1181 (100%) |
| 2009 H1N1 | 483 (15%) | 6,392 (85%) | 2,243 (60%) | 0 (0%) |
| Seasonal A(H1) | 0 (0%) | 0 (0%) | 459 (12%) | 184 (16%) |
| Seasonal A(H3) | 1,239 (39%) | 1 (0.01%) | 382 (10%) | 234 (20%) |
| Influenza A(Unsubtyped) | 748 (24%) | 1,101 (15%) | 510 (14%) | 257 (22%) |
| Influenza B | 706 (22%) | 3 (0.04%) | 510 (14%) | 506 (43%) |

Influenza-Like Illness (ILI) Surveillance from Sentinel Providers

ILI is defined as a fever of at least 100°F plus either a cough or a sore throat. Approximately 60 sentinel providers around the state report weekly the number of total outpatient visits to their offices and the number of visits for ILI. We use the percentage of visits for ILI as an indicator of likely influenza activity. The state ILI baseline is 0.69% and the epidemic threshold is 1.25%. The baseline is defined as the mean of the state ILI% in weeks in the 2007-2010 flu seasons when <10% of specimens were positive at the Arizona State Public Health Laboratory. The epidemic threshold is defined as the mean plus two standard deviations.

The percentage of visits for ILI first exceeded the epidemic threshold at the end of November, coinciding with the increase in laboratory reports, and rising again in January and February during the peak of laboratory reports.



Severe Acute Respiratory Infections (SARI) Surveillance

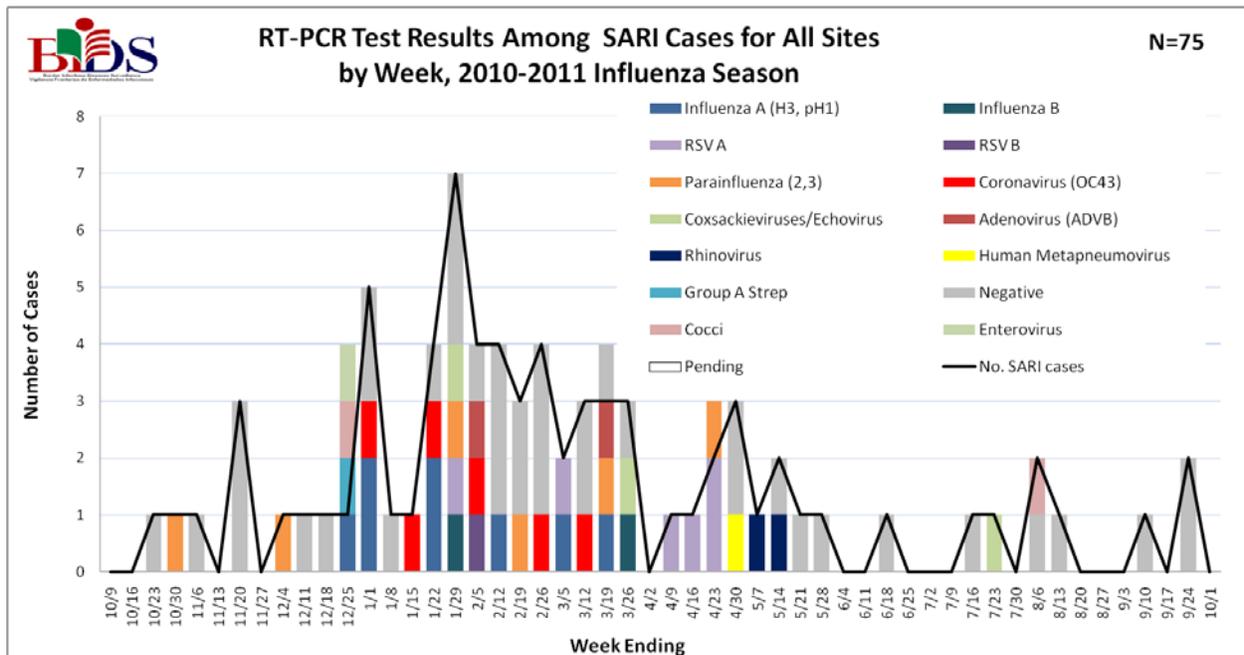
Severe acute respiratory infections (SARI) surveillance is conducted at selected hospitals in counties along the Sonora, Mexican border by the Office of Border Health's Border Infectious Disease Surveillance (BIDS) program. SARI is defined as a hospital admission with a fever of at least 100°F plus either a cough or a sore throat. This surveillance facilitates the detection of circulating influenza strains and allows us to monitor various causes of morbidity and mortality among inpatients with SARI.

SARI cases are tested using an RT-PCR viral panel that detects: influenza A and B; respiratory syncytial virus A and B; parainfluenza virus 1, 2, 3, and 4; human metapneumoviruses A/B; rhinovirus; adenovirus (ADVB and ADVE); coronavirus (NL63, HKU1, 229E, and OC43); coxsackieviruses/echovirus; and bocavirus. If a lower respiratory specimen is collected it is tested by RT-PCR for *Chlamydomydia pneumoniae*, *Mycoplasma pneumoniae*, *Bordetella pertussis*, and *Legionella pneumophila* and bacteriology culture for bacterial etiologies and coinfections. Serum from these patients is also tested for coccidioidomycosis.

Among the 75 cases identified in the 2010-2011 season, 10 (13%) were positive for influenza and seven (9%) were positive for RSV. Thirty-nine (52%) were negative for all tested etiologies.

Forty (53%) of 75 cases were male. Among 73 cases with age data available, thirty-four (47%) were 65 years of age or older and nine (12%) were under five years of age. Thirty-one (41%) of 75 cases were of non-Hispanic white racial/ethnic background, 24 (32%) were Hispanic, 19 (25%) were Native American, and one (1%) was African American.

Of the 42 SARI cases with negative rapid diagnostic influenza results, seven were eventually confirmed as influenza by PCR. Among 74 with symptom duration collected, the median was 4.5 days, with a mean of 7.3 days and range of 1 to 63 days.



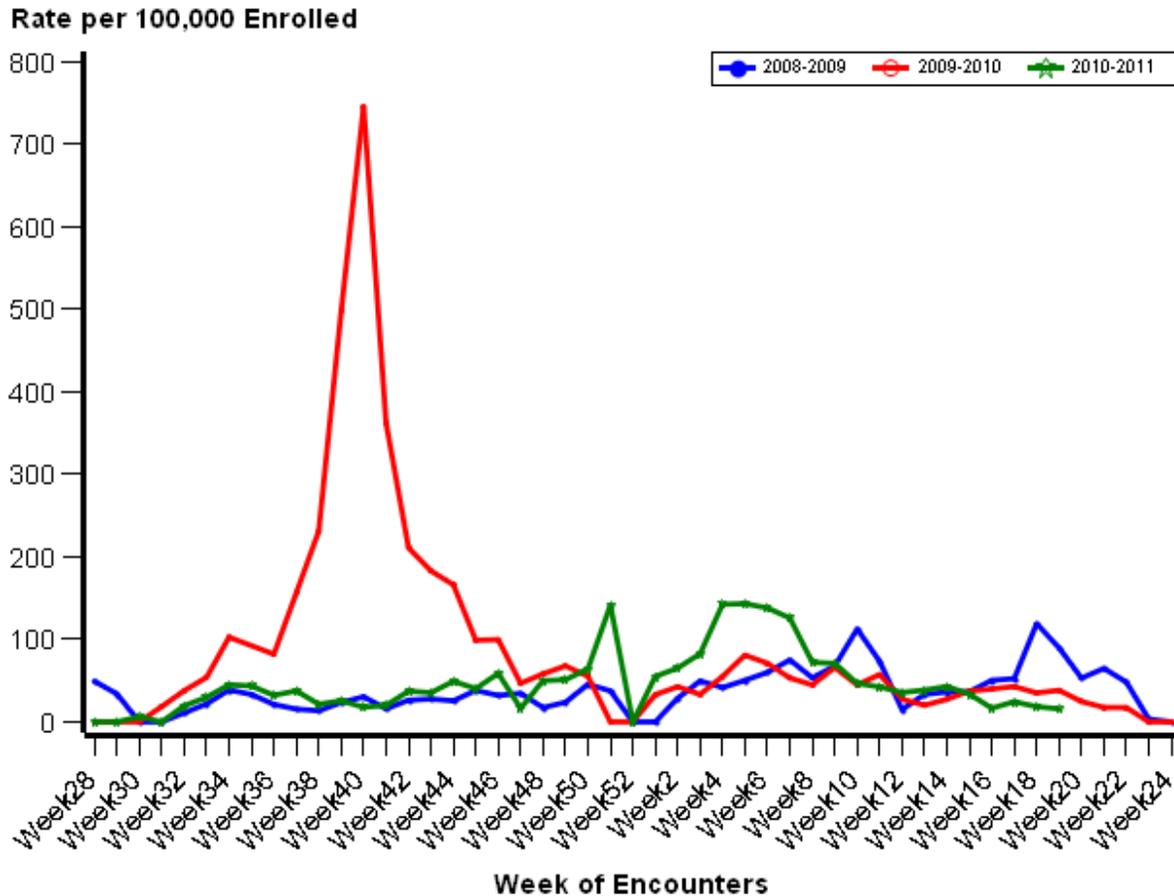
*Co-infections were identified in weeks ending 12/25, 3/26, and 4/23. All etiologies identified are represented.

Influenza-Like Illness (ILI) Surveillance from Participating Arizona Schools

School nurses in approximately 310 Arizona schools around the state use a specific computer program (the Child Health Indicator Program) for electronic management of student health records. The graph presents the weekly trend of ILI syndromes reported among students during the school years of 2008-2009, 2009-2010, and 2010-2011. The number of school nurse encounters are not diagnosed cases of communicable diseases but are based on the nursing codes that school nurses enter to track student conditions. Also, the numbers in the graph are only from schools that used CHIP during the school year.

ILI among school children first peaked just before the winter break (week 51), and then peaked again in February (weeks 4 through 7). ILI during the fall wave of the 2009 pandemic far exceeded any activity seen in school surveillance before or since.

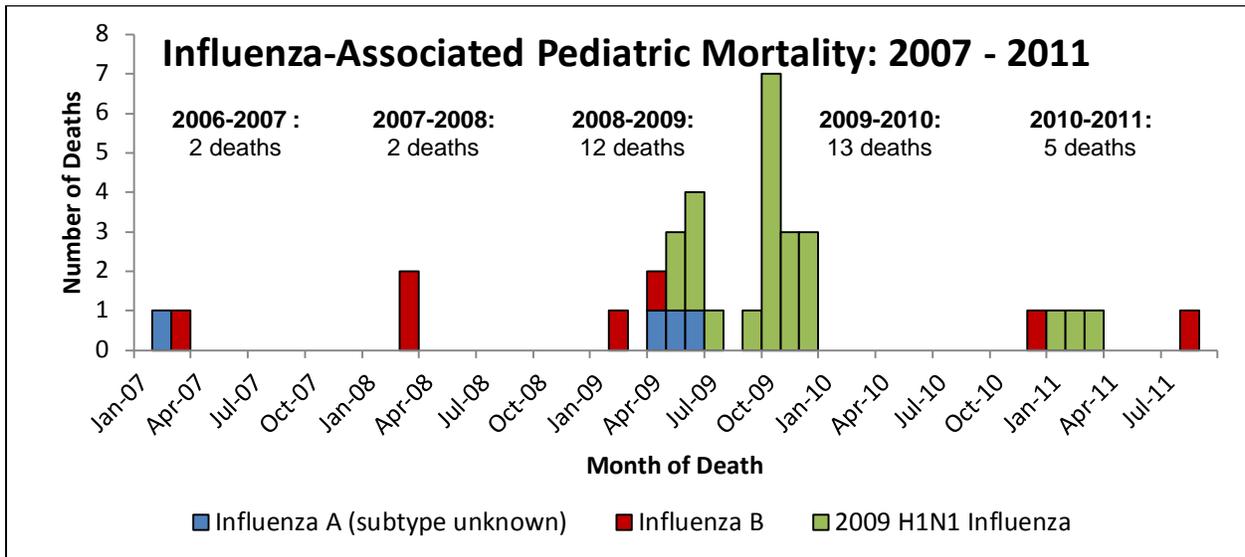
Influenza-Like Illness Per 100,000 Students Enrolled in Participating Schools, Arizona, 2008-2011



Influenza-Associated Pediatric Mortality

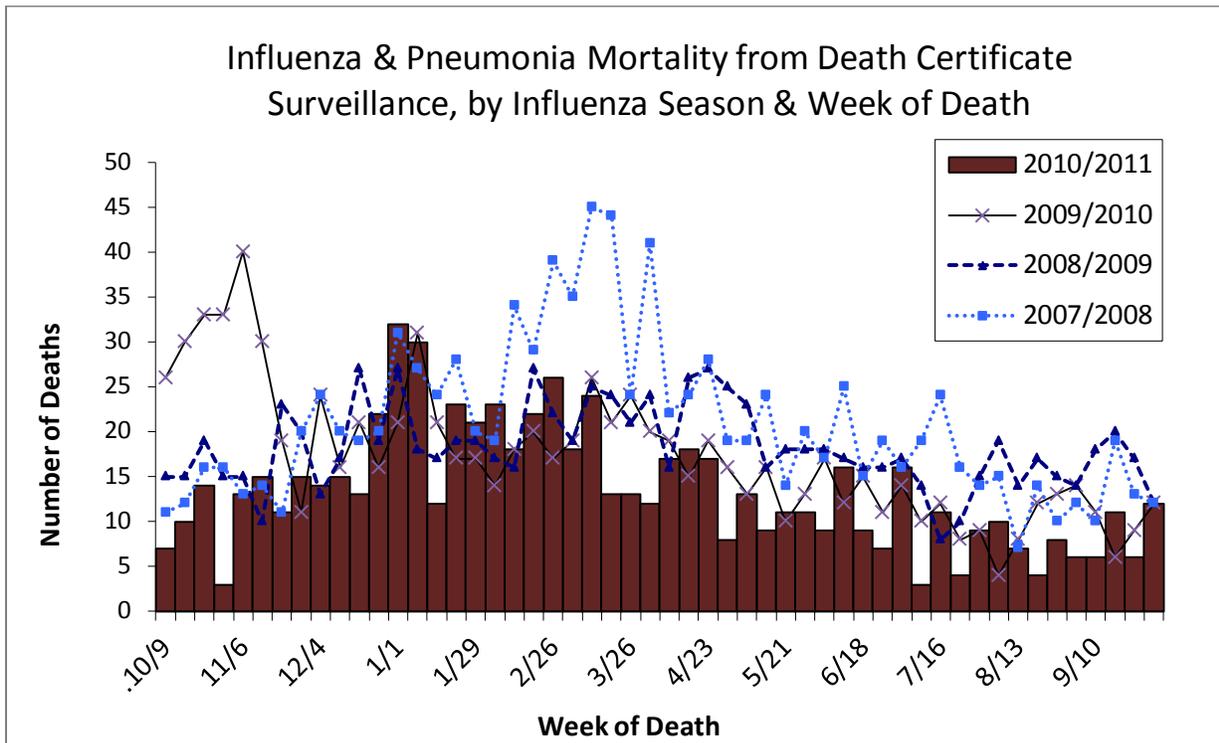
Influenza-associated pediatric deaths are reportable to public health departments in Arizona (R9-6-202). The 2008-2009 and 2009-2010 seasons showed an increase in influenza-associated deaths in children, related to the circulation of the 2009 H1N1 virus, with 12 and 13 deaths reported in those seasons, respectively. Two deaths were reported each of the previous two seasons. Five influenza-associated pediatric deaths were reported and investigated during the 2010-2011 season.

The five children resided in Maricopa County (4) and Cochise County (1). The deaths occurred in December of 2010 (1), and January (2), March (1), and August (1) of 2011. Two cases were under the age of two years. Four were male. Three were confirmed to be infected with the 2009 H1N1 influenza A virus; the other two were confirmed with influenza B. Invasive bacterial coinfections were identified in three of the cases: one with methicillin-resistant *Staphylococcus aureus*, one with methicillin-sensitive *S. aureus*, and one with *Streptococcus pneumoniae*. None of the children had known pre-existing medical conditions.



Pneumonia and Influenza Mortality from Death Certificates

Influenza-associated deaths in adults are not reportable in Arizona, and thus the number of laboratory-confirmed deaths each year is not available. Many influenza-related deaths are due to complications of influenza infection, including pneumonia, and influenza may not be listed as the cause of death on death certificates. Influenza mortality surveillance often uses the category of “pneumonia and influenza” (P & I) from death certificates as an indicator of the severity of an influenza season or of the trends within a season, even though not all pneumonias are associated with influenza. See the CDC website for more information: http://www.cdc.gov/flu/about/disease/us_flu-related_deaths.htm



During the 2010-2011 season, 697 pneumonia or influenza deaths occurred, compared to 903 during the 2009-2010 season and 970 during 2008-2009. The mean and median ages for the 697 P & I deaths in the 2010-2011 season were 76 and 81 years, respectively. Seventeen (2%) deaths were in persons less than 25 years of age; 125 (18%) in persons ages 25 through 64 years; and 555 (80%) in persons aged 65 years or older. Fifty percent of deaths were among males. 364 (52%) deaths occurred in an inpatient setting.

Summer Laboratory-Reported Influenza

Each year, Arizona stops counting rapid diagnostic tests as confirmed cases if they are collected 14 days after the collection date of the last PCR- or culture-confirmed test at ASPHL. This is done because of the high likelihood that rapid diagnostic tests performed in periods with no known virus circulation are false positives. For 2011, the last collection date for an ASPHL-confirmed case was April 26th, 2011, so rapid tests with collection dates after May 10th, 2011 were not counted as confirmed. Positive results of other tests were still counted.

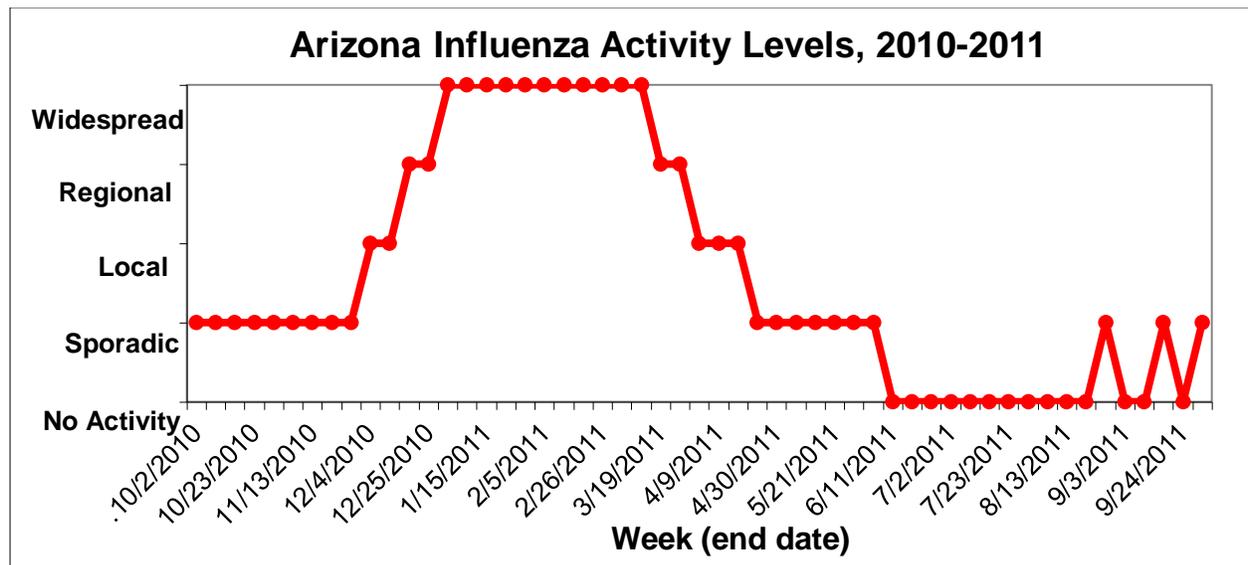
Four laboratory-confirmed influenza cases were identified during the period when rapid tests were no longer counted:

- An influenza B adult case confirmed by culture, reported during week 21 (May), with no known travel.
- An influenza B-associated pediatric death confirmed by RT-PCR at ASPHL, reported during week 34 (August), with no known travel.
- An influenza A (H3) adult case confirmed by RT-PCR at ASPHL, reported during week 37 (September), with known out-of-state travel.
- An influenza A (H3) adult case confirmed by RT-PCR at ASPHL, reported during week 39 (September), with known out-of-state travel.

Twenty-four positive rapid diagnostic tests were reported during this period.

Arizona Influenza Activity Levels

Each week, October through May, ADHS reports an influenza activity level to CDC. (See definitions at the end of this report.) Widespread activity in Arizona is often in February or March. During the 2010-2011 season, Arizona reported widespread activity through all of January and February and part of March.



Glossary of Key Terms

2010-2011 Influenza Season: The season is defined by surveillance weeks. The first day of the 2010-2011 influenza season was September 25th, 2010, or week 39, and the surveillance season continued through October 1st, 2011, or week 39. The seasons usually run from week 40 through week 39, but because a case with apparent in-state transmission was confirmed at the Arizona State Public Health Laboratory in week 39, September 2010, Arizona included this week in the 2010-2011 season.

2009 influenza A (H1N1): The nomenclature for the pandemic virus was later changed to influenza A(H1N1)pdm09. The name 2009 influenza A (H1N1) is used in this report, consistent with its usage during the 2010-2011 season.

Rates: All rates described in this report are calculated using 2010 population denominators from the Vital Statistics Office at ADHS, which are derived from the 2010 census data. County- and age-specific denominators are used when appropriate. For further information, see <http://www.azdhs.gov/plan/menu/info/pop/pop10/pd10.htm>.

Activity Levels: Indicator of the geographic spread of influenza activity, reported to CDC by all states each week.

Widespread: Increased influenza-like illness from sentinel providers (ILI) in three or more regions and large numbers of laboratory-confirmed influenza cases in those regions.

Regional: Increased ILI in two regions and elevated numbers of laboratory-confirmed influenza cases in those regions.

Local: Increased ILI in one region and elevated numbers of laboratory-confirmed influenza cases in that region.

Sporadic: No increase in ILI activity and only isolated laboratory-confirmed influenza cases.

No Activity: No increase in ILI activity and no laboratory-confirmed influenza cases.

Pneumonia and Influenza Mortality: Many influenza-related deaths are due to complications of influenza infection, including pneumonia, and influenza is infrequently listed as the cause of death on death certificates. Surveillance from death certificates often uses the category of “pneumonia and influenza” as an indicator, although not all pneumonias are associated with influenza. See the CDC website for more information http://www.cdc.gov/flu/about/disease/us_flu-related_deaths.htm.