

Influenza Summary 2015–2016 Season

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Executive Summary

This report summarizes influenza activity for the 2015–2016 influenza surveillance season (October 4, 2015 through October 1, 2016).

- ✓ This season was a record season, with a total of 23,657 laboratory-reported cases, an increase of 140% compared to the 5 previous season's average.
- ✓ Influenza activity peaked later in the 2015–2016 season than in previous seasons.
- ✓ Influenza A was the predominately circulating type throughout the season, accounting for 73% of all cases reported. The subtype A (H1N1) pdm09 accounted for 57% of influenza A cases reported for which subtype information was available.
- ✓ While the greatest number of reported influenza cases was among young adults and middle-aged adults 19–49 years old, the rate of reported influenza cases was the highest among children under 5 years of age.
- ✓ Influenza activity was Widespread for ten consecutive weeks from February 2016 to April 2016.
- ✓ Influenza-like illness (ILI) was above the Arizona epidemic threshold for 20 consecutive weeks from December 2015 to late April 2016.
- ✓ Four influenza-associated pediatric deaths were reported this season; three were influenza A (H1N1) pdm09, one was A with no subtype identified.
- ✓ Surveillance activities performed by ADHS remained unchanged overall from the previous season.

Positive influenza tests are reported to ADHS by laboratories under Arizona Administrative Code R9-6-204.

Laboratory-Confirmed Influenza Activity

The weekly number of laboratory-confirmed cases reported was significantly greater than the numbers reported during the 2014–2015 season in <u>Arizona</u> and diverted from <u>national</u> trends. The season peak and total exceeded all prior seasons since influenza became laboratory-reportable in 2004, including the 2009 pandemic.

For the 2015–2016 season, we know of no specific changes in testing or reporting practices. It appears there may truly have been higher levels of disease in the community this season.

The first case of influenza with apparent in-state acquisition was an influenza A(H3) infection that was confirmed at the Arizona State Public Health Laboratory (ASPHL) in a case without recent travel in week 40 (early October).

Reporting of laboratory-confirmed cases began to increase in January with peak activity at the beginning of March. Overall, 23,657 laboratory-confirmed influenza cases were reported during the 2015–2016 season. *See <u>Table 1</u> in the Appendix for more information.*

2015–2016 influenza activity peaked in the beginning of March, later than the previous two seasons.



Laboratory-Confirmed Influenza Population Rates, per 100,000 People

While the aggregate number of laboratory-confirmed cases reported throughout the season is indicative of disease incidence, it is also necessary for us to look at the population rate of influenza cases (number of cases per 100,000 people) to assess the disease burden in the population.

In the 2015–2016 season, Maricopa, Pima and Pinal Counties reported the most cases; however, Greenlee, Yavapai, Coconino, and Cochise Counties reported the highest population rates of reported influenza cases. Differences in rates may reflect not only differences in the level of influenza virus circulating in the community, but also testing and reporting practices. However, rate calculations based on a small number of reported cases or for counties with populations less than 100,000 are not considered reliable since they can be dramatically influenced by small changes in the number of reported cases. *See <u>Table 1</u> in the Appendix for more information.*

Population rates varied by county, with rates ranging from 66 cases to 1,061 cases per 100,000 people.



There are two main types of influenza that cause illness in people: Type A and Type B.

Influenza Types

During the 2015–2016 season, influenza A predominated throughout the season with 73% of the reported cases. This trend of predominating influenza A is similar to previous seasons and was noted nationwide.



The epidemiologic curve of all reported cases, below, illustrates the concomitant circulation of A and B viruses, though in different proportions at different times in the season. During the 2015–2016 season, influenza A viruses peaked at the end of February, whereas influenza B viruses began to increase in the beginning of March and were detected through the summer. *See <u>Table 2</u> in the Appendix for more information.*





Most tests can distinguish between influenza A and influenza B; however, specialized testing can also differentiate subtypes.

Influenza Subtypes and Lineages

Viral culture and molecular testing (reverse transcriptase polymerase chain reaction or RT-PCR) are methods used to identify subtypes of circulating influenza viruses. This subtype information can help health professionals make the best treatment and vaccination decisions.

Influenza A viruses can be further divided into subtypes such as A (H1N1) pdm09 or A (H3). Influenza B viruses can be further divided into lineages such as B/Yamagata or B/Victoria. Many laboratories do not proceed with lineage testing on influenza B specimens. *See <u>Table 3</u> and <u>Figures 1 and 2</u> in the Appendix for more information.*



Influenza A (H1N1) pdm09 accounted for 48% of subtyped viruses during the 2015–2016 season.



In past years, influenza A (H1N1) pdm09 has caused more morbidity and mortality in young and middle-aged adults and children.

Influenza Activity by Age

Age groups that are affected by influenza vary somewhat season-to-season, depending in part on the circulating influenza types, 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.

The age distribution of cases reported in the 2015–2016 season was similar to other influenza A (H1N1) pdm09 dominant years such as the 2013–2014 season, with the highest number of cases reported among young and middle-aged adults 20–49 years old.

While large numbers of laboratory-confirmed cases were reported among young and middle-aged adults, the rate of reported influenza cases was by far the highest among children under 5 years of age. *See <u>Tables 4 and 5</u>* in the Appendix for more information.



Arizona Influenza Activity Levels

Each week, October through May, ADHS reports an influenza activity level to CDC that indicates the geographic spread of influenza activity in Arizona. During the 2015–2016 season, Arizona reported the highest level of activity, Widespread, for 10 consecutive weeks. Since the 2011–2012 season, Arizona has had widespread activity for only 4–7 weeks each season. *See <u>Activity Levels</u> in the Appendix for more information.*

Arizona reported <u>Widespread</u> activity for 10 consecutive weeks, February to April.



ILI is tracked in all U.S. states and territories and shared with the CDC.

Influenza-Like Illness (ILI) Surveillance from Outpatient Sentinel Providers

ILI is defined as a fever of at least 100°F plus either a cough or a sore throat. Approximately 62 sentinel providers around the state report the total number of outpatient visits to their offices and the number of visits for ILI each week. We use the percentage of visits for ILI as an indicator of likely influenza activity.

For the 2015–2016 season, the state ILI baseline was 1.2% and the epidemic threshold was 2.3%.

The percentage of visits for ILI showed similar seasonality to the laboratoryreported influenza data. It exceeded the epidemic threshold for 20 consecutive weeks, longer than previous years, from December through late April, and peaked in late February at 5.5%. *See <u>ILI Calculations</u> in the Appendix for more information.*

Arizona had <u>20 weeks</u> where influenza-like illness (ILI) was above the epidemic threshold.



Influenza-Like Illness (ILI) Percentage Compared to Number of Laboratory-Confirmed Influenza Cases per Week

ILI is often used as a proxy to estimate the burden of influenza in a community. In Arizona, influenza-positive laboratory results must be reported within five working days of the result. ILI is reported weekly, but usually has a two week reporting delay from visit to provider. The coefficient of determination between the ILI percentage and laboratory-reported case numbers was 0.80 (p<0.0001), showing a statistically significant and strong linear relationship between these indicators.



Influenza-Like Illness (ILI) Surveillance from Arizona Schools

School nurses in approximately 140 Arizona schools around the state use a specific computer program (the Child Health Indicator Program, CHIP) for electronic management of student health records. The graph below presents the weekly trend of ILI syndromes reported among students during the school years of 2012–2013 through 2015–2016.

The 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. The numbers in the graph are only from schools that used CHIP during the school year. Since 2012, the number of participating schools has decreased over time.

Influenza-Like Illness peaked in the <u>beginning of March</u> at reporting schools, later than the previous three seasons.



Influenza-associated deaths in children (less than 18 years) have been reportable by healthcare providers in Arizona since 2008 under A.A.C. R9-6-202.

Influenza-Associated Pediatric Mortality

Four influenza-associated pediatric deaths were reported and investigated during the 2015–2016 season.

- ✓ Two of the cases had underlying conditions.
- ✓ The cases resided in Maricopa and Pinal Counties.

The 2008–2009 and 2009–2010 seasons showed an increase in influenzaassociated deaths in children related to the circulation of the A (H1N1) pdm09 virus, with 12 and 13 deaths reported in those seasons, respectively. One to five deaths were reported in each of the other seasons since 2004.

3 influenza A (H1N1) pdm09 and 1 influenza A (unknown)-associated pediatric mortality cases were reported in the 2015–2016 season.



Pneumonia and Influenza Mortality Surveillance

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 is infrequently listed as the cause of death on death certificates. Influenza mortality surveillance often uses the category of "pneumonia and influenza" (P & I) on 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 <u>CDC website</u> for more information.*



During the 2015–2016 season, 891 P & I deaths were identified. This is higher than the previous five seasons, which ranged from 639 to 763 deaths. *See <u>Table</u> 6 and <u>Figure 4</u> in the Appendix for more information.*

Influenza summer investigations include asking about travel history, hospitalization status, vaccination status, and exposures prior to illness onset.

Summer Laboratory-Confirmed Influenza Cases

Each year, Arizona stops counting positive rapid diagnostic tests as confirmed influenza 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 (such as during the summer months) are false positives.

For summer 2016, positive rapid tests with collection dates after June 26th, 2016 until October 2nd, 2016, were no longer counted as confirmed cases. Throughout this time period, 57 influenza cases were reported. Twenty-seven (47%) of the 57 cases reported were ruled out because additional confirmatory testing was either negative or not performed. Thirty (53%) cases were confirmed; however, 13 cases had a specimen collection date prior to the beginning of summer surveillance and were not counted toward the summer surveillance total. Finally, a total of 17 laboratory-confirmed influenza cases were identified during the 2016 summer surveillance period. *See Figure 3 in the Appendix for more information.*

Of these 17 laboratory-confirmed influenza cases that were identified:

- ✓ 76% of cases had confirmatory testing done at ASPHL (the other 24% only had outside laboratory PCR or culture results).
- ✓ 53% were known to be **hospitalized** during their illness.
- ✓ 59% were **female**.
- ✓ 35% were known to be vaccinated with the 2015–2016 season vaccine
- ✓ 18% reported **out of state travel** in the week prior to illness onset.
- ✓ No cases reported **animal exposure** in the week prior to illness onset.

24%	35% of summer flu cases occurred in older adults		
В	≥65 years		
76% A	50–64 years		
	18–49 years	15	
Arizona Department of Health Services <u>Table of Contents</u>	<18 years		

All eligible individuals 6 months of age or older should be vaccinated against influenza annually.

Influenza Vaccination Coverage and Effectiveness

There were many influenza vaccine options available for the 2015–2016 season including both trivalent (3 virus) and quadrivalent (4 virus) combinations.

During the 2015–2016 influenza season, vaccine viruses and circulating viruses were similar. Per the <u>CDC</u>, overall vaccine effectiveness for all ages was 47%. The overall vaccine effectiveness was 41% against influenza A (H1N1) pdm09, 45% against influenza A (H3), 55% against influenza B/Yamagata, and 55% against influenza B/Victoria. These estimates are consistent with other years with matching strains. *See <u>2015–2016 Influenza Vaccine Components</u> in the Appendix for more information.*

Based on Medicare information collected by the Department of Health and Human Service (<u>HHS</u>) for adults aged 65 years and older, approximately 46% of Medicare beneficiaries in Arizona who were eligible received an influenza vaccination during the 2015–2016 season.

Medicare beneficiaries in Maricopa and Pima Counties had the highest vaccination rates.



Interactive Mapping Tool: Live-Tracking Flu Vaccinations of Medicare Beneficiaries. [Figure] Retrieved from <u>http://www.hhs.gov/nvpo/flu-vaccination-map/</u>

Appendix

Appendix 1: Arizona Influenza Surveillance System

Components of the Arizona Influenza Surveillance System

- ✓ Laboratory-reporting of positive tests for influenza includes many types of tests, such as rapid antigen tests, direct fluorescent antigen tests, viral cultures, or molecular testing
- ✓ Virologic surveillance & testing at ASPHL
- ✓ Outpatient influenza-like illness (ILI) surveillance (ILINet)
- ✓ Investigation of influenza-associated pediatric deaths
- ✓ Influenza & pneumonia mortality analyses
- ✓ Surveillance for school nurse-office visits for ILI
- ✓ Investigation of unusual influenza-related occurrences

Goals of the Arizona Influenza Surveillance System

- ✓ Find out when and where influenza activity is occurring
- ✓ Determine what influenza viruses are circulating
- ✓ Assess the intensity of influenza activity and monitor the impact on health
- ✓ Track trends in disease activity and identify the populations most affected
- ✓ Detect changes in influenza viruses and identify unusual events

Appendix 2: Glossary of Key Terms

2015–2016 Influenza Season: The season is defined by surveillance weeks. The first day of the 2015–2016 influenza season was October 4th, 2015, or week 40 and the 2015–2016 surveillance season continued through October 1st, 2016, or week 39.

Rates: County and age specific rates are calculated from the Vital Statistics Office at ADHS, and are derived from data from the National Vital Statistics and State Demographer's Offices. County- or age specific denominators are used when appropriate. For further information, see http://pub.azdhs.gov/health-stats/menu/info/pop/index.php.

Arizona Administrative Code R9-6-202 and R9-6-204: The administrative code R9-6-204 requires laboratories in Arizona to report a positive influenza test within 5 working days of a positive result. Administrative code R9-6-202 requires a provider to report influenza-associated mortality in a child within 1 working day and is nationally notifiable. For further information, see http://apps.azsos.gov/public_services/Title_09/9-06.pdf.

Activity Levels:

- ✓ No Activity: No increase in ILI activity and no laboratory-confirmed influenza cases.
- ✓ Sporadic: No increase in ILI activity and only isolated laboratory confirmed influenza cases.
- ✓ Local: Increased ILI in one region and elevated numbers of laboratory confirmed influenza cases in that region.
- ✓ Regional: Increased ILI in two regions and elevated numbers of laboratoryconfirmed influenza cases in those regions.
- ✓ 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.

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ILI Calculations: The baseline is defined as the mean of the state ILI% in weeks in the 2012–2015 influenza seasons in which two or more consecutive weeks each accounted for less than 2% of the season's total number of specimens testing positive for influenza at ASPHL. The epidemic threshold is defined as the mean plus two standard deviations.

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2015-2016 Influenza Vaccine Components:

- ✓ A/California/7/2009 (H1N1) pdm09-like virus
- ✓ A/Switzerland/9715293/2013 (H3N2)-like virus
- ✓ B (Yamagata)/Phuket/3073/2013-like virus
- ✓ B (Victoria)/Brisbane/60/2008-like virus (quadrivalent vaccine only)

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Appendix 3: Additional Data Tables

Laboratory-Confirmed Influenza Cases

Table 1: Number of Laboratory-Confirmed Influenza Cases Reported and Rate per 100,000Population, by County

County	Number of Laboratory- Confirmed Cases	Rate per 100,000 Population
Apache	202	279.7
Cochise	602	466.3
Coconino	705	497.9
Gila	112	205.9
Graham	145	376.9
Greenlee	112	1,061.1
La Paz	14	66.1
Maricopa	14,318	351.2
Mohave	322	156.5
Navajo	470	428.6
Pima	3,436	340.4
Pinal	1,539	378.6
Santa Cruz	148	294.4
Yavapai	1,127	517.5
Yuma	405	188.4
Total	23,657	350.0

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Influenza Types

Table 2: Number of Laboratory-Confirmed Influenza Cases Reported by Influenza Type,2013–2014 through 2015–2016 Seasons

	2015–2016 Number (Percent)	2014–2015 Number (Percent)	2013–2014 Number (Percent)
Influenza A	17,179 (73)	11,013 (88)	9,495 (76)
Influenza B	6,207 (26)	1,428 (11)	2,750 (22)
Unknown	271 (1)	153 (1)	198 (2)
Total	23,657 (100)	12,594 (100)	12,443 (100)

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Influenza Subtypes and Lineages

Table 3: Number of Laboratory-Confirmed Influenza Cases Reported by Influenza Subtypeor Lineage, 2013–2014 through 2015–2016 Seasons

Influenza Type/Subtype	2015–2016 Number (Percent)	2014–2015 Number (Percent)	2013–2014 Number (Percent)
Influenza A (H1N1) pdm09	1,321 (48)	5 (0.1)	80 (4)
Influenza A (H3)	999 (36)	2,127 (97)	1,606 (82)
Influenza B/Yamagata	383 (14)	50 (2)	36 (2)
Influenza B/Victoria	54 (2)	20 (1)	128 (7)
Total	2,757 (100)	2,202 (100)	1,954 (100)
	1.1.1		

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Influenza Activity by Age

Table 4: Number of Laboratory-Confirmed Influenza Cases Reported by Age Group, 2013–2014 through 2015–2016 Seasons

	2015–2016	2014–2015	2013–2014
	Number	Number	Number
Age Group	(Percent)	(Percent)	(Percent)
<5 years	4,093 (17)	2,152 (17)	2,319 (19)
5–18 years	5,098 (22)	3,366 (27)	2,797 (22)
19–49 years	7,343 (31)	3,044 (24)	4,478 (36)
50–64 years	3,159 (13)	1,222 (10)	1,563 (13)
≥65 years	3,879 (16)	2,669 (21)	1,205 (10)
Unknown	85 (1)	141 (1)	81 (1)
Total	23,657 (100)	12,594 (100)	12,443 (100)

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Table 5: Number of Laboratory-Confirmed Influenza Cases Reported by Influenza Typeand Age Group, 2015–2016 Influenza Season

	Influenza A	Influenza B	Unknown Type	Total
	Number	Number	Number	Number
Age Group	(Percent)	(Percent)	(Percent)	(Percent)
<5 years	3,312 (19)	735 (12)	46 (17)	4,093 (17)
5–18 years	3,346 (20)	1,600 (26)	62 (23)	5,098 (22)
19–49 years	5,536 (32)	1,718 (28)	89 (33)	7,343 (31)
50–64 years	2,102 (12)	1,020 (16)	37 (14)	3,159 (13)
≥65 years	2,739 (16)	1,112 (17)	28 (10)	3,879 (16)
Unknown	54 (1)	22 (1)	9 (3)	90 (1)
Total	17,179 (73)	6,207 (26)	271 (1)	23,657 (100)

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Pneumonia & Influenza Mortality

Table 6: Demographics of Pneumonia & Influenza Deaths, 2015–2016 Influenza Seasonand 2010–2011 Influenza Season to 2014–2015 Influenza Season Average

	2015–2016 Number (Percent)	5 year average Number (Percent)
Mean Age	75	77
<u>Age Group</u>		
<25 years	13 (2)	12 (2)
25–64 years	185 (20)	118 (16)
≥65 years	693 (78)	580 (82)
<u>Sex</u>		
Males	442 (50)	359 (51)
Females	449 (50)	350 (49)
<u>Setting</u>		
Inpatient	576 (65)	392 (55)
Outpatient	38 (4)	29 (4)
Other	277 (31)	289 (41)

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Appendix 4: Additional Figures

Arizona State Public Health Laboratory Testing

Figure 1: Culture and PCR Testing Conducted at ASPHL, 2015–2016 Influenza Season



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Figure 2: Geographic Distribution of Specimens Sent to ASPHL for Influenza Testing by Region, 2015–2016 Influenza Season



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Summer Laboratory-Confirmed Influenza Cases

Figure 3: Summer Influenza Cases by Month Reported and Type, 2015–2016 Influenza Season



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P&I Mortality and Influenza Cases

Figure 4: Number of Laboratory-Confirmed Influenza Cases Compared to P&I Mortality Counts per week



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