



## INFLUENZA EPIDEMIOLOGY REPORT



2015-2016 RHODE ISLAND SURVEILLANCE REPORT

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## SUMMARY OF SEASON

This report provides a surveillance summary of seasonal influenza in Rhode Island for the 2015-2016 influenza season (October 4, 2015 - May 21, 2016) and compares the 2015-2016 influenza season with the 2014-2015 influenza season (September 28, 2014 - May 23, 2015). The Rhode Island Department of Health's (RIDOH) Center for Acute Infectious Disease Epidemiology (CAIDE) maintains a number of influenza surveillance systems that together provide a comprehensive picture of influenza in the state of Rhode Island. These surveillance systems are designed to monitor influenza activity intensity levels and geographic spread of influenza-like illness (ILI); assess and measure the severity of influenza infections within the community as measured by hospitalizations and deaths; characterize circulating influenza strains; and detect novel influenza viruses. Data from each source will be presented and described in this report.

For the 2015-2016 influenza season, the epidemic curves from all surveillance sources revealed a relatively mild season, which peaked in the beginning of March, MMWR Week 10 of 2016 (March 6-12, 2016). This peak was unusually late; during the most recent 18 influenza seasons, only two other seasons have peaked in March (2011–2012 and 2005–2006 seasons)<sup>1</sup>. Compared to the 2014-2015 season, the overall level of influenza activity in 2015-2016 was quite low.

Influenza A was the predominant circulating strain in the 2015-2016 season. Of the subtyped Influenza A specimens, Influenza A (H1N1) 2009 was the most prevalent. This strain was predominant across all influenza surveillance systems in Rhode Island and nationally. The 2015-2016 influenza season was less severe than the previous three flu seasons, as measured by inpatient hospitalizations and influenza-associated mortality. The predominant strain, Influenza A (H1N1) 2009, is generally associated with lower severity than Influenza A H3N2, which was the predominant strain in the 2014-2015 flu season. Influenza A H3 strains of influenza are known to be associated with severe illness, increased hospitalization and mortality, particularly among older individuals and those with compromised immune systems.

In addition, the 2015-2016 seasonal influenza vaccine was well-matched to the circulating viruses throughout the season. The estimated seasonal flu vaccine effectiveness in 2015-2016 was 47%, a significant increase from the 2014-2015 seasonal flu vaccine, which had a vaccine effectiveness of 19%<sup>2</sup>. During the 2014-2015 influenza season, the primary circulating H3N2 virus had genetically drifted from the H3N2 virus in the 2014-2015 seasonal influenza vaccine, leading to reduced vaccine effectiveness<sup>3</sup>.

In Rhode Island, 2,340 influenza specimens tested positive at Rhode Island hospitals, and 511 individuals who tested positive for influenza were hospitalized. CAIDE monitored 45 respiratory outbreaks in congregate living settings. There were fourteen influenza-related deaths.

Rhode Island's robust, multi-source influenza surveillance system was able to provide a well-rounded picture of a relatively mild influenza season. The subsequent sections of this report contain detailed information on each portion of that surveillance system and the findings for the 2015-2016 influenza season.

1 Davlin SL, Blanton L, Kniss K, et al. Influenza Activity — United States, 2015–16 Season and Composition of the 2016–17 Influenza Vaccine. *MMWR Morb Mortal Wkly Rep* 2016;65:567–575. [www.cdc.gov/mmwr/volumes/65/wr/mm6522a3.htm](http://www.cdc.gov/mmwr/volumes/65/wr/mm6522a3.htm)

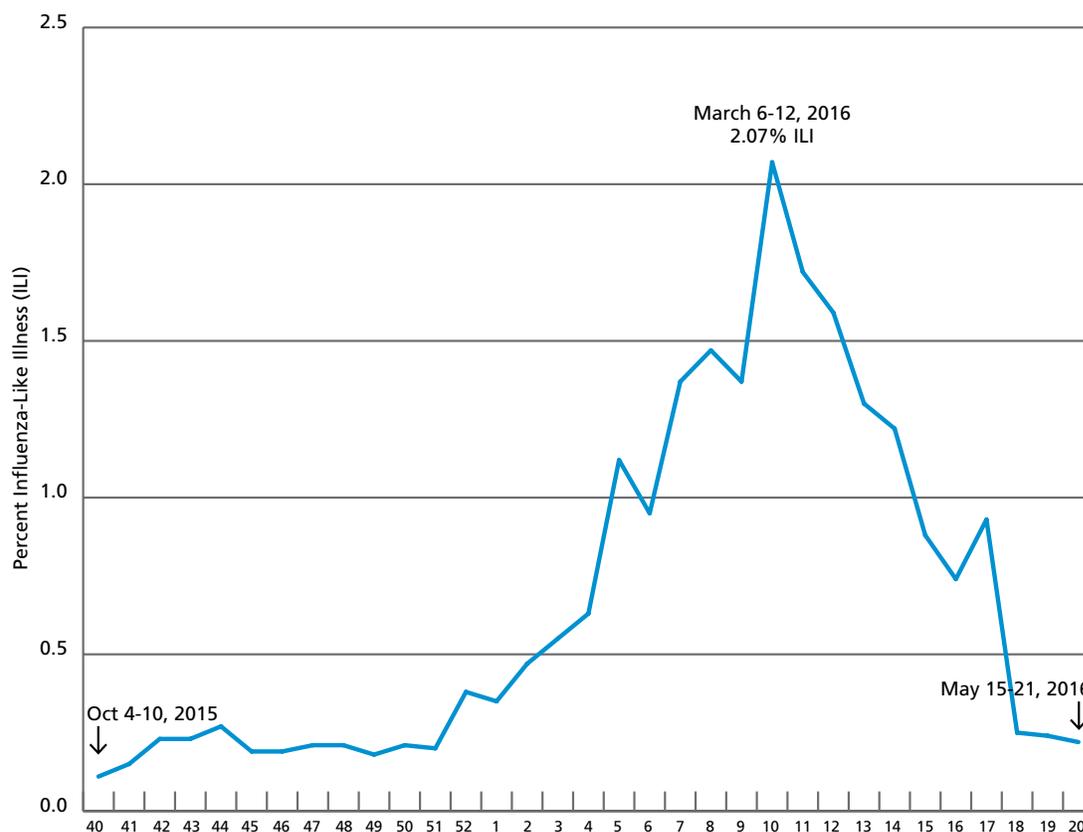
2 Seasonal Influenza Vaccine Effectiveness, 2005-2016. Centers for Disease Control and Prevention. 14 Oct 2016. [www.cdc.gov/flu/professionals/vaccination/effectiveness-studies.htm](http://www.cdc.gov/flu/professionals/vaccination/effectiveness-studies.htm)

3 Appiah GD, Blanton L, D'Mello T, et al. Influenza Activity — United States, 2014–15 Season and Composition of the 2015–16 Influenza Vaccine. *MMWR Morb Mortal Wkly Rep* 2015;64:583-590. [www.cdc.gov/mmwr/preview/mmwrhtml/mm6421a5.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6421a5.htm)

## INFLUENZA-LIKE ILLNESS NETWORK (ILINET): SENTINEL PRACTICES IN OUR COMMUNITY

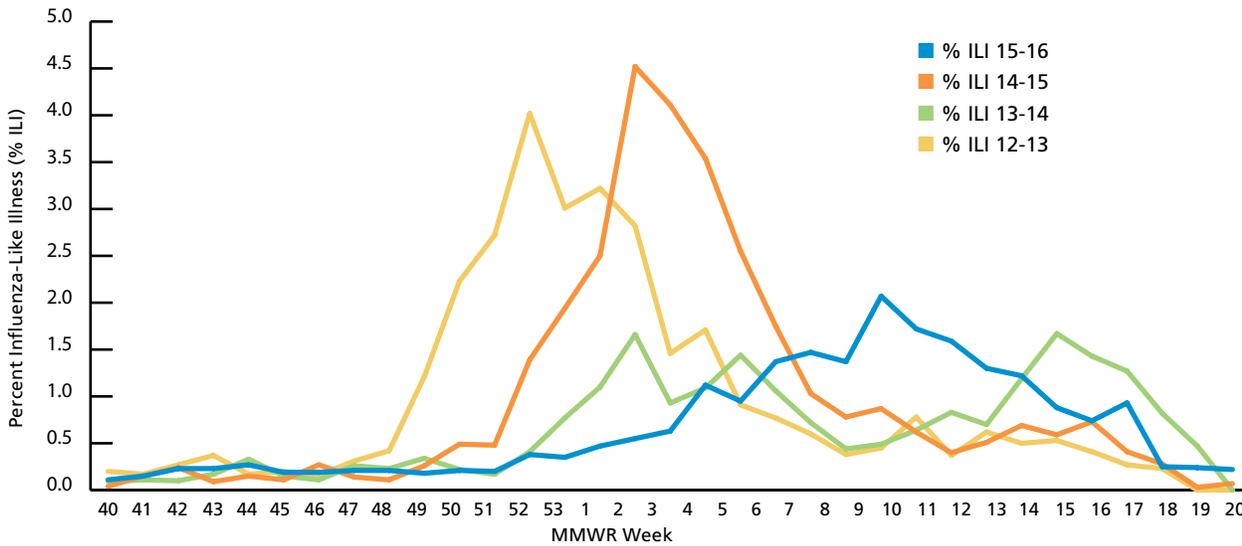
Influenza-like illness (ILI) is defined as the presence of a fever  $\geq 100^{\circ}\text{F}$  or  $37.8^{\circ}\text{C}$ , and cough and/or sore throat. ILI is assessed solely on symptoms and does not require laboratory confirmation. Rhode Island's ILI data come from 17 community-based healthcare practices geographically dispersed throughout Rhode Island who are participants in CDC's ILINet. These practices, which include family medicine providers, urgent care centers, pediatric providers, university health centers, and internal medicine providers, serve as sentinel sites. Each week during the influenza season, all sites report to CDC the number of patient visits for ILI, as well as the total number of patient visits at that practice. The sites also break down the number of patients with ILI by age groups (age 0-4, 5-24, 25-49, 50-64, and 65 and older). ILINet data are monitored by CAIDE in order to determine the geographic spread of ILI throughout the state and the level of ILI in each county. Sentinel surveillance is an essential component of influenza surveillance in Rhode Island.

FIGURE 1. INFLUENZA-LIKE ILLNESS AS A PERCENTAGE OF ALL PATIENT VISITS TO ILINET SENTINEL PROVIDERS, 2015-2016 INFLUENZA SEASON, RHODE ISLAND



The 2015-2016 flu season reached its peak relatively late in the season, with ILI remaining low throughout the fall of 2015 and the beginning of 2016. Levels of influenza-like illness remained below the regional baseline of 1.3% until MMWR Week 7 (February 14-20, 2016), then climbed quickly. Influenza-like illness peaked during MMWR Week 10 (March 6-12, 2016) with 2.1% of all visits to sentinel healthcare providers related to ILI. Influenza-like illness declined quickly during the next four weeks, dipping below the regional baseline in MMWR Week 14 (February 22-28, 2015).

FIGURE 2. PERCENTAGE OF VISITS FOR INFLUENZA-LIKE ILLNESS (ILI) REPORTED BY THE US OUTPATIENT INFLUENZA-LIKE ILLNESS SURVEILLANCE NETWORK (ILINET), 2012-2016 INFLUENZA SEASONS, RHODE ISLAND



The 2015-2016 influenza season had a significantly lower level of ILI activity than the previous season (2014-2015). The 2014-2015 influenza season peaked in MMWR Week 3 (January 18-24, 2015), with 4.5% of all visits related to ILI, double the magnitude of the 2015-2016 flu season peak (2.1% ILI). Additionally, the 2015-2016 influenza season was an unusually late season, peaking seven weeks later than the 2014-2015 influenza season.



FIGURE 3. INFLUENZA-LIKE ILLNESS AS A PERCENTAGE OF ALL PATIENT VISITS TO ILINET SENTINEL PROVIDERS, 2015-2016 INFLUENZA SEASON, RHODE ISLAND, NEW ENGLAND, AND THE UNITED STATES

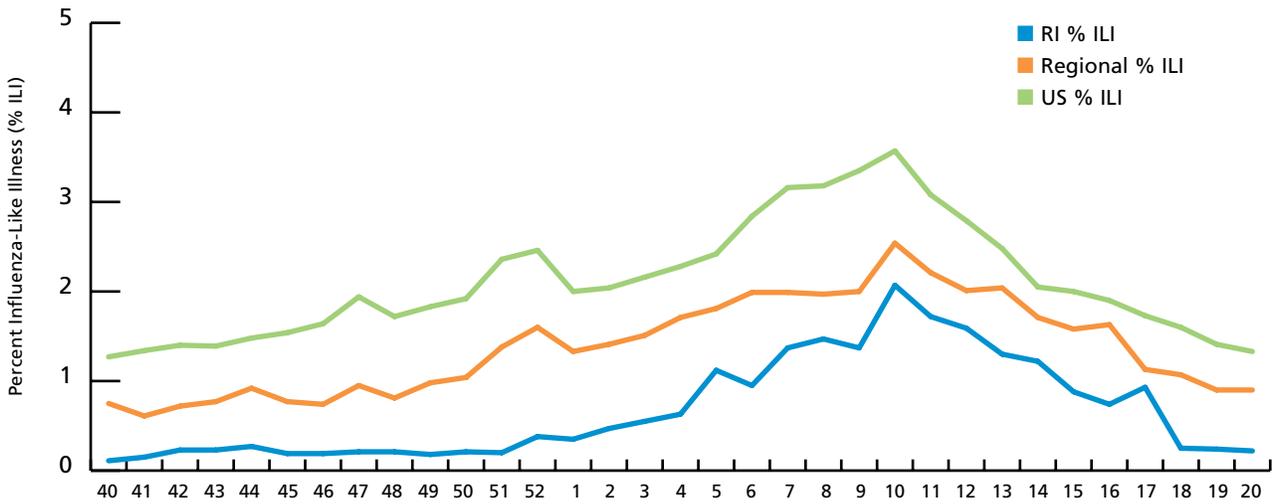


Figure 3 compares ILI in Rhode Island to ILI in the nation and in the region. The region referred to in this graph is Region 1, comprised of the New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont). The shape of the flu season curve in Rhode Island mirrored that of the national and regional ILI curves. Rhode Island had lower levels of ILI than the rest of Region 1 and the United States throughout the 2015-2016 flu season, as is typical. ILI activity peaked in Rhode Island, Region 1, and the United States during the same week: MMWR Week 10 (March 6-12, 2016). Nationally, influenza activity peaked later than the three previous influenza seasons. In the last 18 flu seasons, influenza activity has only peaked in March twice (2011-2012 and 2005-2006).

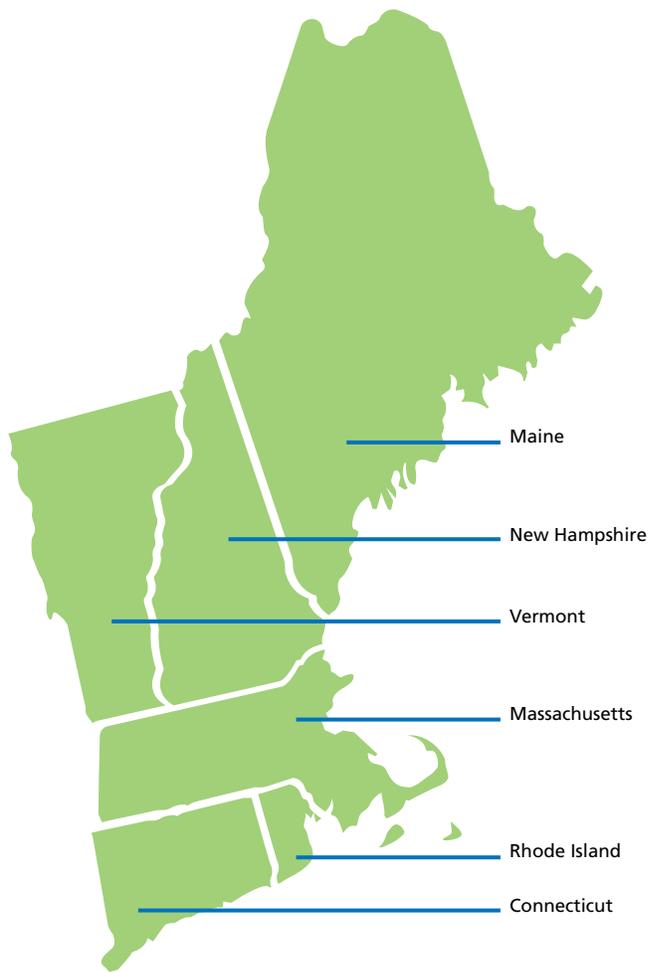
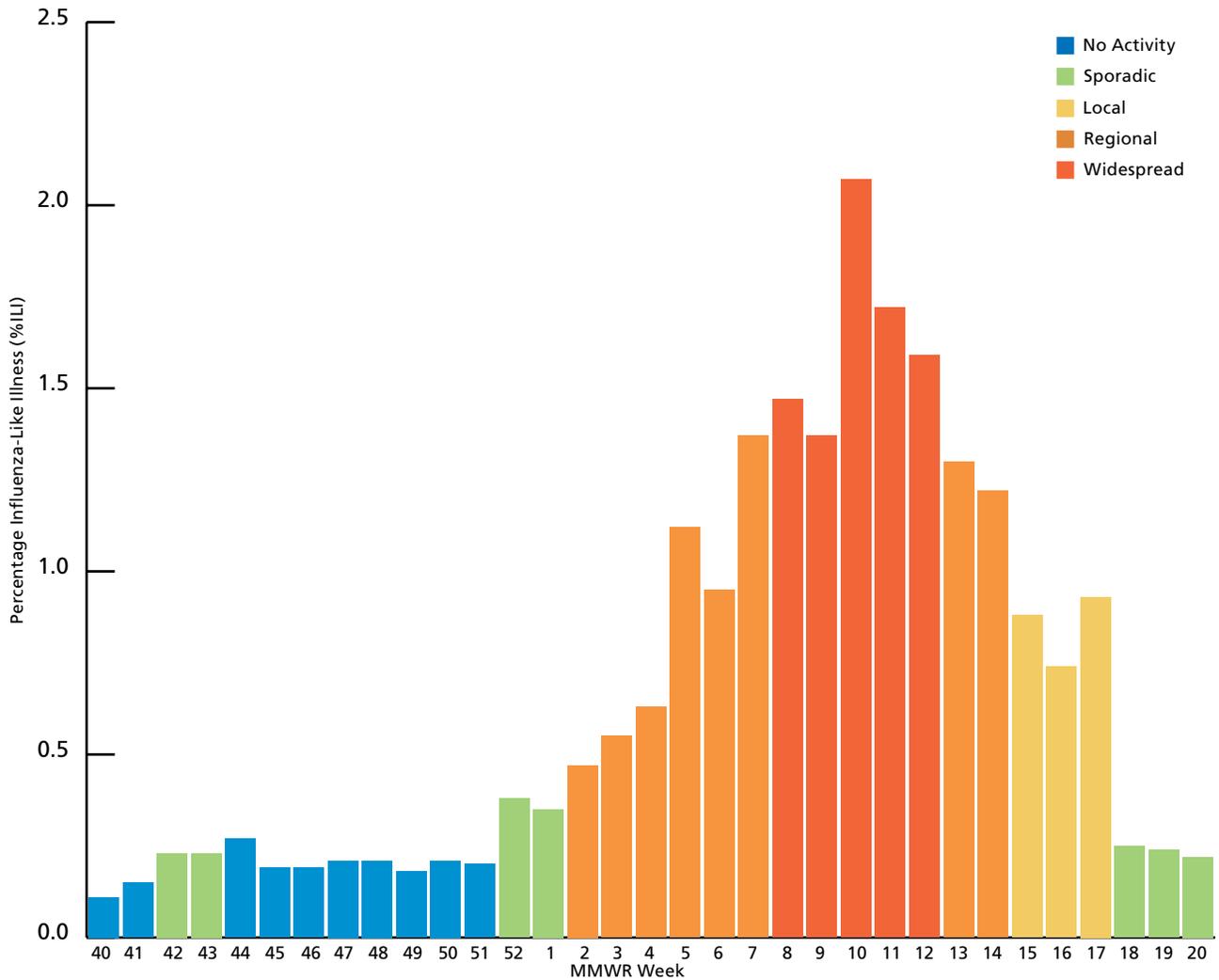


FIGURE 4: ILINET: PERCENTAGE OF SENTINEL VISITS FOR INFLUENZA-LIKE ILLNESS AND GEOGRAPHIC SPREAD OF INFLUENZA ACTIVITY, RHODE ISLAND 2015-2016 INFLUENZA SEASON



Geographic spread is a metric that all states report weekly to CDC. This metric describes the locational range of ILI within a state, but does not measure the severity of the state’s influenza activity. The levels of geographic spread, in order from least to greatest activity, are no activity, sporadic, local, regional, and widespread. RIDOH’s Influenza Surveillance Coordinator and State Epidemiologist determine the geographic spread of ILI within Rhode Island using an algorithm from CDC (Appendix C). Figure 4 shows the geographic spread of ILI and ILI as a percentage of all patient visits to ILINet sentinel providers by week. Rhode Island saw widespread influenza activity for a duration of five weeks, from MMWR Week 8 through MMWR Week 12 (February 21, 2016 - March 26, 2016). Widespread activity and high levels of ILI both occurred much later in the flu season than is typical.

FIGURE 5. NUMBER OF VISITS FOR INFLUENZA-LIKE ILLNESS (ILI) REPORTED BY THE US OUTPATIENT INFLUENZA-LIKE ILLNESS SURVEILLANCE NETWORK (ILINET) IN RHODE ISLAND BY AGE-SPECIFIC GROUP, 2015-2016 SEASON

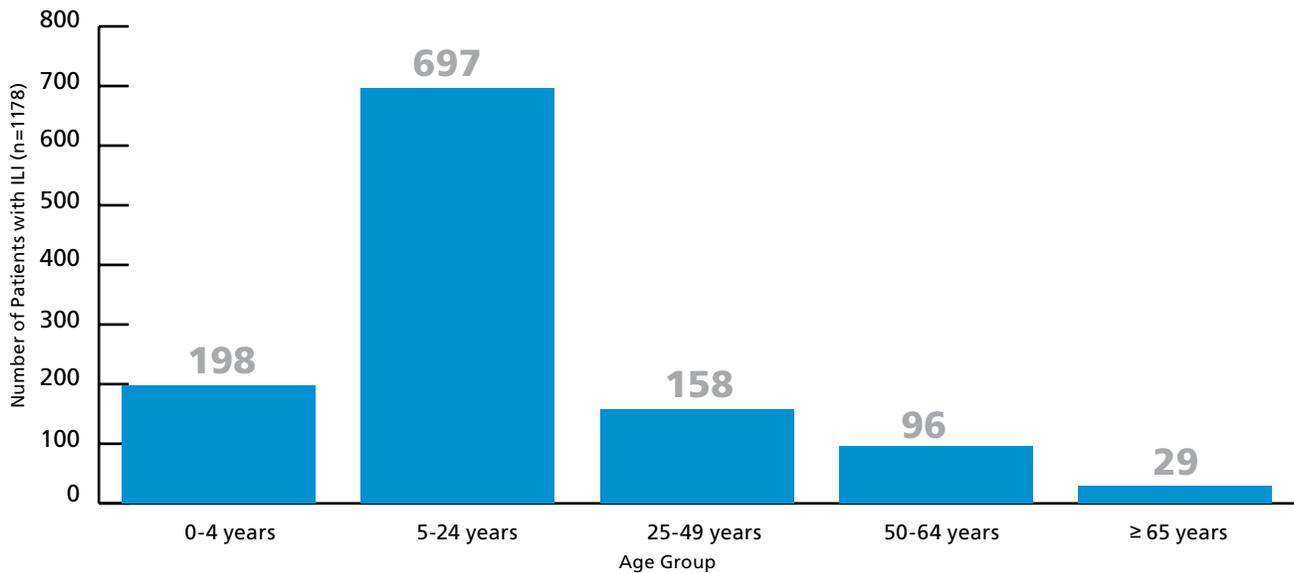


Figure 5 shows the age groupings of individuals with ILI during the 2015-2016 influenza season. ILINet providers reported the highest number of visits for ILI among children and young adults age 5-24, with 697 visits throughout the 2015-2016 influenza season (59% of all patients with ILI). Adults age 65 and older had the lowest reported number of ILI visits with 29 visits during the season (just 2% of all patients with ILI).

The age breakdown of sentinel-reported ILI can be misleading. From this graph, one might conclude that older adults had very low levels of ILI. This is not the case. ILINet data measure visits to healthcare providers in the community, but do not measure hospital visits or inpatient hospitalization. Nationally, adults age 65 and older have the highest rates of influenza-related hospitalization among all age groups and often have severe outcomes from influenza. High rates of hospitalization among older adults occur in Rhode Island as well (See Figure 11). While Figure 5 accurately portrays high levels of ILI among those age 5-24, it does not present the full picture of age and influenza in our state.

### SUMMARY OF ILINET DATA, 2015-2016

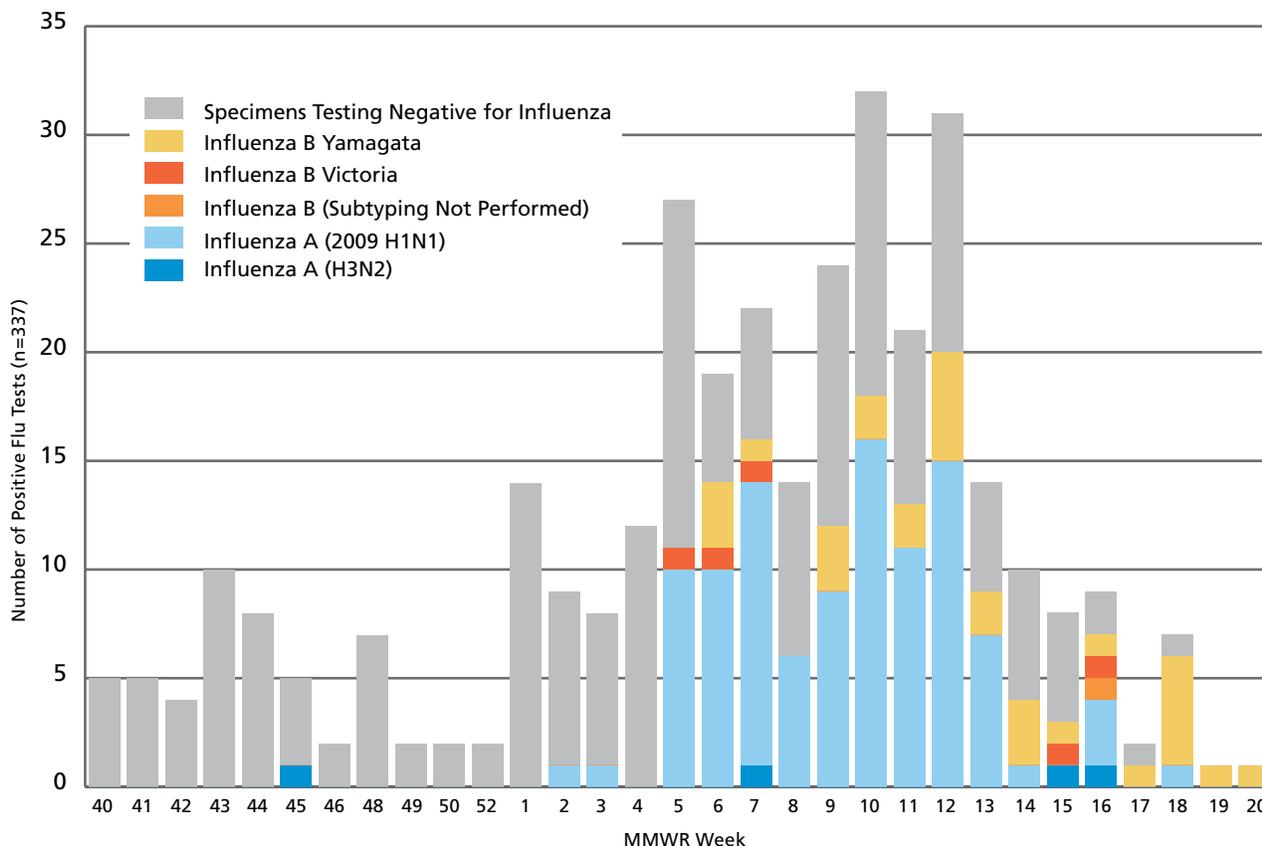
The 2015-2016 influenza season showed lower levels of ILI and a later peak than the previous three flu seasons. ILI peaked in the beginning of March, MMWR Week 10 (March 6-12, 2016) in Rhode Island, in Region 1, and in the nation. While these data do not show severity of influenza (hospitalizations and deaths), or laboratory testing for influenza, they do show that there was sustained transmission of influenza-like illness throughout the state for nearly the entire influenza season.

## RHODE ISLAND STATE HEALTH LABORATORY DATA

The Rhode Island State Health Laboratory accepts nasopharyngeal swab specimens from specific sources to monitor circulating strains and subtypes of influenza. Each ILINet sentinel provider is required to send nine specimens to the Rhode Island State Health Laboratory (three early in the season, three mid-season, and three late in the season). Respiratory outbreaks in congregate living facilities are confirmed via specimen

submission to the Rhode Island State Health Laboratory. In addition, hospitals occasionally send specimens for confirmatory influenza testing, particularly for non-subtypable strains. The Rhode Island State Health Laboratory uses molecular testing for influenza, which subtypes the virus. This method of testing provides important information on the strains of influenza circulating in Rhode Island and contributes to CDC's national and regional data on influenza strains. The Rhode Island State Health Laboratory also submits samples to CDC to monitor antiviral susceptibility of circulating strains of influenza, and to aid in the identification of novel viruses.

FIGURE 6. POSITIVE INFLUENZA TESTS BY STRAIN AND MMWR WEEK, RHODE ISLAND STATE HEALTH LABORATORY, 2015-2016

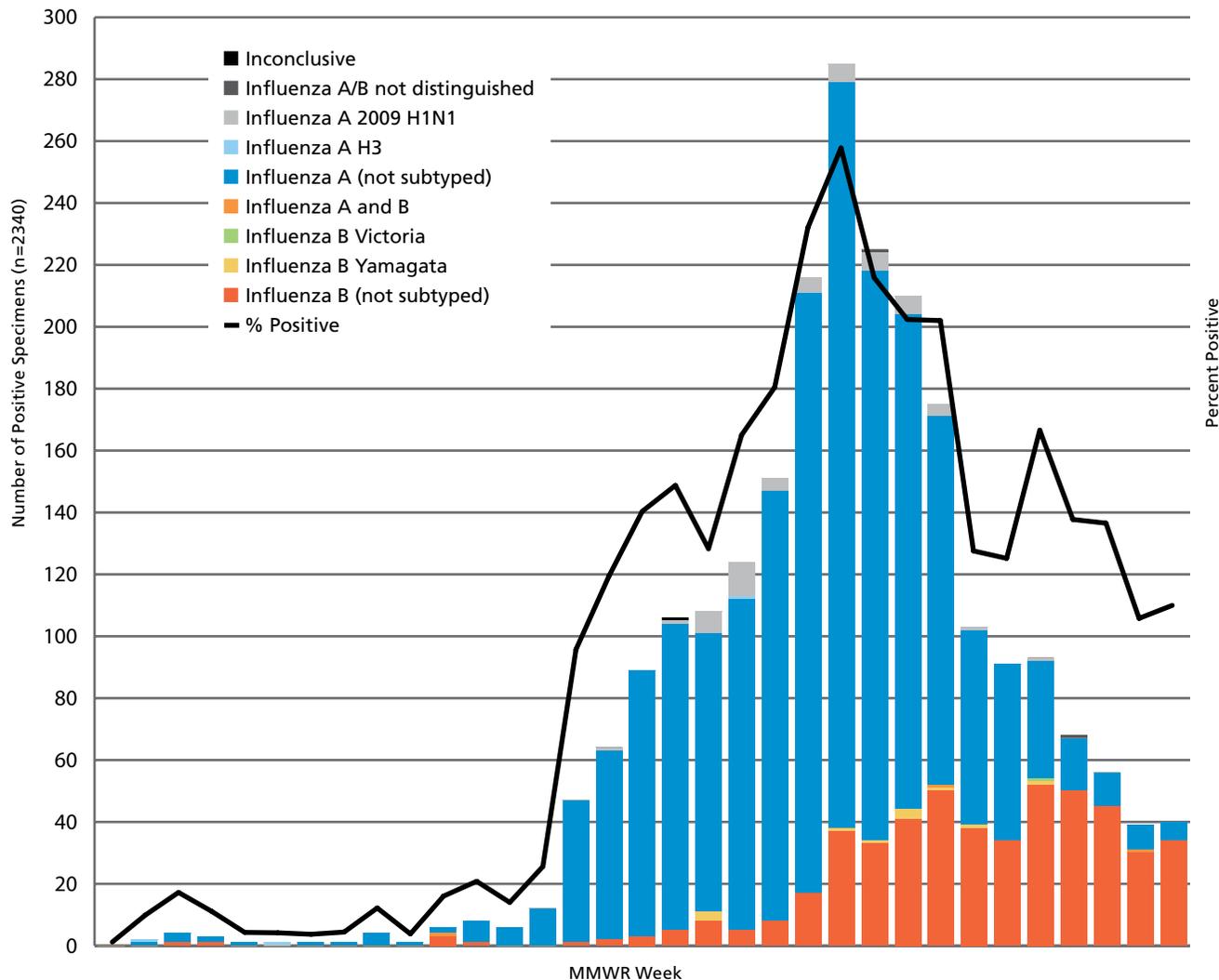


In the 2015-2016 influenza season, the Rhode Island State Health Laboratory tested 337 specimens for influenza. Of these specimens, 144 tested positive. The majority of positive specimens (72%) were Influenza A (H1N1) 2009, consistent with national circulation of Influenza A (H1N1) 2009 during the 2015-2016 influenza season. Overall, 74% of positive specimens were Influenza A, and 26% were Influenza B. During the 2015-2016 influenza season, the Rhode Island State Health Laboratory gained the capacity to subtype Influenza B specimens. The predominant strain of Influenza B was Influenza B Yamagata, making up 21% of all positive flu tests, and 84% of Influenza B specimens. Just like ILI, positive flu results began to appear much later than in most influenza seasons, beginning to increase in MMWR Week 5 (January 31-February 6, 2016). The number of specimens tested peaked in MMWR Week 10, like ILI activity, but the number of specimens that tested positive for influenza peaked in MMWR Week 12 (March 20-26, 2016). Influenza B was detected as soon as positive flu tests began to appear, although it became more prevalent towards the end of the flu season, as is typical.

## HOSPITAL DATA

Each week, Rhode Island's 11 acute-care hospitals report all positive influenza laboratory tests to CAIDE. These data include influenza tests that were conducted in emergency departments and inpatient units. In addition, hospitals report the total number of influenza tests conducted at that hospital, which allows CAIDE to calculate the percent positivity of influenza tests. The following graphs compare hospital data from the 2015-2016 influenza season with hospital data from the 2014-2015 influenza season.

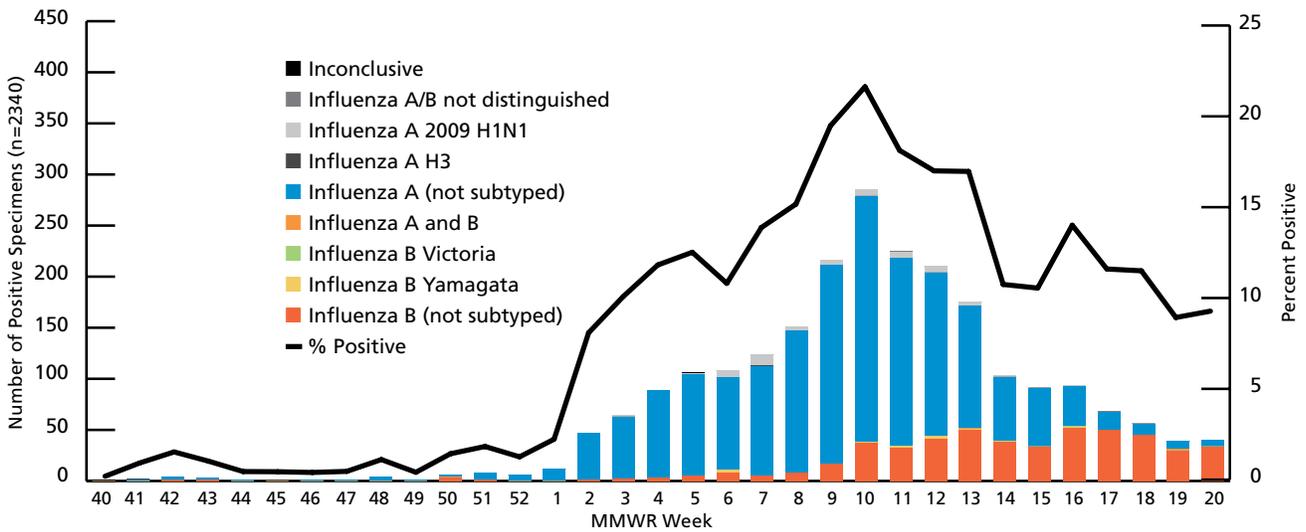
FIGURE 7. ALL POSITIVE INFLUENZA TESTS BY STRAIN AND MMWR WEEK, RHODE ISLAND HOSPITALS, 2015-2016 INFLUENZA SEASON



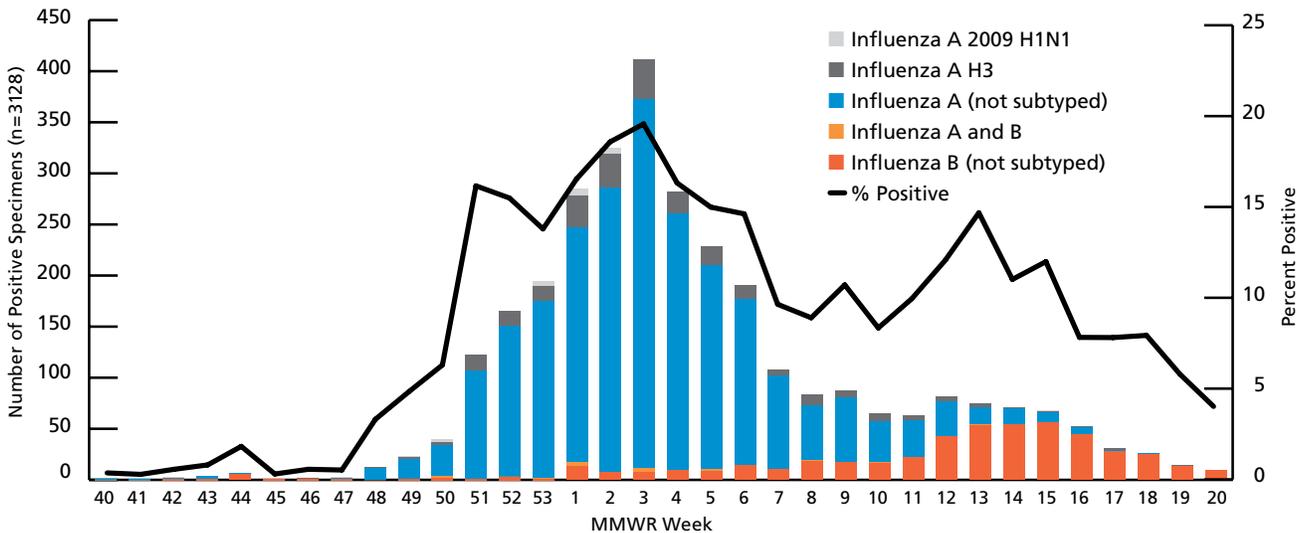
In the 2015-2016 influenza season, 2,340 specimens tested positive for influenza in Rhode Island hospitals. The number of positive tests peaked during MMWR Week 10 (March 6-12, 2016), at 285 influenza-positive tests out of 1,329 tests conducted (percent positivity=21.9%). This was the same week as the peak of the ILINet influenza-like illness. The predominant strain of influenza at the hospitals was Influenza A (not subtyped). Toward the end of the influenza season, Influenza B became more common, replacing Influenza A as the predominant strain from Weeks 16-20 (April 17-May 23, 2016).

FIGURE 8. ALL POSITIVE INFLUENZA TESTS BY STRAIN AND MMWR WEEK, RHODE ISLAND HOSPITALS, COMPARISON OF 2015-2016 SEASON WITH 2014-2015 SEASON .

2015-2016 SEASON



2014-2015 SEASON



During the 2015-2016 influenza season, hospitals reported nearly 800 fewer positive influenza tests than during the 2014-2015 influenza season. Both seasons had one peak week of positive influenza tests, but the 2015-2016 season peaked seven weeks later in MMWR Week 10 (March 6-12, 2016) than the 2014-2015 season peak in MMWR Week 3 (January 18-24, 2015). The peak number of positive influenza tests in 2014-2015 was 439 positive tests in MMWR Week 3, while the peak number of positive tests conducted in hospitals in 2015-2016 was 285 in MMWR Week 10. In both flu seasons, Influenza A (not subtyped) was predominant and Influenza B became more prevalent in the latter half of the season.

TABLE 1. ALL POSITIVE INFLUENZA TESTS BY STRAIN, RHODE ISLAND HOSPITALS, 2015-2016 AND 2014-2015 INFLUENZA SEASONS.

Strain	All Positive Influenza Tests			
	2015 - 2016		2014 - 2015	
	N	%	N	%
Influenza A (not subtyped)	1,767	75.5%	2,353	75.2%
Influenza B (not subtyped)	499	21.3%	483	15.4%
Influenza A H3	3	0.1%	256	8.2%
Influenza A 2009 H1N1	53	2.3%	21	0.7%
Influenza A and B	3	0.1%	15	0.5%
Influenza B Yamagata	11	0.5%	Not available	
Influenza B Victoria	1	0.0%	Not available	
Influenza A/B not distinguished	2	0.1%	0	0.0%
Inconclusive	1	0.0%	0	0.0%
<b>Total</b>	<b>2,340</b>		<b>3,128</b>	

In both the 2015-2016 and the 2014-2015 influenza seasons, Influenza A (not subtyped) comprised the largest percentage of positive tests (75.5% in 2015-2016 and 75.2% in 2014-2015). Influenza B comprised the second-highest percentage of tests in both seasons (21.3% in 2015-2016 and 15.4% in 2014-2015). Of subtyped Influenza A specimens, Influenza A (H1N1) 2009 was the predominant strain in 2015-2016, while Influenza A H3 was the predominant strain in the 2014-2015 flu season. Overall, fewer specimens were subtyped in hospital laboratories during the 2015-2016 flu season.

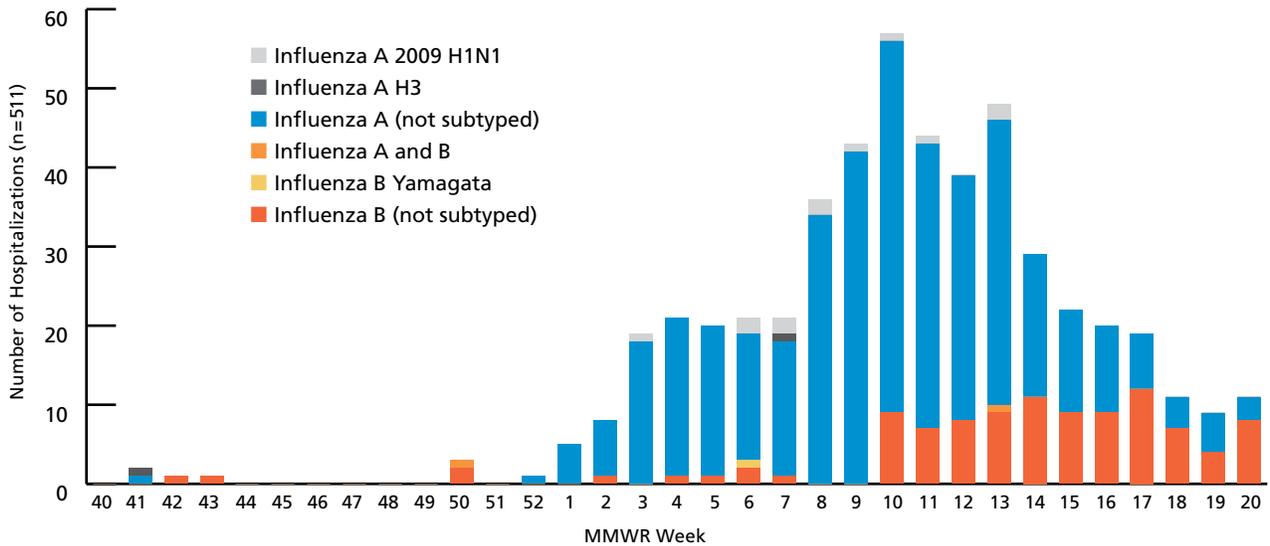
## INFLUENZA TEST TYPES IN HOSPITALS

Hospitals use two types of tests for influenza: molecular tests and rapid diagnostic tests. In the 2015-2016 influenza season, 60% of positive specimens were tested by rapid influenza diagnostic test, and 40% were tested by molecular assay. Rapid influenza diagnostic tests can determine if an individual is infected with Influenza A or B but cannot further characterize the virus. During the beginning and end of influenza season, rapid tests are not as specific as molecular tests and can result in false positives. During the peak of the flu season, rapid tests are not as sensitive and can result in false negatives. However, due to their speed of providing results and ease of use, they still are an important component of the armamentarium of influenza tests. In the 2015-2016 season, the hospitals that utilized molecular assays did not subtype their influenza tests, even though molecular tests (such as RT-PCR) can determine Influenza A or B subtypes (such as Influenza A (H1N1) 2009 or Influenza B Victoria). Therefore, fewer hospital laboratory positive tests were subtyped in 2015-2016, and any subtyped specimen results that appear on the previous graphs above were performed at the Rhode Island State Health Laboratory.

## INFLUENZA-RELATED HOSPITALIZATIONS

Data on influenza-related hospitalizations are a subset of the data on all positive influenza tests at hospitals described above. This subset consists of individuals who tested positive for influenza and were hospitalized as inpatients.

**FIGURE 9. INFLUENZA HOSPITALIZATIONS BY STRAIN AND MMWR WEEK, RHODE ISLAND HOSPITALS, 2015-2016 INFLUENZA SEASON**

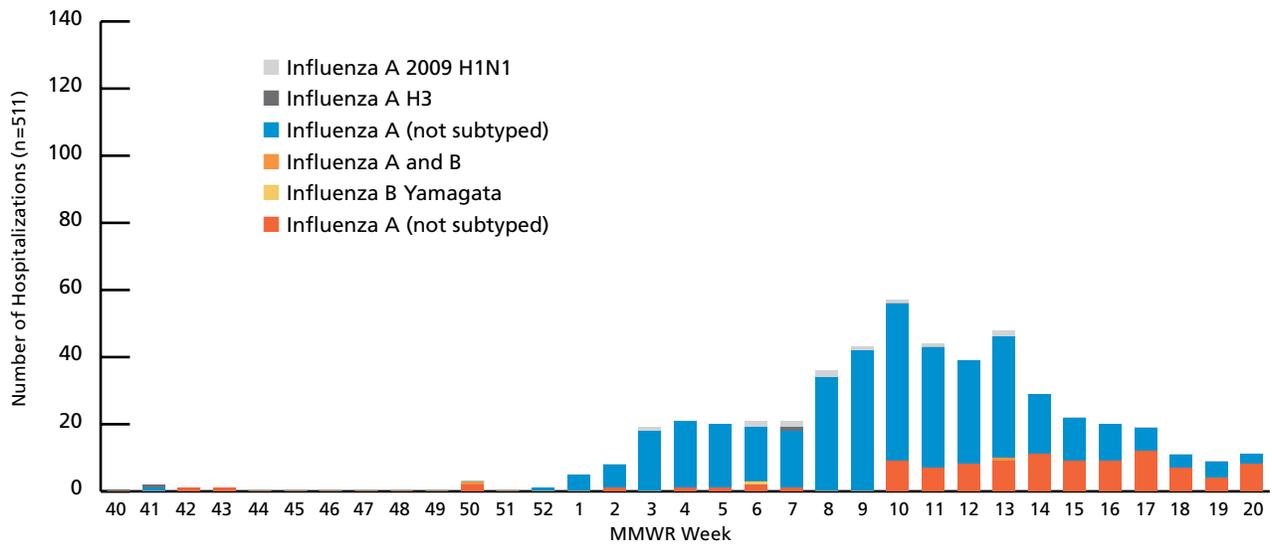


In the 2015 -2016 influenza season, 511 individuals who tested positive for influenza were hospitalized. The shape of the curve and the strain breakdown is nearly the same as the curve for all individuals who tested positive for influenza, with a late peak caused by Influenza A viruses in MMWR Week 10 (March 6-12, 2016).

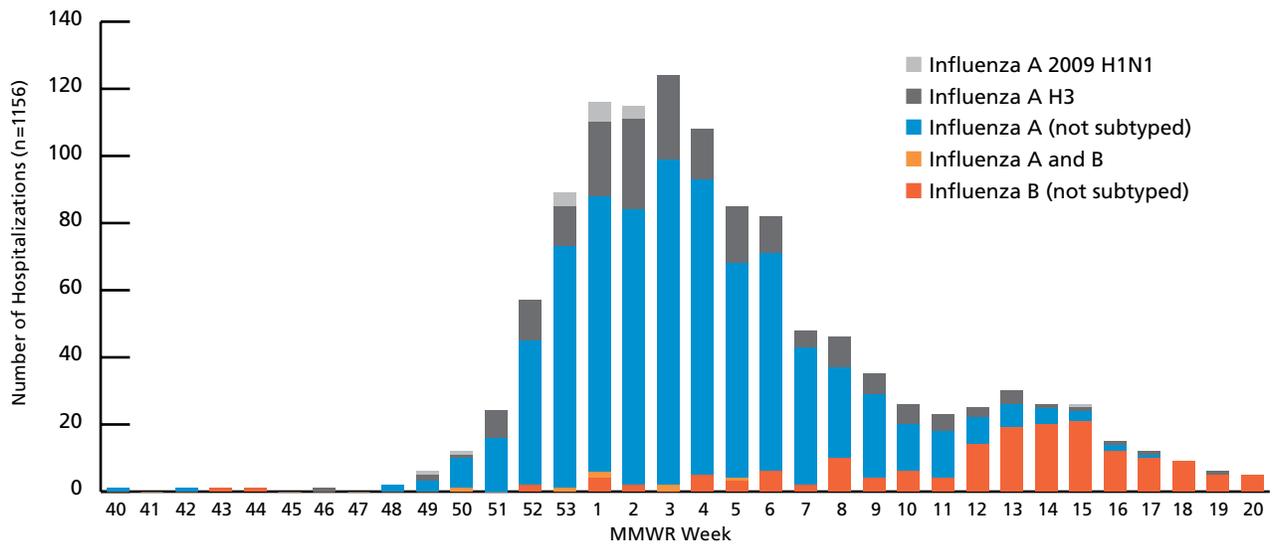


FIGURE 10. INFLUENZA HOSPITALIZATIONS BY STRAIN AND MMWR WEEK, RHODE ISLAND HOSPITALS, COMPARISON OF 2015-2016 AND 2014-2015 INFLUENZA SEASONS

2015-2016 SEASON



2014-2015 SEASON



Compared to the 2014-2015 flu season, the 2015-2016 flu season had lower levels of influenza-related hospitalizations. In 2014-2015, 1,156 individuals were hospitalized, while in 2015-2016, less than half that number (511 individuals) were hospitalized. Both seasons had one peak week of hospitalizations, but the 2015-2016 season peaked seven weeks later in the year than the 2014-2015 season (MMWR Week 10 [March 6-12, 2016] versus MMWR Week 3 [January 18-24, 2015]). The peak number of influenza hospitalizations in 2014-2015 was 124 hospitalizations in MMWR Week 3, while the peak number of influenza hospitalizations in 2015-2016 was 57 in MMWR Week 10. In both flu seasons, Influenza A (not subtyped) was predominant and Influenza B became more prevalent in the latter half of the season. The data in the hospitalization graphs are a subset of the data in the positive hospital test graphs.

FIGURE 11. POSITIVE INFLUENZA TESTS BY HOSPITAL VISIT TYPE AND AGE, RHODE ISLAND HOSPITALS, 2015-2016 INFLUENZA SEASON

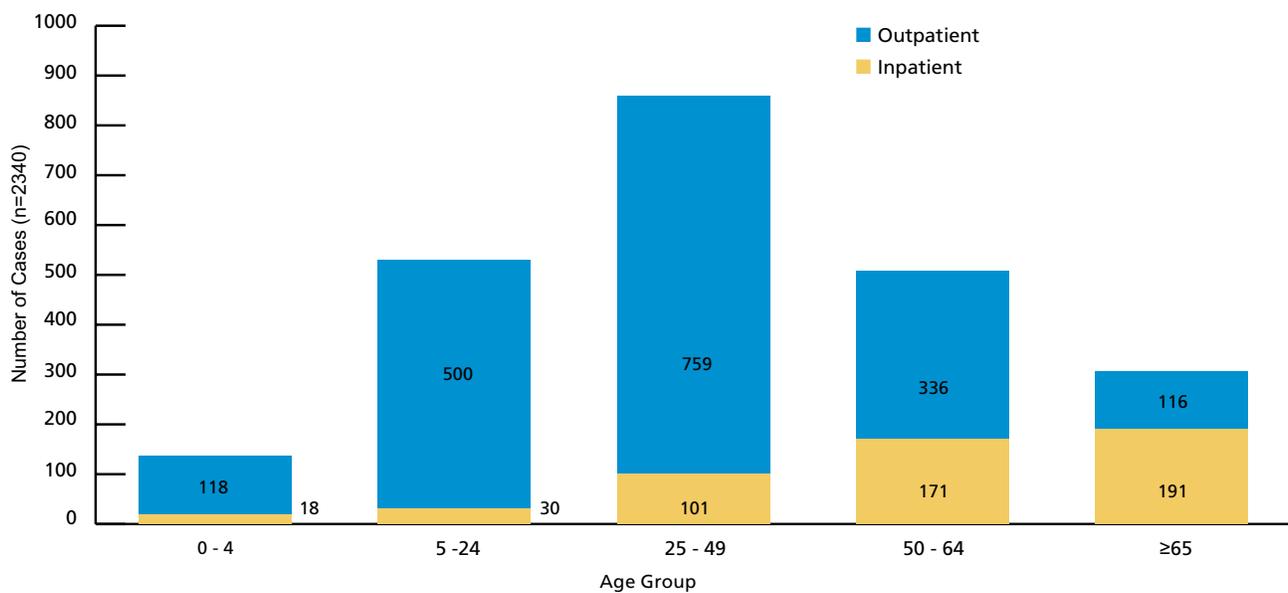
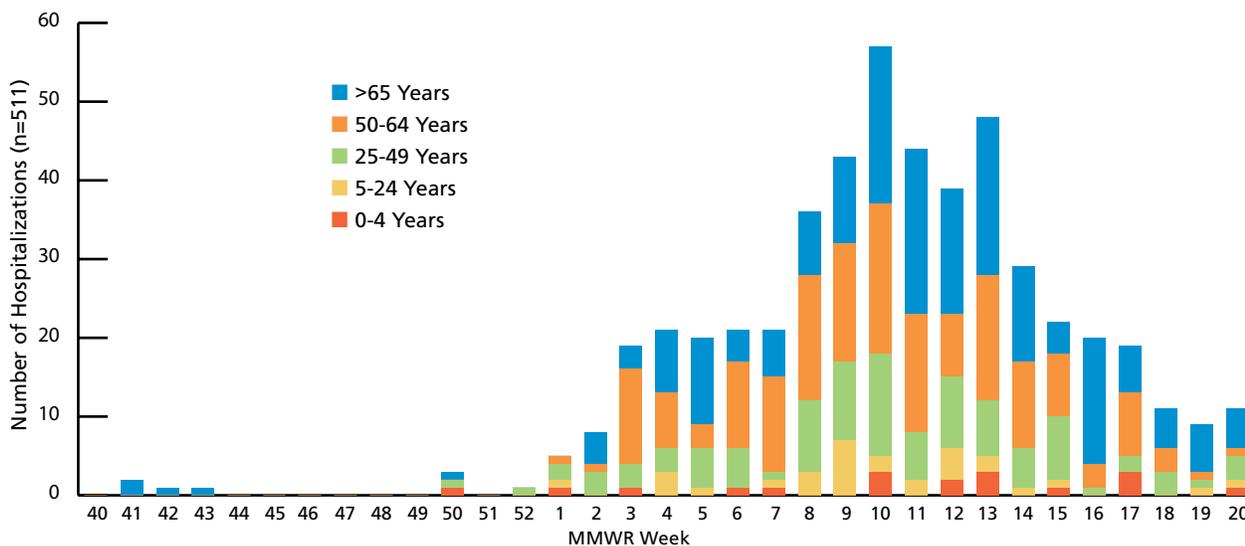


Figure 11 displays an aggregate of all positive influenza tests from hospitals for the 2015-2016 season by age group, broken down by type of hospital visit (inpatient or outpatient). Older adults (65 and older) had the largest number of hospitalizations, followed by adults between the ages of 50 and 64.

FIGURE 12. INFLUENZA HOSPITALIZATIONS BY AGE AND MMWR WEEK, RHODE ISLAND HOSPITALS, 2015-2016 INFLUENZA SEASON

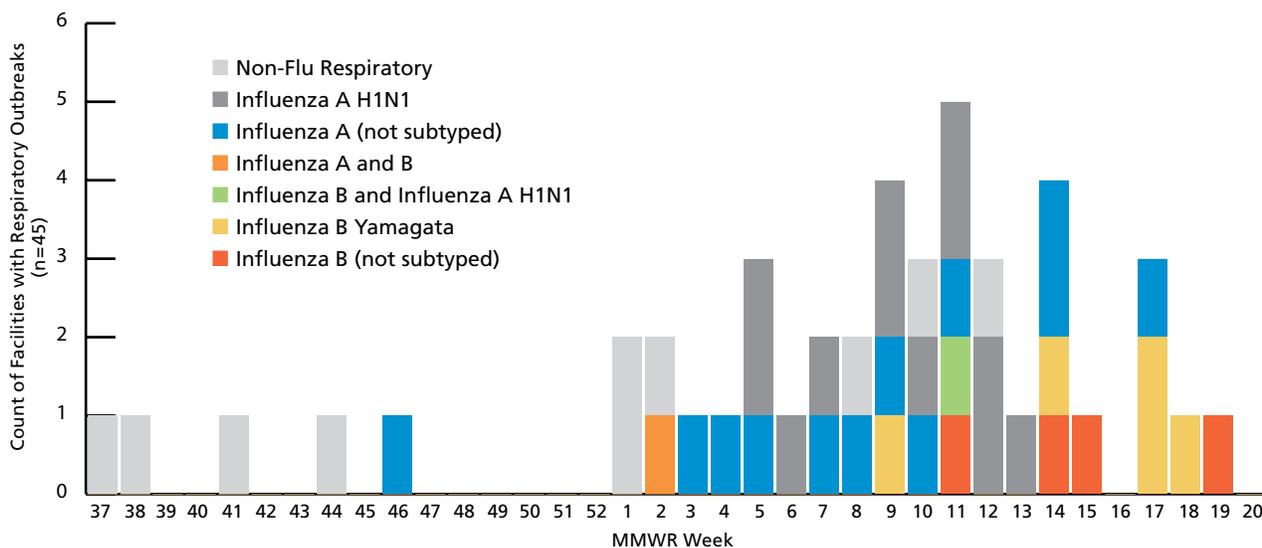


Although adults 65 and older had the most hospitalizations in the 2015-2016 flu season, they did not lead as dramatically as they did in the 2014-2015 flu season, where they comprised the majority of hospitalizations each week. This is because influenza A H3 (the predominant strain in 2014-2015) is known to cause higher rates of hospitalizations and severe outcomes in older adults. However, regardless of strain type, during most influenza seasons older adults are hospitalized for influenza at higher rates than younger individuals. Figures 11 and 12 provide a distinct contrast to the ILI graph (Figure 5) that presents visits to community healthcare providers, in which older adults had the lowest number of healthcare visits related to ILI. The disparity between these graphs highlights the importance of a multi-faceted influenza surveillance system. It is important to look at these two data sets together to gain a comprehensive understanding of the influenza season. While ILINet is an indicator of the volume of influenza in the state, it does not measure severity of disease. Hospitalization data does not show the spread of ILI in the community, but it is an excellent indicator of severity. This graph reflects the fact that older adults are more vulnerable to severe illness and complications from influenza infection, leading to hospitalization.

## RESPIRATORY OUTBREAKS

All outbreaks of influenza and respiratory illness in congregate living settings are reportable to the Rhode Island Department of Health. For surveillance purposes, a respiratory outbreak is defined as one case of laboratory-confirmed influenza in a congregate living setting, or two cases of influenza-like illness. Congregate settings include mainly long-term care facilities and assisted living communities, but can also include hospital wings, group homes, adult day programs and other residential programs. When a facility reports an outbreak, CAIDE provides infection control recommendations and telephones the facility daily to obtain updated case counts. CAIDE also tracks the percentage of residents of a facility that are vaccinated and continues to monitor a facility until 10 days have passed following its last new case of influenza or respiratory illness. Facilities submit three to five nasopharyngeal specimens to the Rhode Island State Health Laboratory for testing and subtyping.

FIGURE 13. RESPIRATORY OUTBREAKS IN LONG-TERM CARE AND ASSISTED LIVING FACILITIES, BY MMWR WEEK, 2015-2016 INFLUENZA SEASON



During the 2015-2016 influenza season, there were 45 discrete outbreaks of respiratory disease in congregate living facilities. The predominant strains identified in these outbreaks were Influenza A (2009) H1N1 (27% of all outbreaks) and Influenza A (not subtyped) (27% of all outbreaks). Not all respiratory outbreaks were caused by influenza: specimens from 22% of respiratory outbreaks tested negative for influenza at the Rhode Island State Health Laboratory. The vast majority (84%) of reported outbreaks were in long-term care facilities (facilities with skilled nursing services), with the rest split among assisted living facilities, hospitals, and various day or residential programs. Attack rates for respiratory illness within each facility were calculated by dividing the number of residents with ILI or influenza at each facility by the total number of residents living in the facility. The mean attack rate was 6.4%, and the median attack rate was 4.2%. Attack rates ranged from 0.06% to 55.6%. In the 2015-2016 influenza season, there were nearly 100 fewer respiratory outbreaks than in the 2014-2015 influenza season. This difference is representative of the general difference in severity and activity of the two flu seasons.

Facilities with outbreaks self-reported vaccination rates among residents. Older adults are a well-vaccinated population throughout the US, with a 2015-2016 influenza vaccination coverage rate of 63.4% among adults 65 and older<sup>4</sup>. Among the populations in congregate living settings in Rhode Island, vaccine coverage was even higher. The mean reported vaccination rate among residents in congregate settings with outbreaks was 88%, and the median rate was 90%.

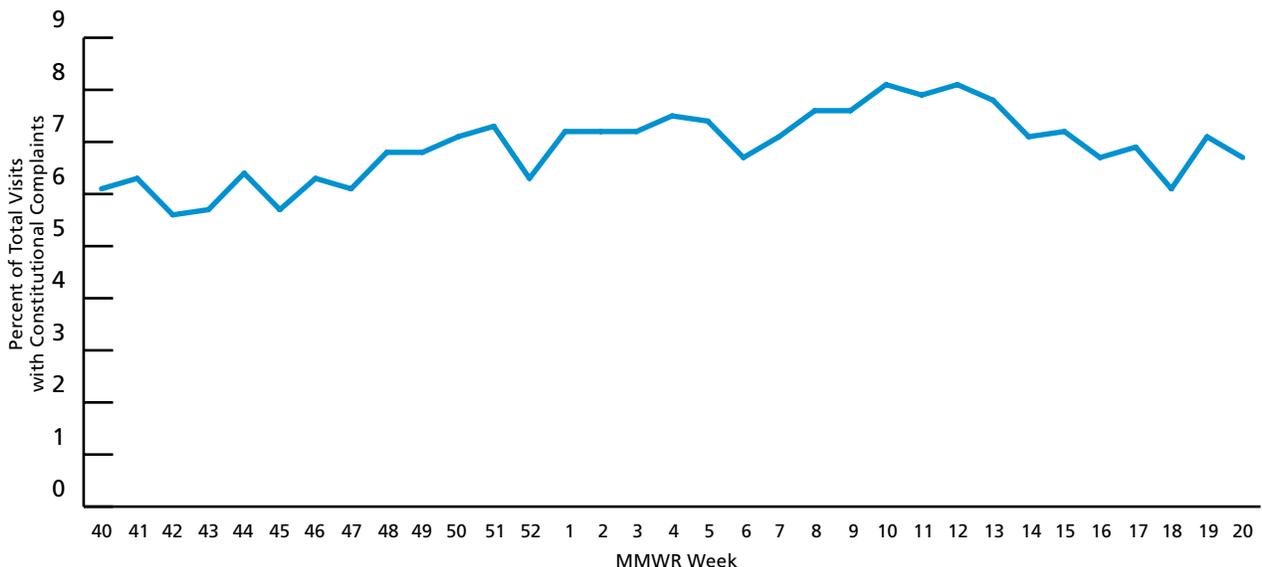
## RODS: SYNDROMIC SURVEILLANCE

The Real-Time Outbreak and Disease Surveillance system (RODS) monitors chief complaints from hospital emergency departments in Rhode Island. Data are analyzed based on syndrome in order to detect patterns of disease outbreaks. While there is no specific syndrome for influenza-related visits, an increase in influenza-

<sup>4</sup>Santibanez TA, Kahn KE, Zhai Y, et al. Flu Vaccination Coverage, United States, 2015-16 Influenza Season. Centers for Disease Control and Prevention. 29 Sept 2016. [www.cdc.gov/flu/fluview/coverage-1516estimates.htm](http://www.cdc.gov/flu/fluview/coverage-1516estimates.htm)

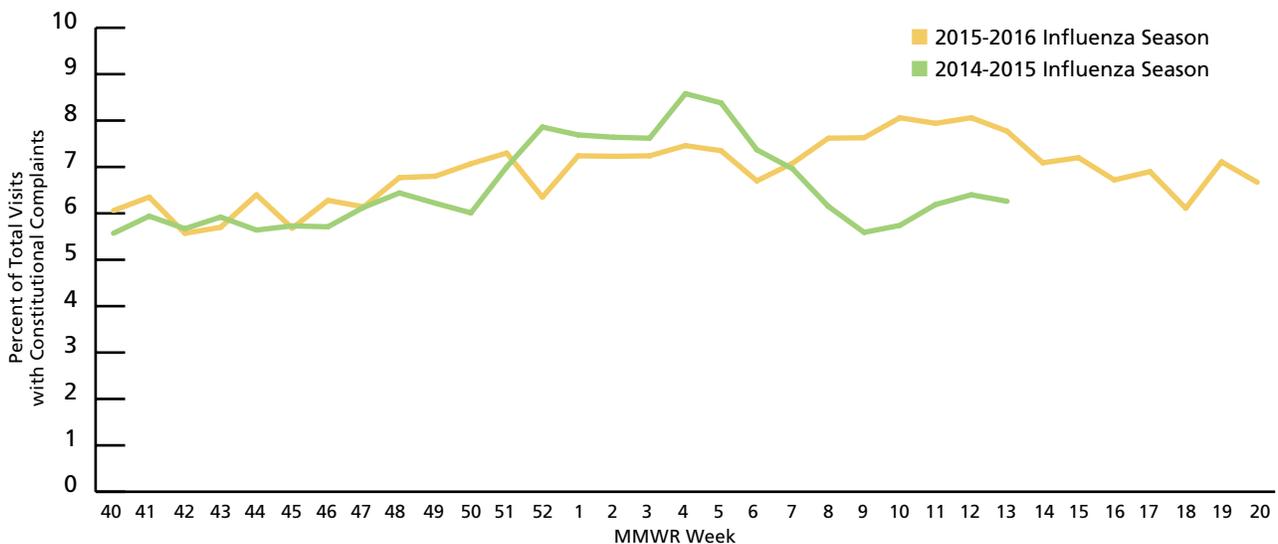
like illness is most likely to trigger an alert for constitutional syndrome, which consists of chief complaints of fever, myalgia, or a chief complaint of influenza. Therefore, constitutional syndrome is used as a proxy for influenza-like illness. RODS triggers alerts based on algorithms that detect unexpected increases in the number of visits for constitutional syndrome.

FIGURE 14. PERCENTAGE OF ALL EMERGENCY DEPARTMENT VISITS DUE TO CONSTITUTIONAL SYNDROME BY MMWR WEEK, RHODE ISLAND HOSPITALS, 2015-2016 INFLUENZA SEASON



The syndromic surveillance data for the 2015-2016 influenza season mirror the ILI and hospitalization data, with the percentage of constitutional syndrome visits peaking around Week 10.

FIGURE 15. PERCENTAGE OF ALL EMERGENCY DEPARTMENT VISITS DUE TO CONSTITUTIONAL SYNDROME BY MMWR WEEK, RHODE ISLAND HOSPITALS, COMPARISON OF 2015-2016 AND 2014-2015 INFLUENZA SEASONS



Compared to the 2014-2015 influenza season, constitutional complaints in the 2015-2016 seasons showed a later and lower magnitude peak.

## LIMITATION OF RODS

In the 2014-2015 influenza season, several of the hospitals in Rhode Island migrated their electronic medical record systems to new software. This change affected interoperability with the syndromic surveillance system, temporarily preventing a proper reading of emergency room data. Consequently, RODS data for the 2014-2015 influenza season were only available through MMWR Week 12 (March 22-28, 2015). This issue was resolved by the beginning of the 2015-2016 influenza season.

## INFLUENZA-RELATED MORTALITY

An influenza-associated death is defined, for surveillance purposes, as a death resulting from a clinically compatible illness that was confirmed to be influenza by an appropriate laboratory or rapid diagnostic test. There should be no period of complete recovery between the illness and death. Influenza-associated deaths became reportable by regulation in Rhode Island during the 2013-2014 influenza season.

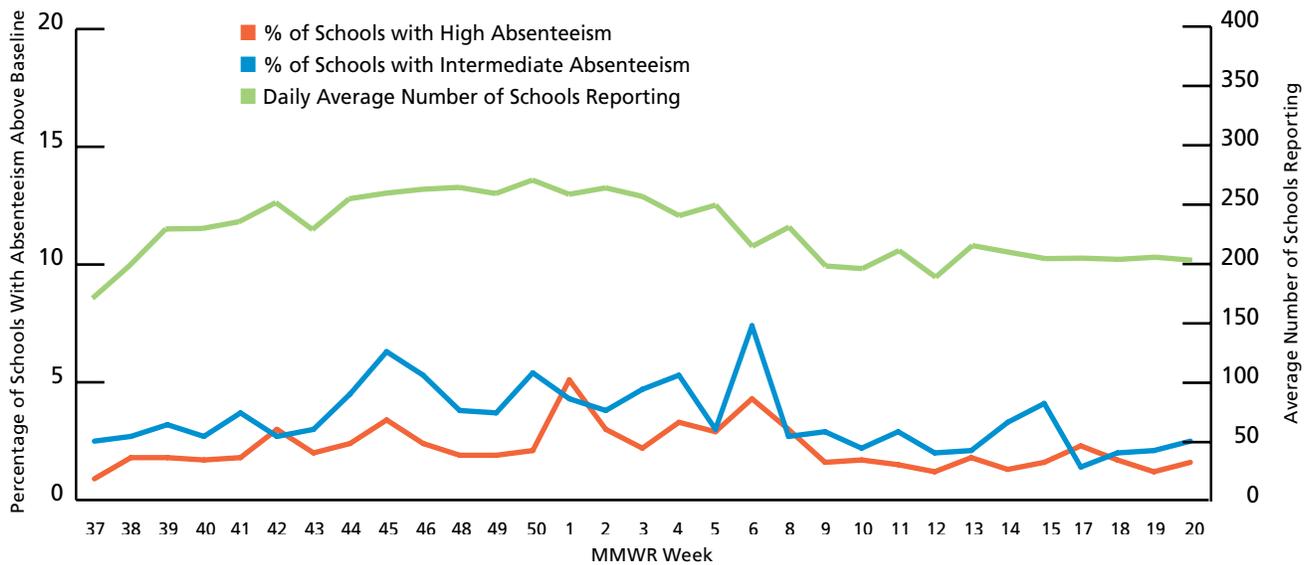
During the 2015-2016 season, there were fourteen adult influenza-associated deaths reported to RIDOH. There were no pediatric influenza-associated deaths in the 2015-2016 season. Compared to the 2014-2015 flu season, during which 40 deaths were reported to RIDOH, the 2015-2016 flu season had relatively few influenza-associated deaths. This difference is consistent with the difference in severity associated with the circulating influenza viruses in each season. In the 2014-2015 influenza season, the main circulating subtype was Influenza A H3, which has been associated with increased hospitalizations and deaths, particularly in comparison to the Influenza A (2009) H1N1 viruses that were predominant in the 2015-2016 influenza season.

In the 2015-2016 influenza season, the mean age of the fourteen adult influenza-related deaths was 63, and the median age was 65. The age range of influenza deaths was 36-88. Of all reported influenza-related deaths, nine individuals tested positive for Influenza A (not subtyped), three tested positive for Influenza B (not subtyped) and two tested positive for Influenza A (2009) H1N1. Many of the influenza-associated deaths occurred in people who had underlying medical issues. Health conditions reported at time of death included chronic obstructive pulmonary disease (COPD), chronic kidney disease, cerebral palsy, coronary artery disease, hypertension, cystic fibrosis, morbid obesity, dementia, cancer, and opiate dependency. It is possible that the actual number of adult influenza-associated deaths was higher than the number reported due to the relatively recent implementation of reporting requirements.

## SCHOOL ABSENTEEISM

Increases above normal trends in school absenteeism can serve as an indicator of influenza activity within a school. In an effort to detect outbreaks, CAIDE monitors school absenteeism data reported through the Rhode Island Department of Education. If higher-than-expected school absenteeism rates are detected for three consecutive days, CAIDE contacts the school nurse teacher, inquires about the reason for the increased absenteeism, and reviews infection control measures should influenza-like illness be the reason for the increased absenteeism.

FIGURE 16. SCHOOL ABSENTEEISM: LEVEL OF ABSENTEEISM AND NUMBERS OF SCHOOLS REPORTING, 2015-2016 SCHOOL YEAR



In the 2015-2016 school year, an average of 227 out of 419 schools reported weekly (range 170-270 schools). A school with high absenteeism is defined as an absenteeism rate over 200% of a school’s baseline absenteeism rate for a given day. During the 2015-2016 school year, the weekly average percentage of schools with high absenteeism peaked twice, with 5.1% of schools reporting high absenteeism in MMWR Week 1 (January 3- 9, 2016) and 4.3% of schools reporting high absenteeism in MMWR Week 6 (February 7-13, 2016). These peaks occurred in weeks adjacent to school vacations. A school with intermediate absenteeism is defined as an absenteeism rate between 100 and 199% of a school’s baseline absenteeism rate for a given day. During the 2015-2016 school year, the weekly average percentage of schools with intermediate absenteeism peaked in MMWR Week 6 (February 7-13, 2016), with 7.4% of schools reporting intermediate absenteeism. School absenteeism trends in the 2015-2016 flu season did not mirror ILI or hospital flu test trends.

School absenteeism can be a marker of circulating illness in school-aged children, but not all increases in absenteeism are due to influenza, or to illness at all. Impending school vacations, adverse weather, senior skip days, and terror threats can all impact school attendance. In addition, the school year is interspersed with school holidays, and, at times, snow days. In an effort to control for these factors, weeks with school vacations or multiple days of weather cancellation were omitted from Figure 16.

## LIMITATIONS

This report is subject to several limitations. Unlike many other infectious diseases, individual cases of influenza are not reportable to RIDOH; only outbreaks of respiratory illness and influenza-associated deaths are reportable. Therefore, RIDOH does not maintain a count of the number of influenza cases in Rhode Island. Instead, a variety of data are collected using a group of surveillance systems, each with its own strengths and limitations. ILINet illustrates geographic spread of ILI across the community but does not provide information on severity of disease or laboratory-confirmed cases of influenza. In contrast, hospitalization data describes severity of influenza illness, but do not provide data on geographic spread of influenza throughout the state. Respiratory outbreak surveillance only provides data on Rhode Island's long-term care facility residents. The Rhode Island State Health Lab provides highly accurate molecular testing, but the samples it receives are often pre-screened, and thus the percent of positive tests does not have a meaningful denominator. Finally, RODS data are syndromic, providing data on trends in emergency department chief complaints, but not measuring influenza or ILI specifically.

While each of the components of the surveillance system is vital, no single component can be solely relied upon to gather comprehensive data for the state. In order to perform complete surveillance of influenza, RIDOH draws upon the strengths of each component to compensate for the limits of others. RIDOH relies upon voluntary partnerships with sentinel sites and hospitals to report high-quality data.

## CONCLUSION

The 2015-2016 influenza season was less severe than the previous flu season, with fewer hospitalizations and lower rates of influenza-like-illness (ILI) compared to the 2014-2015 influenza season. The 2015-2016 season had a late peak of hospitalizations, positive flu tests, and ILI in MMWR Week 10 (March 6-12, 2016). This was the latest peak since the 2011-2012 influenza season. The predominant subtyped strain of influenza during the 2015-2016 influenza season was Influenza A (2009) H1N1, which remained a good match to the seasonal influenza vaccine.

In partnership with community agencies, RIDOH maintains a strong, multi-faceted influenza surveillance system that informs understanding and decision-making not only at the individual physician-patient level, but also at local, statewide, and national levels.

## APPENDIX A. DESCRIPTION OF DATA SOURCES

CAIDE maintains a number of influenza surveillance systems. These surveillance systems are designed to monitor influenza activity and influenza-like illness (ILI), assess and measure the burden of influenza infections within the community, characterize circulating influenza strains, and detect novel influenza viruses. In Rhode Island, the following surveillance systems are used to accomplish these goals:

**Outpatient Influenza-Like Illness Surveillance Network (ILINet):** RIDOH participates in an influenza sentinel surveillance program known as ILINet. It is a collaborative effort among the Centers for Disease Control and Prevention (CDC), state health departments, and ILINet sites within each state. ILINet providers are recruited annually by state health departments. ILI is defined as a fever ( $\geq 100^{\circ}$  F or  $37.8^{\circ}$ C) and cough and/or sore throat in the absence of a known cause other than influenza. Each week, ILINet health care provider sites report to RIDOH and CDC the total number of patients seen as well as the number of those patients presenting with ILI. These data are aggregated by age group (0-4, 5-24, 25-49, 50-64, and 65 and older).

ILINet providers are also responsible for routinely submitting nasopharyngeal (NP) swabs from symptomatic patients to the Rhode Island State Health Laboratory for influenza testing by polymerase chain reaction (RT-PCR). For the 2015-2016 influenza season, 17 providers agreed to participate and were enrolled for the season. These consisted of five family practices, four student health centers, four pediatric facilities, three internal medicine practices, and one urgent care center (Appendix B).

**Rhode Island State Laboratory Virology Surveillance:** The Rhode Island State Health Laboratory, a World Health Organization (WHO) accredited laboratory, types and subtypes influenza specimens from facilities experiencing respiratory outbreaks, the Office of the State Medical Examiners, sentinel sites, and occasionally from hospitals. The Rhode Island State Health Laboratory has the ability to detect all circulating strains of influenza. Any specimen unable to be subtyped is perceived to be a variant strain and is forwarded to CDC for testing.

**Hospital Surveillance:** Hospital laboratories throughout the state conduct routine tests for influenza via molecular assays and rapid diagnostic tests. Demographic and clinical information about the positive test results and aggregate numbers of total influenza tests run are sent to CAIDE on a weekly basis. Among the clinical information are influenza-associated hospitalizations and influenza-associated pediatric deaths, which are mandatory reportable events in Rhode Island.

**Real-time Outbreak and Disease Surveillance system (RODS):** This syndromic surveillance system allows real-time monitoring of chief complaints (from patients upon arrival in emergency departments) of several syndromes that include respiratory, constitutional, gastrointestinal, hemorrhagic and neurologic. Constitutional symptoms most closely resemble those of influenza (fever, myalgia, or chief complaint of influenza). Syndrome trends are also studied by child versus adult distribution, hospital, and ZIP code.

**Influenza-Associated Mortality:** Since 2006, influenza-associated pediatric deaths have been reportable to CDC. Since the 2013-2014 influenza season, all influenza-associated deaths, regardless of age, have been reportable to RIDOH.

**School Absenteeism:** In an effort to detect outbreaks, CAIDE monitors school absenteeism data reported through the Rhode Island Department of Education. CAIDE calculates baseline rates of absenteeism for each school, based on previous years and months of absenteeism rates. If higher than expected baseline school absenteeism rates are detected for three consecutive days, CAIDE contacts the school nurse teacher, inquires about the reason for the increased absenteeism, and reviews infection control measures should influenza-like illness be the reason for the increased absenteeism.



## SENTINEL PROVIDERS

- 1.** Anchor Medical Associates  
1 Commerce Street  
Lincoln, RI 02865
- 2.** South County Internal Medicine  
481 Kingstown Road  
Wakefield, RI 02879
- 3.** University Medicine Foundation  
43 Jefferson Blvd Suite 2  
Warwick, RI 02888
- 4.** Coastal Waterman Pediatrics  
900 Warren Avenue  
East Providence, RI 02914
- 5.** Well One Primary Medical and Dental - North Kingstown  
308 Callahan Road  
North Kingstown, RI 02852
- 6.** South County Walk-in & Primary  
360 Kingstown Road Suite 104  
Narragansett, RI 02883
- 7.** Bryant University Health Center  
1150 Douglas Pike  
Smithfield, RI 02917
- 8.** Warren Family Practice  
851 Main Street  
Warren, RI 02885
- 9.** Ecap East Bay Family Healthcare  
6 John Chaffee Blvd  
Newport, RI 02840
- 10.** East Greenwich Pediatrics, Inc  
1377 South County Trail-Suite 2B  
East Greenwich, RI 02818
- 11.** Well One Primary Medical  
36 Bridgeway  
Pascoag, RI 02825
- 12.** University of Rhode Island  
Potter Building Health Center  
6 Butterfield Road  
Kingston, RI 02881
- 13.** Aquidnick Medical Associates, Inc  
50 Memorial Boulevard  
Newport, RI 02840
- 14.** University Medicine Foundation  
1525 Wampanoag Trail, Suite 202  
East Providence, RI 02915
- 15.** Rhode Island College  
Brown Hall  
600 Mount Pleasant Avenue  
Providence, RI 02908
- 16.** Brown University Health Center  
13 Brown Street  
Providence, RI 02912
- 17.** Blackstone Valley Pediatrics  
2 Meehan Lane  
Cumberland, RI 02864

## APPENDIX C. INFLUENZA ACTIVITY LEVEL DEFINITIONS

The statewide influenza activity, also known as geographic spread, is reported to CDC each week. The determination of the activity is made using the following algorithm, provided by CDC.

### ACTIVITY LEVEL DEFINITIONS

Activity Level	ILI activity*/Outbreaks		Laboratory data
<b>No activity</b>	Low	AND	No lab confirmed cases†
<b>Sporadic</b>	Not increased	AND	Isolated lab-confirmed case(s)
	Not increased	AND	Lab confirmed outbreak in one institution‡
<b>Local</b>	Increased ILI in 1 region**; ILI activity in other regions is not increased	AND	Recent (within the past 3 weeks) lab evidence of influenza in region with increased ILI
	2 or more institutional outbreaks (ILI or lab confirmed) in 1 region; ILI activity in other regions is not increased	AND	Recent (within the past 3 weeks) lab evidence of influenza in region with the outbreaks; virus activity is no greater than sporadic in other regions
<b>Regional (doesn't apply to states with ≤4 regions)</b>	Increased ILI in ≥2 but less than half of the regions	AND	Recent (within the past 3 weeks) lab confirmed influenza in the affected regions
	Institutional outbreaks (ILI or lab confirmed) in ≥2 and less than half of the regions	AND	Recent (within the past 3 weeks) lab confirmed influenza in the affected regions
<b>Widespread</b>	Increased ILI and/or institutional outbreaks (ILI or lab confirmed) in at least half of the regions	AND	Recent (within the past 3 weeks) lab confirmed influenza in the state.

\*ILI activity can be assessed using a variety of data sources including ILINet providers, school/workplace absenteeism, and other syndromic surveillance systems that monitor influenza-like illness.

† Lab confirmed case = case confirmed by rapid influenza diagnostic test, antigen detection, culture, or PCR.

‡ Institution includes nursing home, hospital, prison, school, etc.

\*\*Region: population under surveillance in a defined geographical subdivision of a state.

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### **Staff:**

Division of Preparedness, Response, Infectious Disease, and Emergency Medical Services  
Center for Acute Infectious Disease Epidemiology

Abby L. Berns, MPH, Influenza Surveillance Epidemiologist

Sarah Hart Shuford, MPH Public Health Epidemiologist

Diane Brady, MS, RN, Consultant Public Health Nurse

Cassandra Calcione, BA, Disease Intervention Specialist

Daniela N. Quilliam, MPH, Chief, Center for Acute Infectious Disease Epidemiology

John P. Fulton, PhD, Director, Academic Affairs

Utpala Bandy, MD, MPH, Medical & Division Director, Rhode Island State Epidemiologist

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### **Center for Acute Infectious Disease and Epidemiology:**

Phone: 401-222-2577

Fax: 401-222-2488



[www.health.ri.gov](http://www.health.ri.gov)



Gina M. Raimondo  
*Governor*

Anya Rader Wallack  
*Acting Secretary, Executive Office of Health and Human Services*

Nicole Alexander-Scott, MD, MPH  
*Director of Health*