Influenza Epidemiology Summary Report
Rhode Island 2013-2014

Rhode Island Department of Health (HEALTH)
Division of Infectious Disease & Epidemiology (IDE)

Table of Contents

Synopsis

This report provides a summary of seasonal influenza surveillance observations for Rhode Island from September 29, 2013 through May 17, 2014 and compares them with the previous four seasons. In terms of intensity the 2013-2014 influenza season was similar to that seen in 2011-2012. The epidemiologic curve from Influenza-like Illness Network (ILINet) shows a season with three peaks, all barely above the regional baseline of 1.2.

Data regarding the age group most affected by influenza differ among the various surveillance systems. ILINet shows that 5-24 year olds visited their physicians with complaints of influenza-like-illness (ILI) more than any other age group, whereas hospital surveillance shows that 25-49 year olds were most likely to test positive for influenza. Not surprisingly, individuals over the age of 64 were the most likely to be have an influenza-associated hospitalization.

Influenza A dominated the 2013-2014 season with Influenza B becoming more common towards the end of the season. Of the subtyped Influenza A specimens, 2009 H1N1 was the most prevalent. This was seen across all influenza surveillance systems in Rhode Island.

This report summarizes data reported by: The Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and National Respiratory and Enteric Virus Surveillance System (NREVSS) collaborating laboratories (of which the Rhode Island State Health Laboratory is a member), the Rhode Island Outpatient Influenza-Like Illness Surveillance Network (ILINet), the 122 Cities Mortality Reporting System (of which Providence is a participating city), the Real-Time Outbreak and Disease Surveillance System (RODS), reports of Institutional Clusters/Outbreaks, and data submitted by point of care testing facilities and hospital laboratories.

Rhode Island Influenza Surveillance Systems

The Rhode Island Department of Health, Division of Infectious Disease and Epidemiology (IDE), 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): The Rhode Island Department of Health (HEALTH) participates in an influenza sentinel surveillance program known as ILINet. It is a collaborative effort among CDC, state health departments, and volunteer ILINet facilities within the community. ILINet providers are recruited annually by state health departments.

Influenza-like illness is defined as a fever (≥ 100° F or 37.8°C) and cough and/or sore throat in the absence of a known cause other than influenza. Each week, ILINet physicians report to HEALTH and CDC the total number of patients seen, as well as the number of those patients who had ILI. This data is aggregated by age group (0-4 years, 5-24 years, 25-49 years, 50-64 years, and 65 years and older).

ILINet providers are also responsible for routinely submitting nasopharyngeal (NP) swabs from symptomatic patients to the state health laboratory for influenza testing by real time polymerase chain reaction (RT-PCR). For the 2013-2014 influenza season, twenty (20) providers agreed to participate and were enrolled for the season. These consisted of six student health centers, four internal medicine practices, four pediatric facilities, four family practices, and two urgent care centers. (For a list of sentinel providers, see Table 2 on page 17).

Rhode Island Hospital Surveillance: Hospital laboratories throughout the state conduct routine tests for influenza via RT-PCR/other molecular assays and Rapid Diagnostic tests. Demographic and clinical information about the positive test results and aggregate numbers for total influenza tests run are sent to IDE 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.

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 state's medical examiner, sentinel sites, and occasionally from hospitals. The State Health Laboratory has the ability to detect all circulating strains of influenza. Any specimen that does not match is perceived to be a variant strain and is forwarded to the CDC for testing.

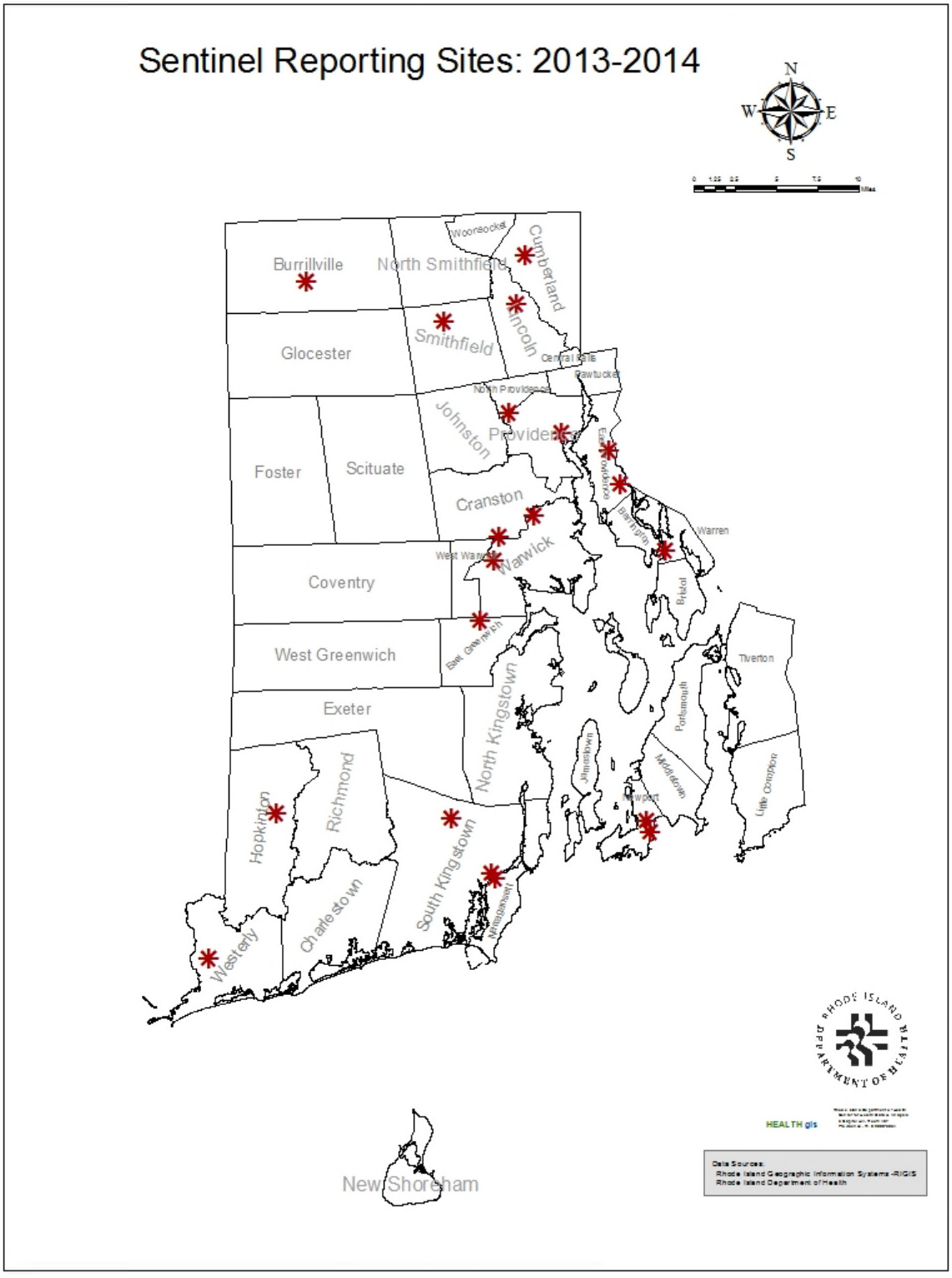
Real-time Outbreak and Disease Surveillance System (RODS): This syndromic surveillance system allows real-time monitoring of chief complaints (from patients upon arrival in emergency departments) of several syndromes that include respiratory, constitutional, gastrointestinal, hemorrhagic and neurologic.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

Influenza-Associated Mortality: Influenza-associated pediatric deaths have been reportable to CDC since 2006. Starting in the 2013-2014 influenza season, all influenza-associated deaths regardless of age, became reportable to the Rhode Island Department of Health.

Pneumonia and Influenza Mortality: The city of Providence is included in the 122 Cities Pneumonia and Influenza (P&I) mortality reporting system. This data is reported by the Department of Health's Office of Vital Records and is published weekly in the Morbidity and Mortality Weekly Report (MMWR) and in the National Influenza Surveillance Reports published by CDC.

Institutional Clusters and Outbreaks Surveillance: Respiratory clusters and outbreaks in institutions are mandatory reportable events to the Rhode Island Department of Health. An institutional cluster or outbreak is defined as one laboratory confirmed case of influenza or two or more cases of acute febrile respiratory illness occurring within 48 to 72 hours in a long-term care facility (LTCF), school or other congregate environment.

Influenza-Like Illness Surveillance Network (ILINet)

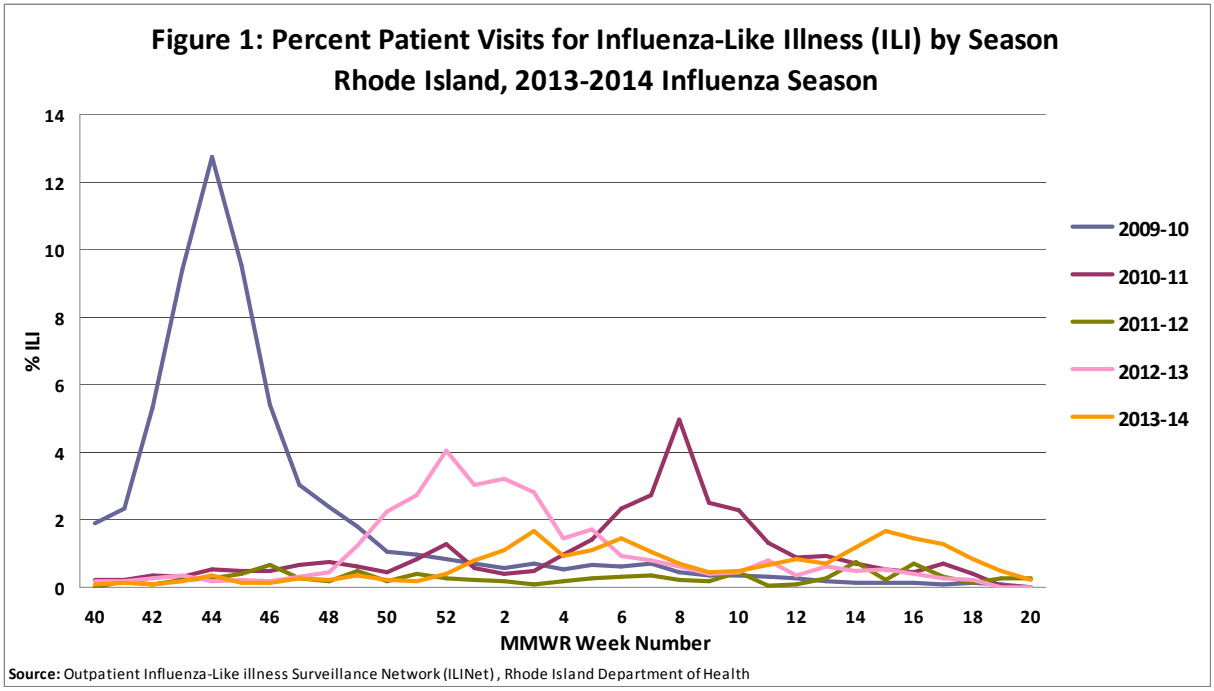


See page 18 for a complete list of participating ILINet providers in Rhode Island.

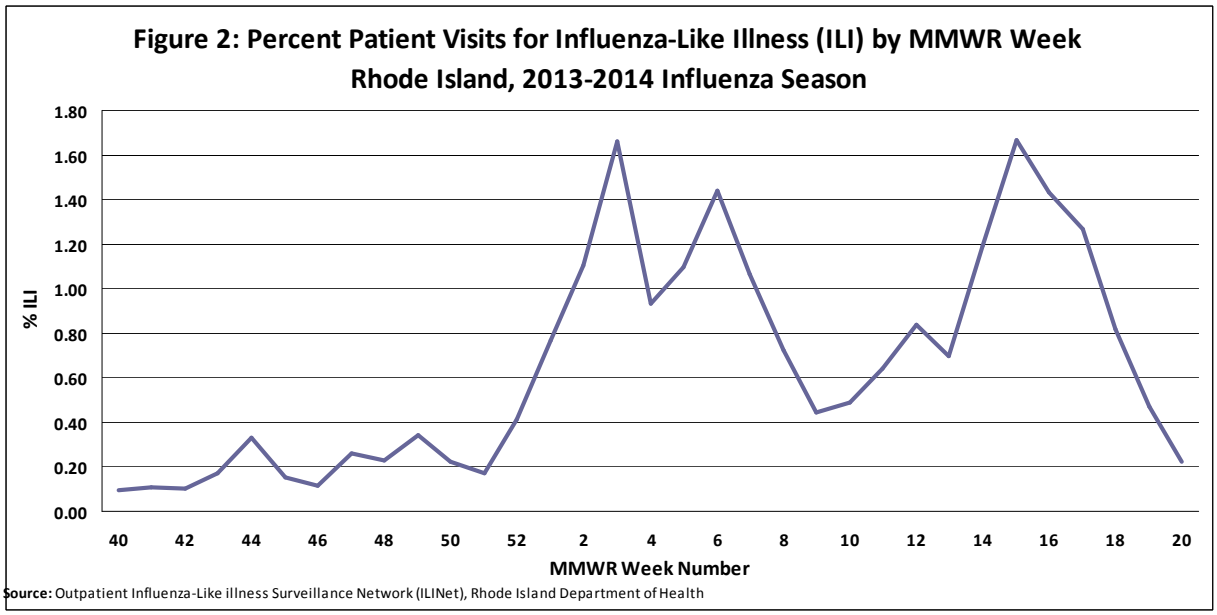
Sentinel Surveillance of Influenza-like Illness (ILI)

Based on surveillance data provided by participating ILINet sites, the 2013-2014 influenza season was on par with the 2011-2012 influenza season, which was quite mild, did not reach above 2.0% ILI statewide, and was preceded by a season with moderate activity (Figure 1). However, the 2013-2014 influenza season differs from RI's previous seasons in that the ILI curve was bimodal in shape.

NOTE: All figures are presented using the convention of Morbidity and Mortality Weekly Report (MMWR) week number. For the corresponding dates, please see **Appendix B**.

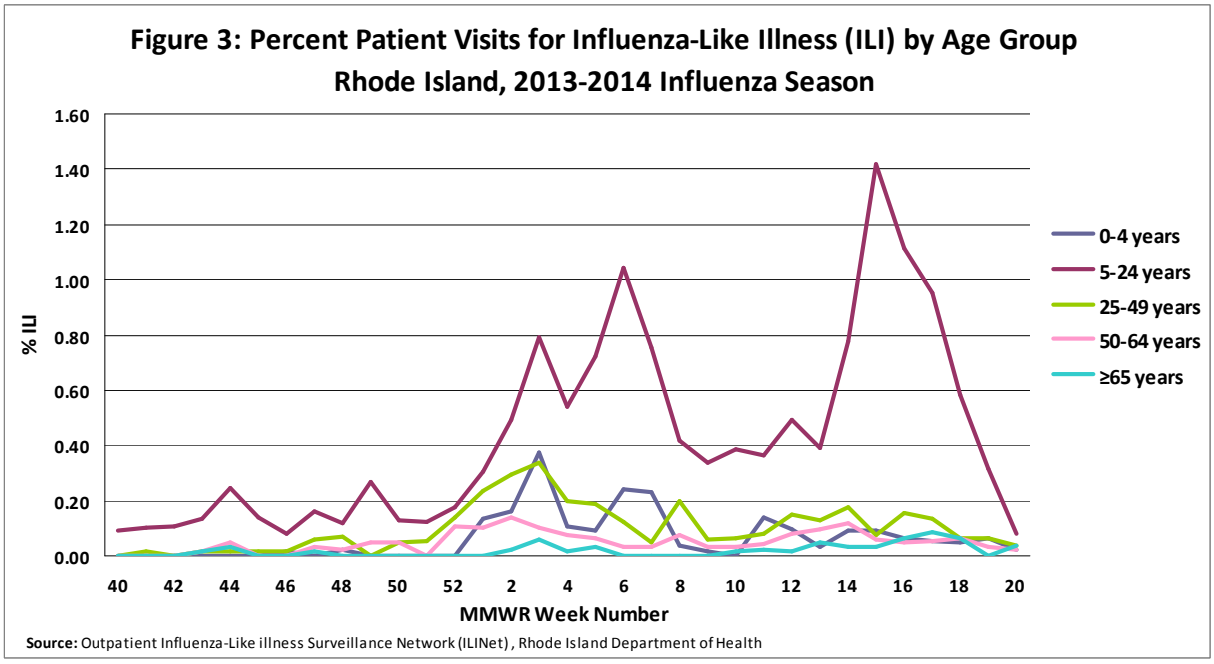


As seen in Figure 2, the 2013-2014 influenza season consisted of three peaks in activity with an overall bimodal shape. Percent ILI increased very rapidly after MMWR Week 51, peaking at 1.66% ILI during Week 3. The following week, percent ILI feel below the regional baseline of 1.2, but was followed by another peak of 1.44% ILI in Week 6. The percent ILI dipped down to 0.44% at MMWR week 9 followed by a peak at MMWR week 15 reaching 1.67% ILI.



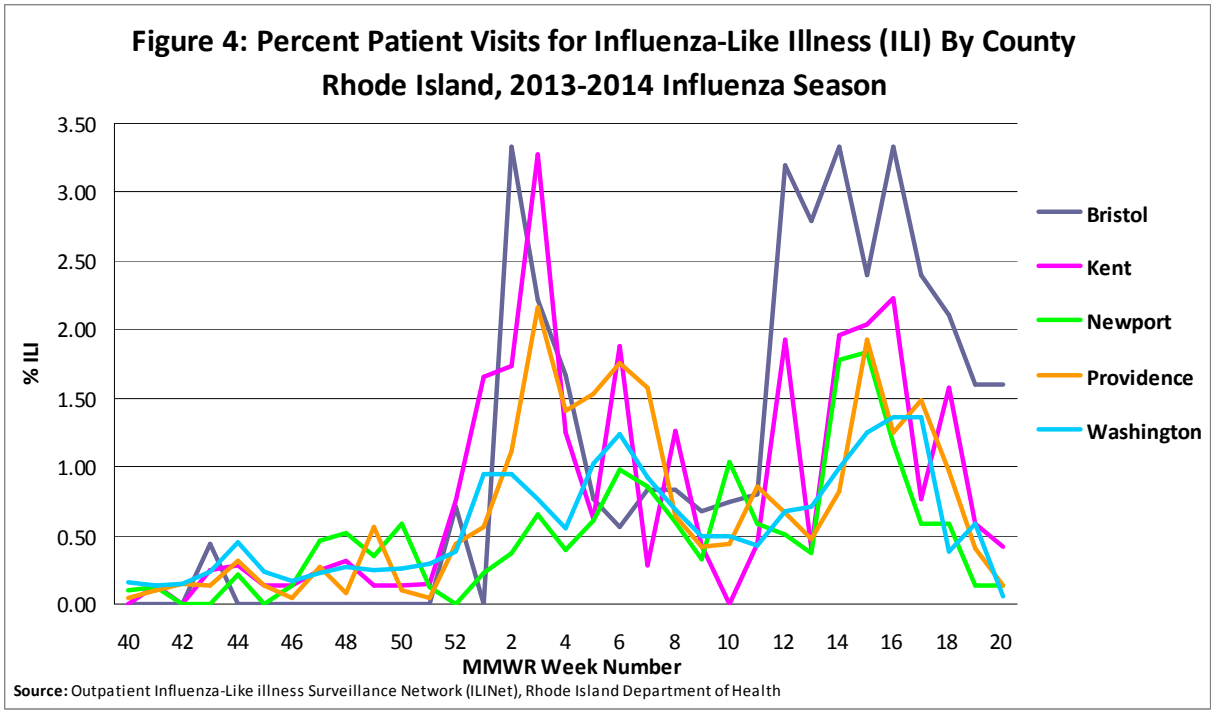
Influenza-Like Illness by Age Group

ILI surveillance data was further analyzed based on patient's age in order to determine the groups most susceptible to influenza-like infections. As illustrated in Figure 3, school-aged individuals (5-24 years) were the most likely to seek care for influenza-like illness in an outpatient setting during 2013-2014 season. For the entirety of this season, the percent patient visits for ILI among people in this age group was higher as compared to all other age groups. The lowest frequency of patient visits reported by sentinel providers for ILI was among individuals 65 years and older, closely followed by individuals in the age range of 50-64 years of age. Interestingly, while most age groups saw a peak around MMWR week 3, only the 5-24 year age group saw a significant second peak around MMWR week 17.



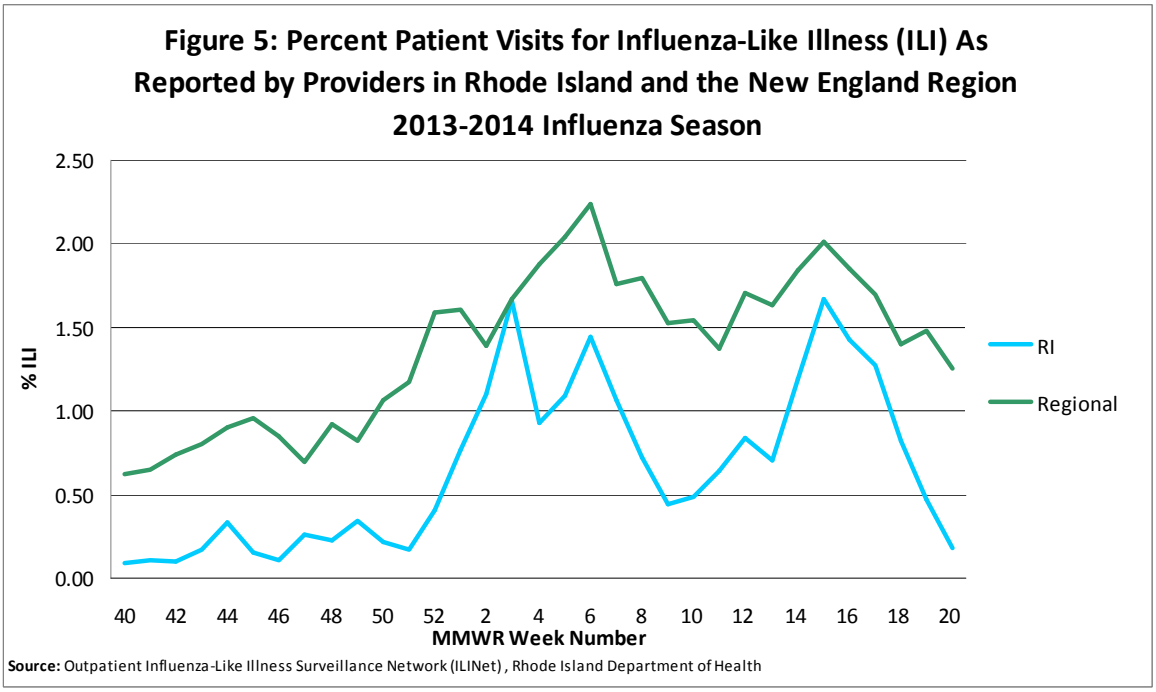
Influenza-Like Illness by County

County level analysis loosely mirrors the trend seen in Figure 2 with overall ILI activity. All counties showed an increase in ILI activity around MMWR Week 3 and/or MMWR Week 6, a decrease around MMWR Week 9 or 10, and another peak around MMWR Week 16. Bristol County saw the highest rise in individuals with influenza-like illness with Kent County following closely behind.



Rhode Island ILINet Surveillance Data Compared with the New England Region

The state-specific ILI trend across the 2013-2014 influenza season is very similar to that seen at the regional level (Region 1) where the regional ILI was consistently higher than in the state (see Figure 5). Both show an increase after MMWR week 50, with a peak around MMWR Week 6, a decrease around MMWR Week 9-12, and a second peak at Week 15 or 16.

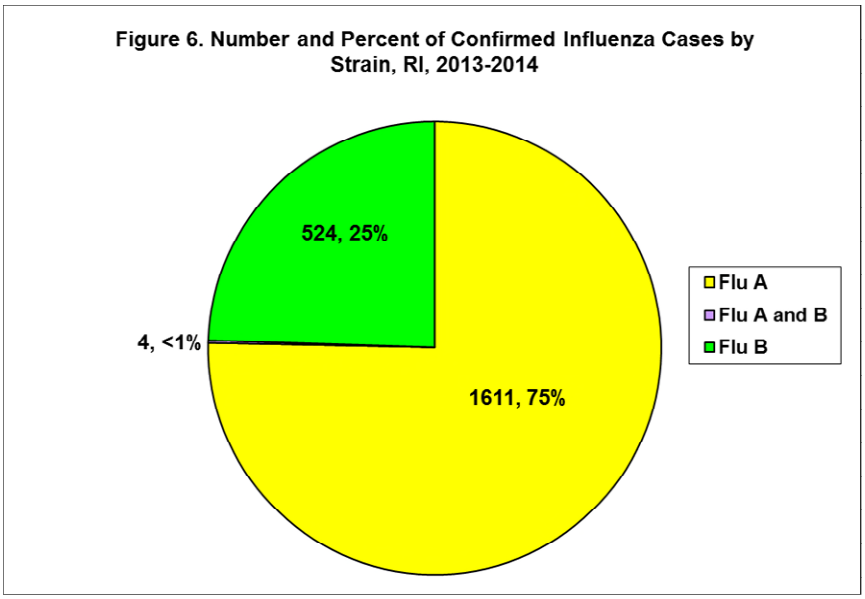


Rhode Island Hospital Surveillance

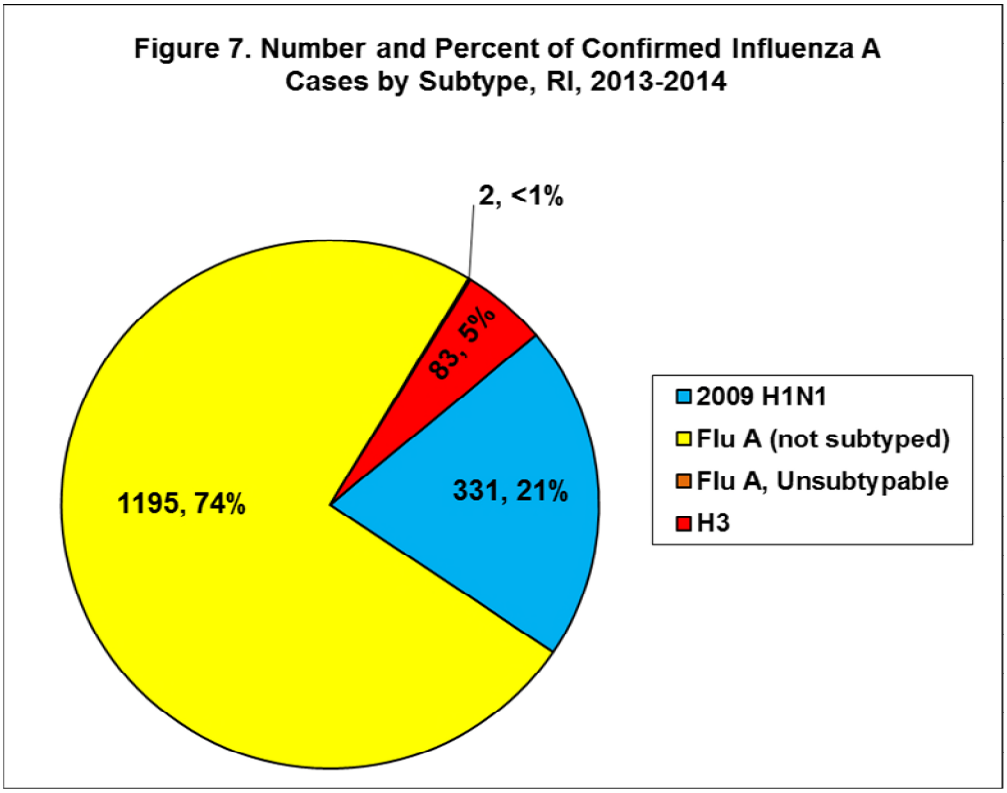
Confirmed Influenza Test Results by Flu Strain

Rhode Island's twelve (12) acute care hospitals conduct influenza tests and report positive results on a voluntary basis to IDE. This data is monitored weekly and helps guide the designation of influenza activity. During the course of the 2013-2014 influenza season, there were a total of 2,139 positive tests reported to the Rhode Island Department of Health from hospitals alone.

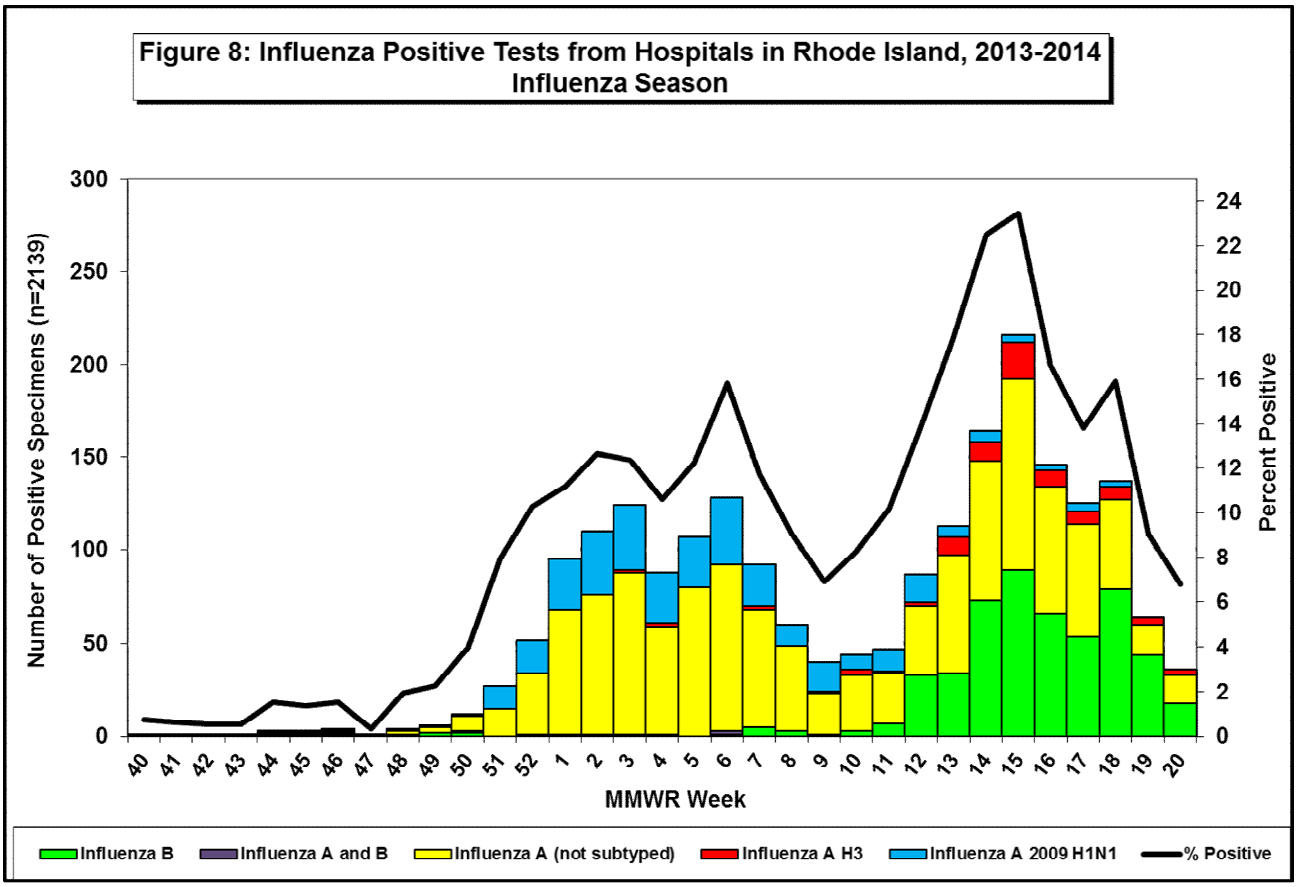
Influenza type A was the predominant strain, accounting for approximately 75% or 1,611 of all results. Twenty-five (25) percent of cases tested positive for influenza type B and <1% were co-infected with both influenza type A and B (Figure 6). This data is in accordance with what was seen by CDC at the national level[1].



Of the influenza type A specimens that were subtyped, the predominant subtype was 2009 H1N1, which accounted for 21% of the total 1,611 positive influenza A tests (Figure 7). However, the majority of influenza A specimens (74%) were not subtyped. This is largely due to the fact that most hospitals use rapid influenza diagnostic tests which are not capable of subtyping specimens.

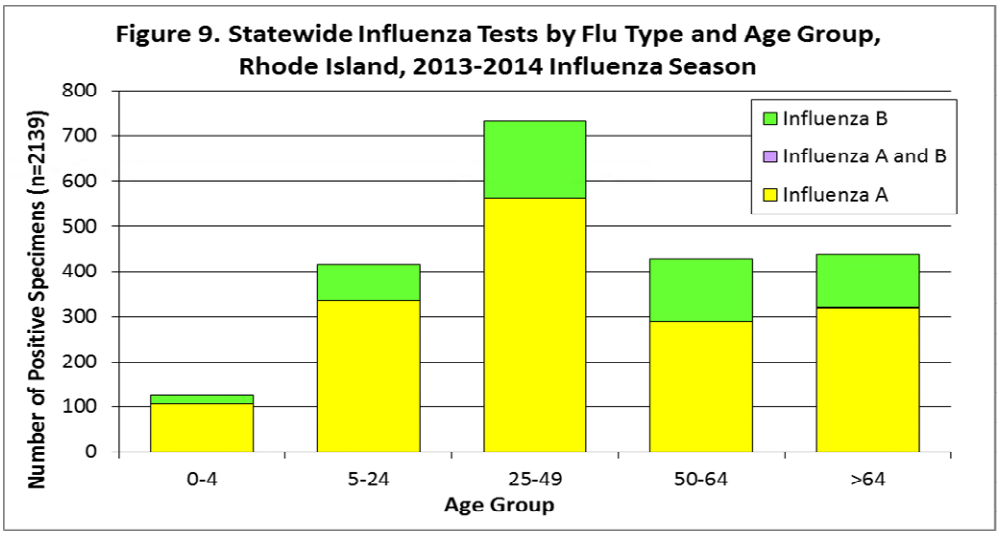


Positive influenza test results from hospitals plotted over time (Figure 8) very closely mirror statewide ILI throughout the season (Figure 2) with a peak around Week 3, Week 6, and Week 15. Figure 8 also complements Figure 6 and 7 by further demonstrating that Flu A dominated the 2013-2014 season with 2009 H1N1 as the most common subtype. Plotting the flu strains over time does provide some new insights such as the fact that Influenza A H3 became more common during the last peak of the season as did Influenza B.



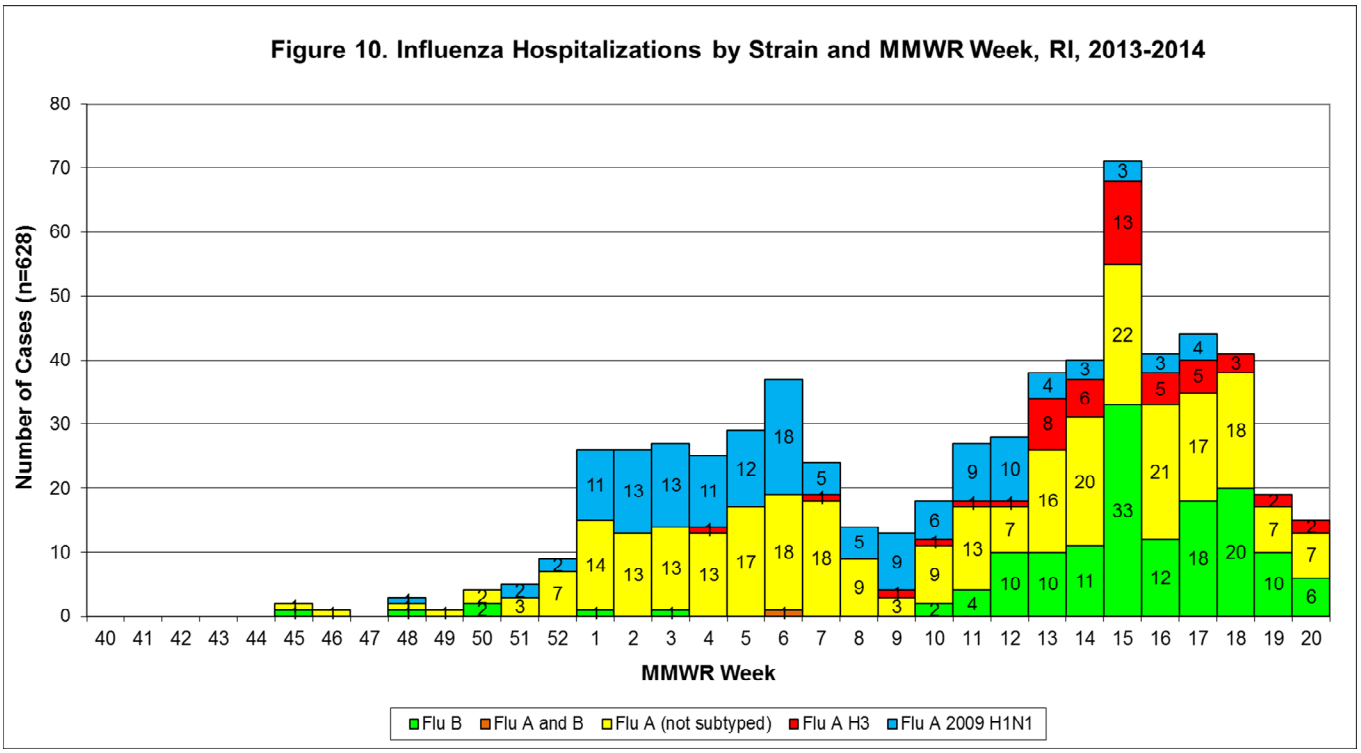
Positive Flu Test Results by Flu Type and Age Group

Hospital flu test results were analyzed further to determine whether certain age groups were more susceptible to specific flu strains. Persons ages 25-49 years of age were most likely to test positive for flu in a hospital setting (inpatient or outpatient) during the 2013-2014 season. This age group accounted for 733 (34.27%) of the total 2,139 influenza test results reported to HEALTH from hospitals. The 0-4 age group was the least likely to test positive for flu, accounting for 5.84% of cases tested at hospitals. These results are not consistent with what is observed from ILINet surveillance data. This can be explained by several reasons. Those people seeking care at hospitals: may be more severely ill than those seeking care at primary care provider offices; may not have a primary care provider; or may be ill on the weekend or holidays when their primary care provider offices are closed.

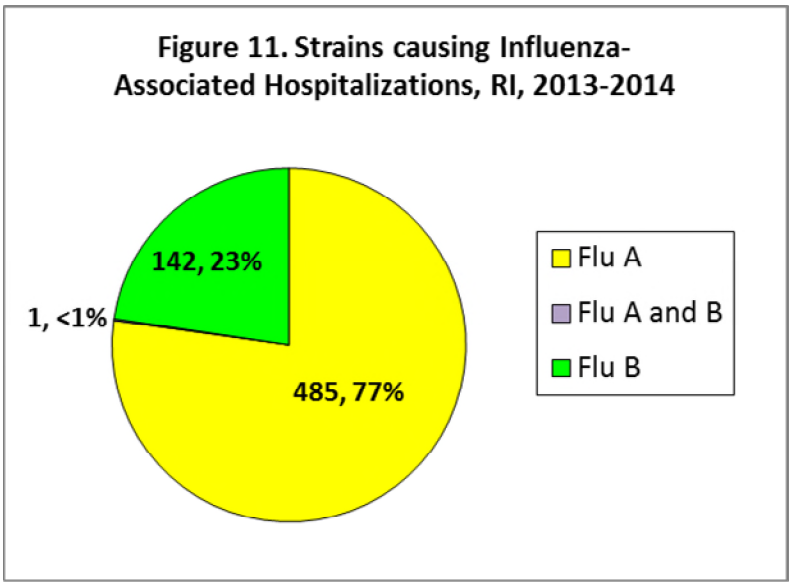


Rhode Island Influenza-Associated Hospitalizations

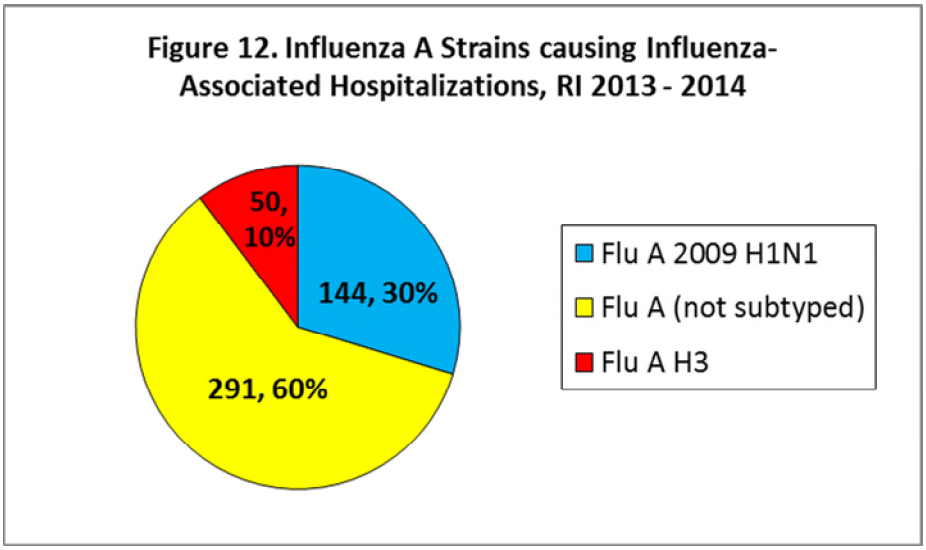
Six hundred and twenty eight (628), or 29% of all individuals that tested positive for influenza (2,139) were hospitalized during the 2013-2014 season. The curve in Figure 10 is similar to that seen in Figure 8 but with less magnitude and slightly less variability over time (with the exception of Week 15). All influenza strains are represented nearly each week.



The majority (77%) of influenza-associated hospitalizations were caused by the A strain of the virus. A smaller percent, 23%, were caused by Influenza B.

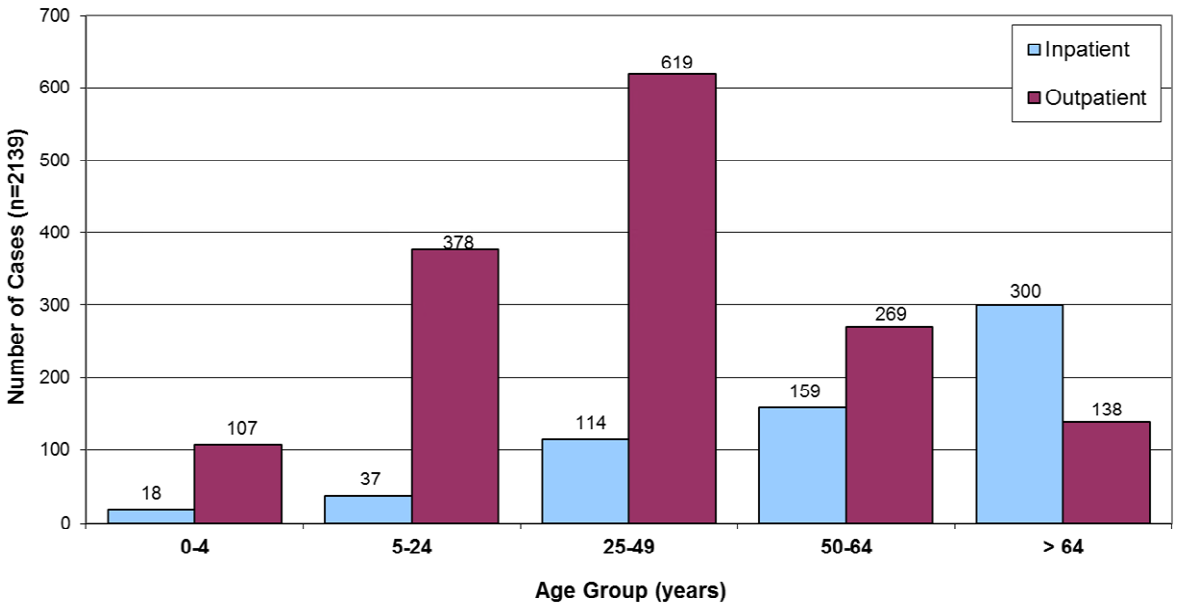


Most (60%) of the Influenza A strains that contributed to hospitalizations were not subtyped. However, of the subtyped Influenza A strains, 2009 H1N1 was most common.



As seen in Figure 13, the most common age group for outpatient visitors with positive influenza tests was 25-49 year olds. Hospitalized individuals testing postive for influenza were most frequently over the age of 64.

Figure 13. Statewide Influenza Tests by Age Group, RI, 2013-2014

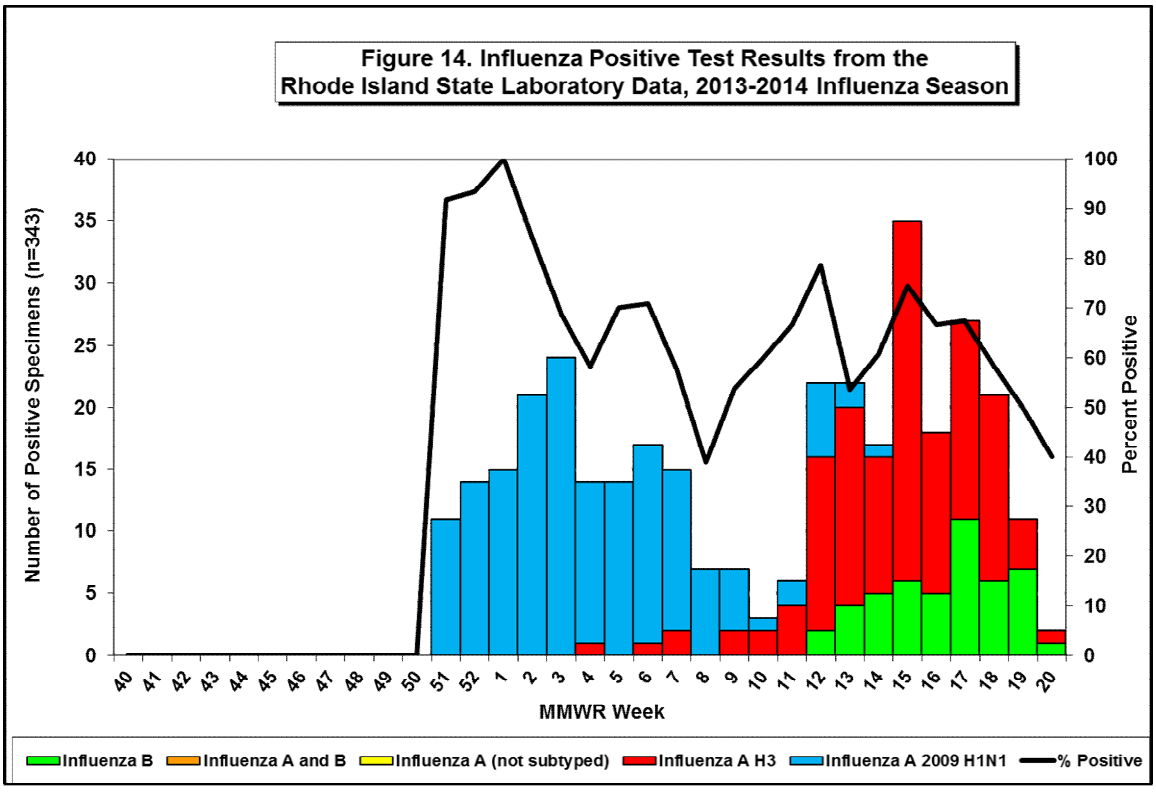


Rhode Island State Laboratory Virology Surveillance

The vast majority of seasonal influenza infections can be classified as either Influenza A or Influenza B viral infections. Influenza A viruses can be further categorized into subtypes on the basis of two surface antigens: hemagglutinin (H) and neuraminidase (N). Since 1977, Influenza A (H1N1) viruses, influenza A (H3N2) viruses, and influenza B viruses predominantly have been in global circulation. Following the H1N1 pandemic of 2009, a novel virus, Influenza A (2009 H1N1) emerged and has since been in circulation.

During the 2013-2014 influenza season, the Rhode Island State Health Laboratory tested a total of 544 specimens, of which 343 (63.1%) tested positive for influenza. Clinical specimens were submitted by participating ILINet practices, area acute care hospitals, and facilities within the community reporting influenza/respiratory outbreaks to IDE. With all of the Influenza A specimens subtyped, the influenza curve is really clear. The first specimen was confirmed at the Rhode Island State Health Laboratory in Week 51. Of the 343 positive specimens, Influenza A 2009 H1N1 was the predominant virus, accounting for roughly 48.1% of all results. Surveillance data from Region 1 illustrates a very similar pattern with Influenza A 2009 H1N1 predominating.

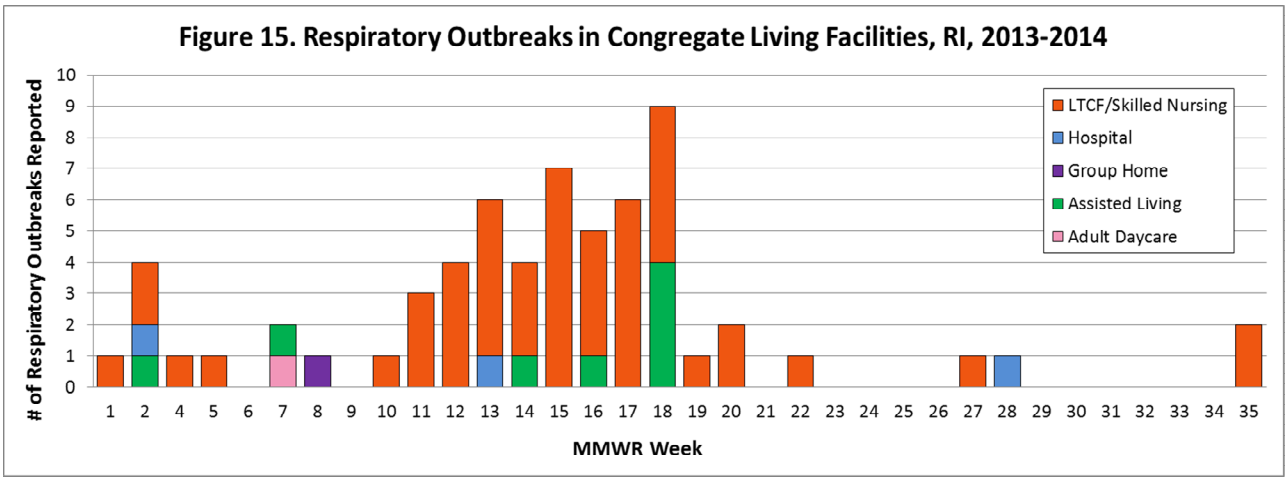
Influenza A H3 was seen several weeks later (Week 4) and by season's end accounted for 38.2% of all positive influenza test results from the Rhode Island State Health Laboratory. The first specimen to test positive for Influenza B occurred later in the season in Week 12. The data reflects the overall ILI trend in 2013-2014 with a peak around Week 3 and Week 15.



Respiratory Cluster and Outbreak Surveillance

From October 2013 to May 2014, there were 63 respiratory outbreaks reported in congregate living facilities (long-term care, assisted living, prisons, hospitals, group homes) and in adult daycares. In addition, 24 schools reported positive influenza cases to the Rhode Island Department of Health.

The first outbreak of the season occurred during MMWR week 1 (December 29, 2013 – January 4, 2014). The largest number of outbreaks was reported during MMWR week 18, just a couple of weeks past the peak of the season.



As seen in Figure 16, the majority (79%) of the outbreaks occurred in long-term care/skilled nursing facilities.

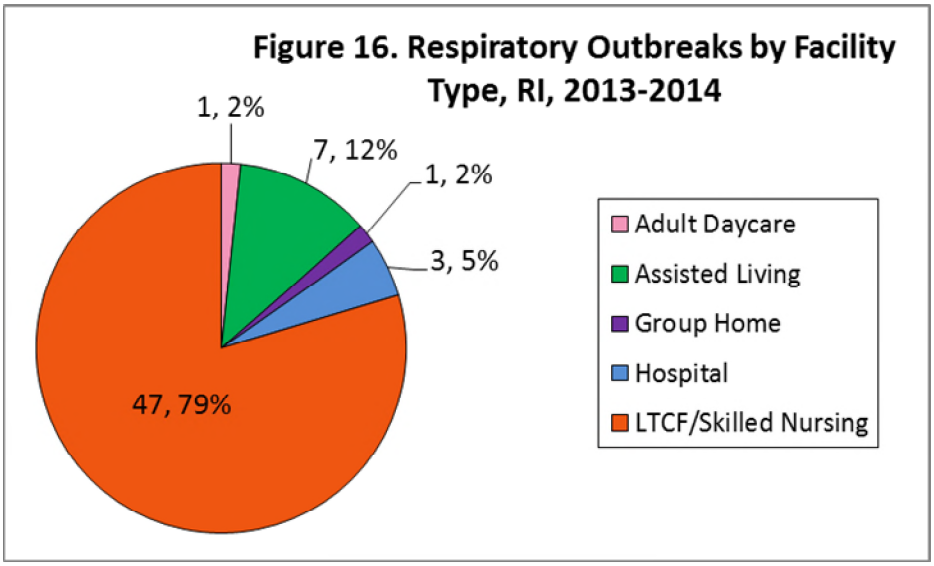
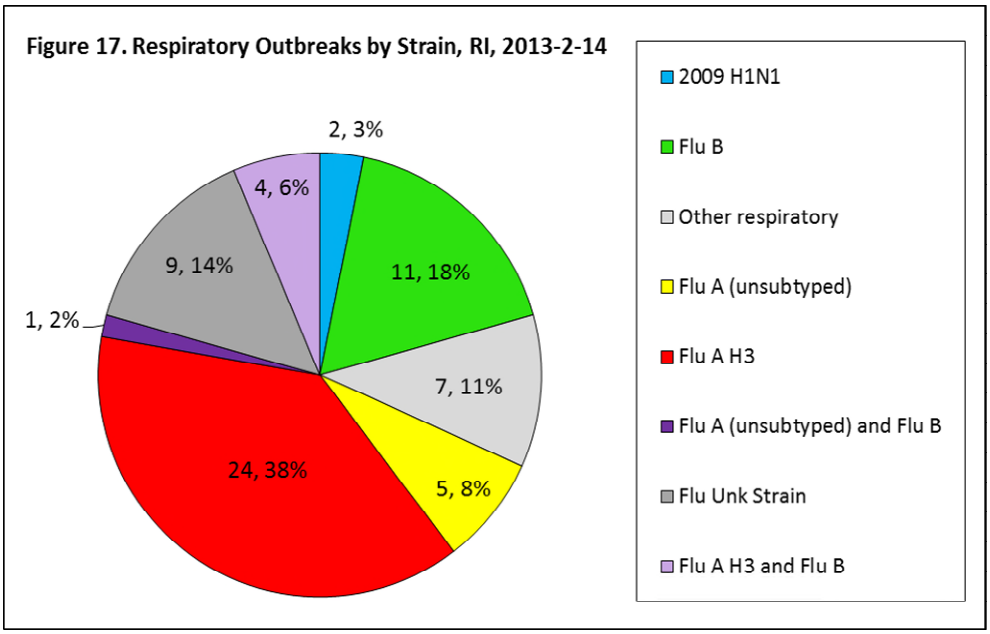


Figure 17 illustrates that most (38%) of the respiratory outbreaks were caused by Influenza A H3.

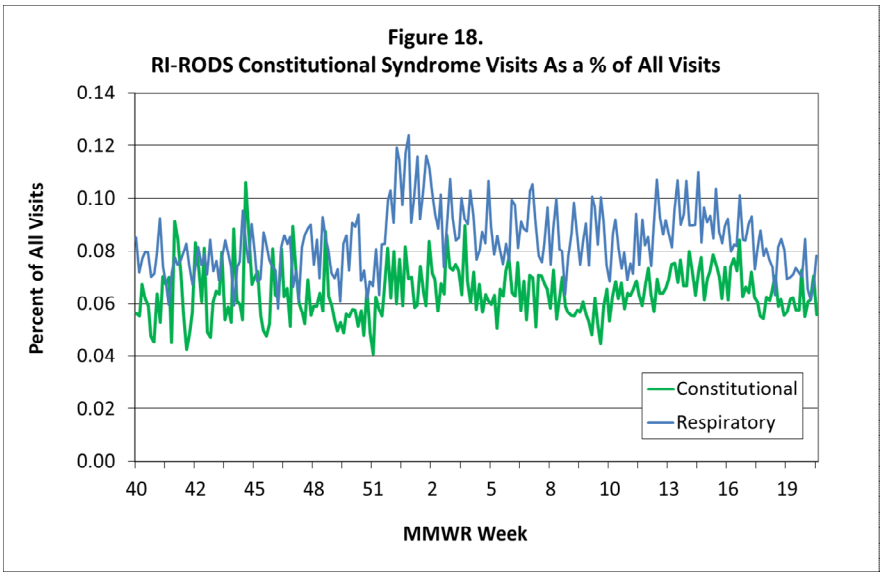


Real-Time Outbreak and Disease Surveillance System

Syndromic Surveillance

The Real-Time Outbreak and Disease Surveillance System (RODS) monitors chief complaints from emergency departments of reporting hospitals. The data is analyzed based on syndrome in order to detect patterns of disease outbreaks. The system triggers alerts based on algorithms that detect an unexpected increase in the number of visits. While there is no specific syndrome for influenza-related visits, an increase in influenza-like illness would most likely trigger an alert for "Respiratory" or "Constitutional" symptoms.

The figure below demonstrates an increase in patient visits for constitutional and respiratory chief complaints around week 1 and week 15. This timing is a week or two before the peaks seen by the enrolled sentinel sites. These occurrences illustrate the importance of the RODS system as an early detection tool.



Influenza-Associated Mortality

Influenza-associated pediatric deaths became reportable in Rhode Island in February 2006. Since that time, observed pediatric deaths associated with influenza in the state remain low. There were three (3) influenza-associated pediatric death cases investigated and confirmed during the 2009-2010 influenza A (H1N1) pandemic; prior to that, there was one (1) confirmed case reported during the 2005-2006 influenza season. There were no influenza-associated pediatric deaths reported or identified during the 2010-2011, 2011-2012, 2012-2013, or 2013-2014 influenza seasons. All influenza-associated deaths, regardless of age, became reportable during the 2013-2014 influenza season. Thirty-two deaths were reported to IDE last season (Table 1).

Table 1. Influenza-associated Deaths During the 2013-2014 Influenza Season, RI

# of deaths reported	32
Mean Age:	80
Median Age:	85
Age Range:	28 - 105

Pneumonia and Influenza (P&I) Mortality Surveillance

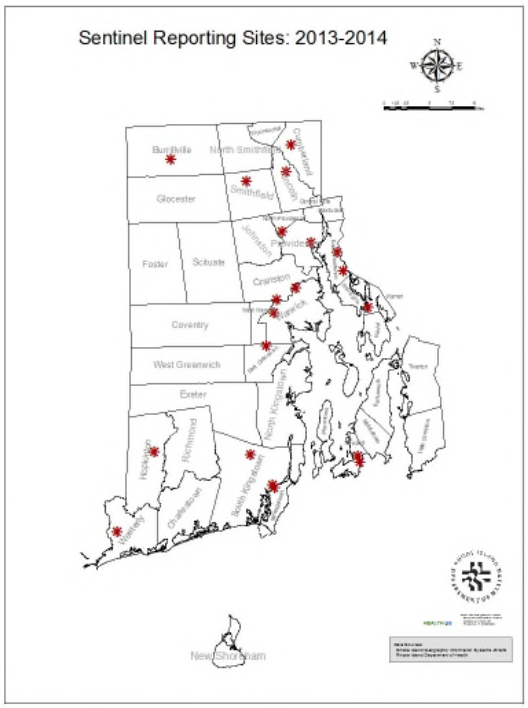
As part of its national influenza surveillance effort, the Centers for Disease Control and Prevention (CDC) receives weekly mortality reports from vital statistics offices of 122 cities and metropolitan areas across the United States within 2-3 weeks from the date of death. Participating areas report the total number of death certificates received and the number of those for which pneumonia or influenza was listed as the underlying or contributing cause of death by age groups (less than 1 year, 1-24 years, 25-44 years, 45-64 years, ≥ 65 years). Together with the World Health Organization laboratory results, U.S. private physicians' reports, and state epidemiologist estimates of influenza morbidity, the 122 Cities mortality data are used to assess the impact of influenza each winter. This system consistently covers approximately one-third of the deaths in the United States and provides CDC epidemiologists with preliminary information with which to evaluate the impact of influenza on mortality in the United States and the severity of the currently circulating virus strains. Providence, RI is one of the participating cities.

There were only 5 deaths reported through the Pneumonia and Influenza Mortality Surveillance system for Providence County during the 2013-2014 influenza season. Interestingly, these all occurred during or after MMWR week 16, which is very late into the season. All individuals were 65 years or older.

HEALTH greatly appreciates the efforts of all our ILINet providers and their staff. These ILINet providers generate data for much of the influenza surveillance program and for the information presented in this report. Participating providers for the 2013-2014 season are listed below.

Table 2. Sentinel Providers

RI Sentinel Providers



1. Westerly Urgent Care **77 Franklin Street** **Westerly, RI 02891**	**11. Warren Family Practice** **851 Main Street** **Warren, RI 02885**
2. Anchor Medical Associates **1 Commerce Street** **Lincoln, RI 02865**	**12. Salve Regina College Health Center** **100 Ochre Point Ave** **Newport, RI 02840**
3. Midland Medical **1312 Oaklawn Avenue** **Cranston, RI 02920**	**13. East Greenwich Pediatrics, Inc** **1377 South County Trail-Suite 2B** **East Greenwich, RI 02818**
4. Wood River Health Services, Inc **823 Main Street** **Hope Valley, RI 02832**	**14. Well One Primary Medical** **36 Bridgeway** **Pascoag, RI 02825**
5. South County Internal Medicine **481 Kingstown Road** **Wakefield, RI 02879**	**15. University of Rhode Island** **Potter Building Health Center** **6 Butterfield Road** **Kingston, RI 02881**
6. University Medicine Foundation **1035 Post Road** **Warwick, RI 02888**	**16. Aquidnick Medical Associates, Inc** **50 Memorial Boulevard** **Newport, RI 02840**
7. Coastal Waterman Pediatrics **900 Warren Avenue** **East Providence, RI 02914**	**17. University Medical Foundation** **1525 Wampanoag Trail, Suite 202** **East Providence, RI 02915**
8. Community College of Rhode Island **400 East Avenue** **Warwick, RI 02860**	**18. Rhode Island College** **Brown Hall** **600 Mount Pleasant Avenue** **Providence, RI 02908**
9. South County Walk-in & Primary **360 Kingstown Road Suite 104** **Narragansett, RI 02883**	**19. Brown University Health Center** **13 Brown Street** **Providence, RI 02912**
10. Bryant University Health Center **1150 Douglas Pike** **Smithfield, RI 02917**	**20. Blackstone Valley Pediatrics** **2 Meehan Lane** **Cumberland, RI 02864**

Appendix A. Estimated Level of Influenza Activity

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.

ACTIVITY LEVEL DEFINITIONS

The activity level definitions used in the State and Territorial Epidemiologist's Report are:

Activity Level	ILI activity*/Outbreaks		Laboratory data
No activity	Low	And	No lab confirmed cases†
Sporadic	Not increased	And	Isolated lab-confirmed cases
	OR		
	Not increased	And	Lab confirmed outbreak in one institution‡
Local	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
	OR		
	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
Regional (doesn't apply to states with ≤4 regions)	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
	OR		
	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
Widespread	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 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.

Appendix B. MMWR Week Number and Corresponding Dates for 2013-2014

MMWR Week	Dates
40	September 29 - October 05 2013
41	October 06 - October 12 2013
42	October 13 - October 19 2013
43	October 20 - October 26 2013
44	October 27 - November 02 2013
45	November 03 - November 09 2013
46	November 10 - November 16 2013
47	November 17 - November 23 2013
48	November 24 - November 30 2013
49	December 01 - December 07 2013
50	December 08 - December 14 2013
51	December 15 - December 21 2013
52	December 22 - December 28 2013
1	December 29 2013 - January 04 2014
2	January 05 - January 11 2014
3	January 12 - January 18 2014
4	January 19 - January 25 2014
5	January 26 - February 01 2014
6	February 02 - February 08 2014
7	February 09 - February 15 2014
8	February 16 - February 22 2014
9	February 23 - March 01 2014
10	March 02 - March 08 2014
11	March 09 - March 15 2014
12	March 16 - March 22 2014
13	March 23 - March 29 2014
14	March 30 - April 05 2014
15	April 06 - April 12 2014
16	April 13 - April 19 2014
17	April 20 - April 26 2014
18	April 27 - May 03 2014
19	May 04 - May 10 2014
20	May 11 - May 17 2014

Appendix C: For More Information:

Rhode Island Department of Health Influenza Website
http://www.health.ri.gov/flu/index.php

Centers for Disease Control and Prevention (CDC)
http://www.cdc.gov/flu/

World Health Organization (WHO)
http://www.who.int/topics/influenza/en/

Prevention: Cover your cough print ready flyer
http://www.cdc.gov/flu/protect/pdf/covercough_school8-5x11.pdf

Rules and Regulations Pertaining to the Reporting of Communicable, Environmental, and Occupational Diseases
http://sos.ri.gov/documents/archives/regdocs/released/pdf/DOH/7434.pdf

MMWR Influenza reports
http://www.cdc.gov/mmwr/mguide_flu.html

Interactive FluView
http://www.cdc.gov/flu/weekly/fluviewinteractive.htm

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