



Pandemic (H1N1) 2009 Epidemiology Summary Report Rhode Island: 2009-2010

Division of Infectious Disease and Epidemiology

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1. Synopsis

The novel 2009 A H1N1 (2009 H1N1 or Swine flu) strain of influenza first emerged in the United States during April 2009 and rapidly spread across all states and around the globe. The World Health Organization after declaring several pre-pandemic alert phases, declared a global pandemic on June 11, 2009. During the course of two waves of transmission, the novel H1N1 resulted in substantial morbidity and mortality in the United States from spring through fall of 2009 and remained the dominant influenza strain throughout the 2009-2010 influenza season. 2009 H1N1 has been reported in all U.S. states and territories and in nearly all countries worldwide.

The RI Department of Health activated “Incident Command System” (ICS) and it’s Emergency Operations Center (EOC) on April 26, 2009, to coordinate the response to this emerging public health threat. Response activities were organized into a team structure according to the National Incident Management System. These teams had different areas of focus including but not limited to: logistics, communications, epidemiology, laboratory testing, at-risk populations, antiviral medications, a vaccine task force, and hospital/pre-hospital preparedness. As the outbreak unfolded, team structures and staffing were periodically assessed and modified for functionality and utility.

This report summarizes the surveillance efforts of the Epidemiology Branch for the duration of activation of the “incident command system” of the Rhode Island Department of Health, from April 19, 2009 (date of the first U.S. Swine flu case) through May 22, 2010 (MMWR week 20) during the 2009 pandemic.

In Rhode Island, the emergence and transmission of the virus resulted in a first wave of high levels of flu activity during late spring/early summer 2009, followed by a lull in late summer. A larger second wave of flu activity was recorded during the fall, peaking in early November 2009 (MMWR Week 44), tapering off in late fall and subsiding in March 2010. At the peak level of activity, the percentage of sentinel office visits for influenza-like illness (ILI) was 12.73%. Note that in a bad year this number does not exceed 5%. The Rhode Island peak in activity coincided with that of New England (Region 1) but was somewhat larger and occurred slightly later than the national peak, which occurred in late October. However, following the peak activity, the Rhode Island ILI rate was consistently below that of the national level from December 2009 through May 2010. Attack rates were highest for pediatric and young adult populations, as was the experience nationwide. In terms of severity, there were 443 H1N1 hospitalizations, which was proportionately lower than what would have been expected from the national estimates of 274,000 (range 195,000 to 403,000), as well mortality in RI was also proportionately low with 13 deaths attributable to the pandemic, compared to an estimated 12,470 (range 8,870 to 18,300) nationally. Pregnancy and morbid obesity emerged as new risk factors for severe illness in RI and nationally. During the Pandemic and through the 2009-2010 influenza season in Rhode Island, 2009 A H1N1 was the dominant circulating influenza strain with sporadic detections of seasonal A and B subtypes, which was also the case regionally and nationally. Antiviral resistant to

Oseltamivir was not an issue with a sample of RI isolates tested. Lastly, based on a survey conducted by the U.S. Centers for Disease Control and Prevention (CDC) Rhode Island had the highest 2009 H1N1 vaccination rate of the 50 states, estimated at 39% of its residents. Rates were much higher for pediatric populations.

2. Overview of RI Influenza Surveillance Systems

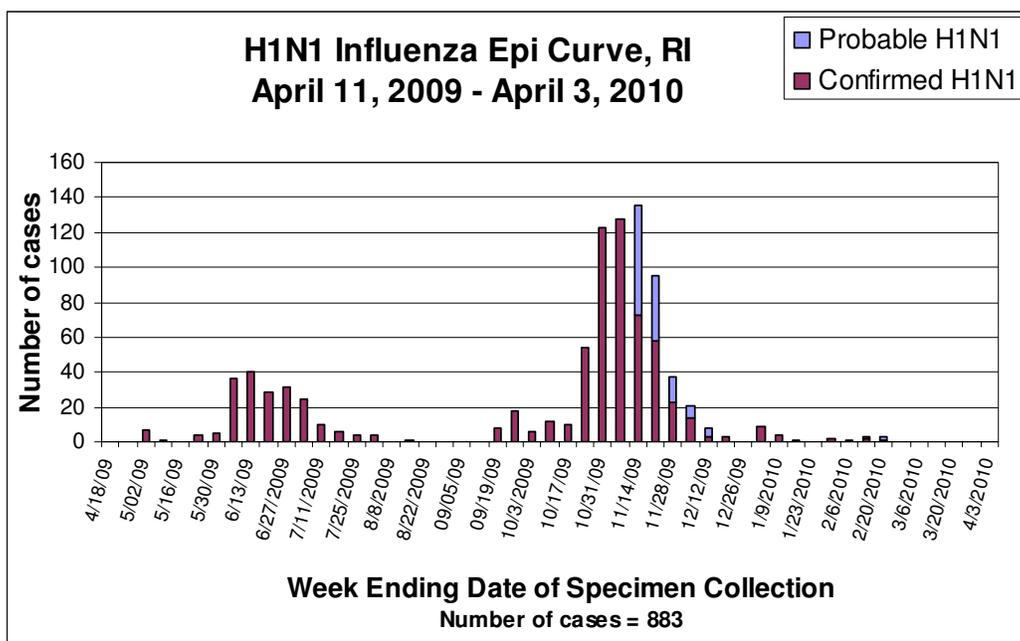
The goal of influenza surveillance is to estimate the epidemic curve in time (arrival, peak and departure) of the influenza outbreak, assess the geographic spread of illness, assess severity as measured by hospitalizations and deaths, assess strain characterization (dominant circulating strain, antibiotic resistance, match with vaccine strain etc.), as well as assess impact on the health care delivery system. These data support public health actions such as public information campaigns, medical policy guidance, statewide planning for surge capacity in medical care settings and also guide timing of implementation of prevention and control responses by public health officials. The Division of Infectious Disease and Epidemiology employed the following systems for monitoring of influenza in the state, most were pre-existing, and others were new or expansions of existing systems:

- **Case Based Surveillance.**
- **RI State Health Laboratory surveillance for influenza.**
- **Institutional clusters and outbreak surveillance.**
- **Influenza sentinel provider system (ILINet).**
- **2009 H1N1-associated hospitalizations.**
- **2009 H1N1-associated mortality.**
- **2009 H1N1-associated pediatric mortality.**
- **Pneumonia and influenza mortality (122 Cities).**
- **Real-time Outbreak and Disease Surveillance (RODS) system.**
- **School absenteeism.**
- **State Epidemiologists' Weekly Report on Influenza Activity.**
- **Neighborhood Health Plan & PCHC surveillance for ILI burden.**
- **Surescripts antiviral medication prescription surveillance:**
- **2009 H1N1 Vaccination Doses**

3. Case Based Surveillance System

H1N1 surveillance via PCR testing at the RI State Laboratory was restricted to the following priority cases: all hospitalized cases, all suspect deaths attributed to influenza, all pregnant women, sample testing from outbreak/cluster investigations, and from a sampling of patients visiting sentinel provider sites (5 swabs a week per sentinel). A small number of tests were performed outside these parameters, upon special request by community physicians. These results were useful to derive consistent, systematic and timely intelligence on the epidemic curve, statewide geographic spread as well as intensity of circulation over time.

Lifespan laboratories started performing the Luminex PCR test on Nov 9th, 2009 which provides a result that indicates the presence of Influenza A virus, and is able to confirm seasonal A and B strains but not the H1N1 swine strain. This test was validated by the state lab. These tests that are Influenza A positive but are not seasonal A or B positive were recorded by epidemiology as "probable H1N1". And are displayed below.



**H1N1 Case Characteristics by Age
Rhode Island, April 11, 2009 - April 3, 2010**

| | Age group (N) | Age group (%) | Female (N) | Female (%) | Pregnant (N) Hosp/Total | Hospitalized (N) | Hospitalized (%) | Deaths (N) |
|--------------------|----------------------|----------------------|-------------------|-------------------|--|-------------------------|-------------------------|-------------------|
| 0-4 years | 87 | 9.9% | 39 | 4.4% | --- | 78 | 17.7% | - |
| 5-12 years | 157 | 17.8% | 68 | 7.7% | --- | 55 | 12.5% | 2 |
| 13-18 years | 143 | 16.2% | 72 | 8.2% | 1/7 | 42 | 9.5% | 1 |
| 19-25 years | 179 | 20.3% | 109 | 12.3% | 10/38 | 39 | 8.8% | - |
| 26-44 years | 148 | 16.8% | 92 | 10.4% | 11/27 | 96 | 21.8% | 1 |
| 45-64 years | 138 | 15.6% | 87 | 9.9% | --- | 102 | 23.1% | 6 |
| 65+ years | 30 | 3.4% | 14 | 1.6% | --- | 29 | 6.6% | 3 |
| Unknown | 1 | 0.1% | 1 | 0.1% | --- | --- | --- | - |
| TOTAL | 883 | 100% | 482 | 54.6% | 22/72 | 441 | 100% | 13 |

**Geographic Distribution of H1N1 Cases
Rhode Island, April 11, 2009 - April 3, 2010**

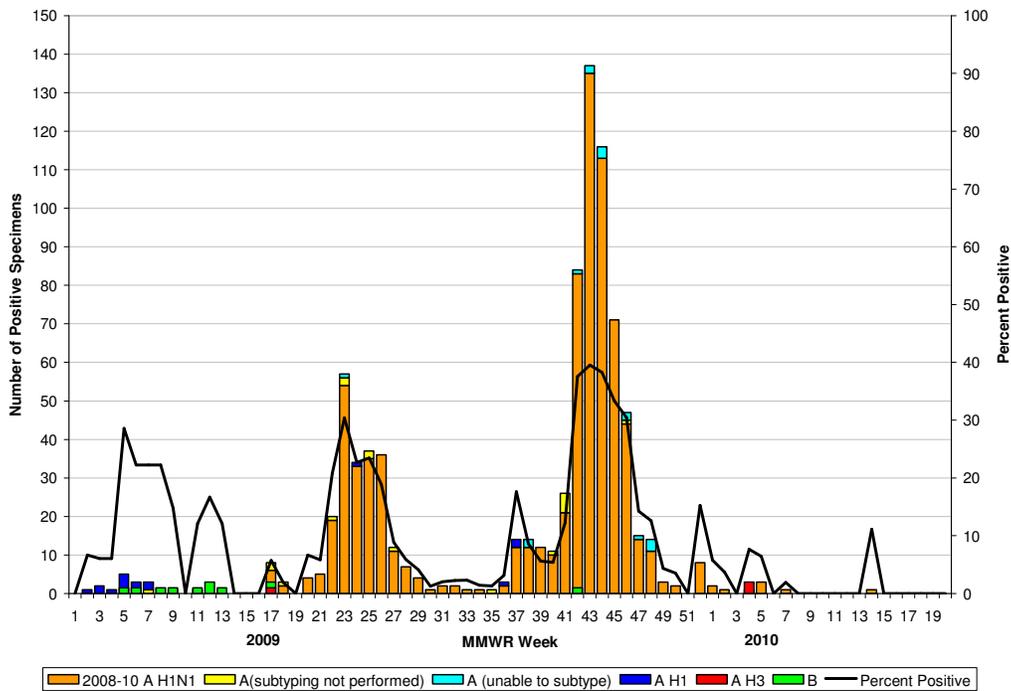
| County | Number of Cases | Percent | Rate per 100,000* | Number of Hospitalizations | Number of Deaths |
|-------------------|------------------------|----------------|--------------------------|-----------------------------------|-------------------------|
| Bristol | 25 | 2.8% | 2.83 | 9 | 1 |
| Kent | 83 | 10.9% | 9.40 | 57 | 1 |
| Newport | 57 | 7.6% | 68.86 | 15 | |
| Providence | 605 | 66.1% | 68.52 | 340 | 10 |
| Washington | 113 | 12.0% | 89.05 | 20 | 1 |
| TOTAL | 883 | 100% | 83.47 | 441 | 13 |

* Rates are based on 2007 estimates of the population for Counties of RI. Source: Population Division, US Census Bureau

Other than supporting all the other surveillance systems, lab testing was also performed to detect antiviral resistance. A sample of swabs was periodically sent to CDC for this purpose.

The RI State Health Laboratory data demonstrates the two waves of the 2009 H1N1 pandemic, the smaller first wave from early-May through early-July 2009 followed by a lull and then a larger second wave from mid-September through early-December 2009. Each wave lasted approximately 8 weeks. At its peak volume (week 43), the RI State Health Laboratory tested 231 isolates, 137 of which were positive for influenza (59.3%). Following the 2009 fall wave, laboratory testing tapered off, with only 1 isolated positive case of 2009 H1N1 (found week 14, ending April 10, 2010). In total from April 2009 - week 16 (week ending April 25, 2009) through May 2010 - week 20, the RI State Health Laboratory tested 3,532 isolates with 826 samples positive for influenza. The dominant influenza strain identified during the pandemic via laboratory testing was the 2009 H1N1 (Swine origin flu), which accounted for 785 of the cases (95.0%); an additional 32 isolates were positive for influenza A but were either unsubtypable (n = 15; 1.8%) or typing was not performed (n = 17; 2.1%). Seasonal influenza strains only accounted for 1.1% of positive isolates during the pandemic and through the 2009-2010 influenza season. Specifically, seasonal influenza A H1N1 was identified in 4 samples (0.5%), A H3N2 in 3 samples (0.4%) and B in 2 (0.2%) of samples.

WHO isolates for Rhode Island reported by WHO/NRVESS collaborating laboratories, MMWR Week 1 (ending January 10, 2009) to MMWR Week 20 (ending May 22, 2010)



In addition to the above laboratory reports RI Hospital Laboratory initiated Luminex PCR testing as mentioned in the hospitalizations section. As those tests are not specific for

H1N1 they are not reportable through the WHO-NVRSS system, but proved invaluable for hospitalization surveillance, easing the burden on the state lab considerably, while supporting surveillance efforts with timely reporting of results to epidemiology.

5. Institutional Clusters and Outbreak Surveillance

Institutional clusters and outbreaks are mandatory reportable events. An institutional cluster is defined in regulation as two (2) or more cases of influenza-like illness (ILI) in a long-term care facility (LTCF), school or other congregate environment. Clusters are investigated and responded to on a case by case basis using standard epidemiology principles.

School Cluster Investigations

Early in the pandemic (April-May 2010) school cases had been described in Texas and major school outbreaks with school closings were occurring in New York (Queens). Not surprisingly in RI some of our earliest case reports of ILI associated with travel to Mexico or travel to New York occurred in school children and college age youth, resulting in testing of sporadic cases. Only one school closing was recommended in early May, based on existing CDC school closing guidelines as a community mitigation measure. Once it was understood that the severity of illness (as measured by hospitalizations and deaths) caused by pandemic strain was relatively low and that widespread community transmission was in progress, school closure was rapidly abandoned as a mitigation strategy.

School nurse teachers were instructed to report class room clusters (2 or more cases of ILI reporting to the nurse's office) and in the first month of the pandemic it was the testing of school students from these classroom clusters that was the first indication of H1N1 circulating in RI. Almost simultaneously cases started being reported from college health centers. Suspect cases were swabbed and rapidly confirmed. By May 5th the first school student and the first university student had been confirmed.

There were 26 school influenza cluster investigations from May through June 2009, with 7 confirmed outbreaks (26.9% of investigations). During the 2009-2010 school-year, from September 2009 through June 2010, there were an additional 169 school influenza cluster investigations, resulting in 22 confirmed outbreaks (13.0% of investigations).

The utility of cluster investigations was to document community wide circulation of the pandemic strain, however in retrospect after the initial two months of the pandemic continued monitoring of this very labor intensive system did not provide any useful additional public health intelligence. It was however our very first surveillance system that indicated to us the fact that H1N1 had arrived in the state.

Other Institutional Cluster Investigations

From May through August of 2009, there were 2 influenza cluster investigations at rehabilitation facilities with 0 confirmed influenza outbreaks; 5 investigations at long-term care facilities resulting in 0 confirmed outbreaks; and 2 investigations at summer camps resulting in 0 confirmed outbreaks. From September 2009 through May 2010, there was 1 influenza cluster investigation at a rehabilitation facility with 0 confirmed influenza outbreaks; 4 investigations at long-term care facilities with 0 confirmed outbreaks; 1 investigation at a chronic care hospital, which was confirmed to be an influenza outbreak; and 2 investigations at correctional institutes, both of which were confirmed influenza outbreaks. Control recommendations were made according to published guidelines. See advisories at <http://www.health.ri.gov/flu/about/h1n1/>

6. Influenza Sentinel Surveillance System

Historically RI has maintained 17 sentinel physician sites. As the pandemic affected pediatric and young adult populations, the network was ramped up to include 4 new pediatric locations and 5 new university health centers as well as an additional urgent care location so that there were 27 Rhode Island sentinel providers participating in the RI surveillance network during the 2009 H1N1 pandemic (see **Appendix A** for a complete listing of sentinel providers in RI). The sentinel provider system requires weekly reporting of number of influenza-like illness (ILI) cases, by age-group, along with the denominator of total number of all visits for that week. From this, ILI rates as a proportion of all visits is calculated (ILI %). ILI is defined as fever ($\geq 100^{\circ}$ F or 37.8° C) and cough and/or sore throat in the absence of a known cause other than influenza. Sentinel providers submit weekly data to the U.S. Centers for Disease Control and Prevention (CDC) via the internet or by fax. Sentinel providers are also responsible for routine submission of nasopharyngeal swabs to the RI State Health Laboratory for influenza virus detection and subtyping by reverse-transcription polymerase chain-reaction (RT-PCR), with a prescribed periodicity determined by public health need. During the pandemic sentinels were asked to submit 1 swab per day (5 per week).

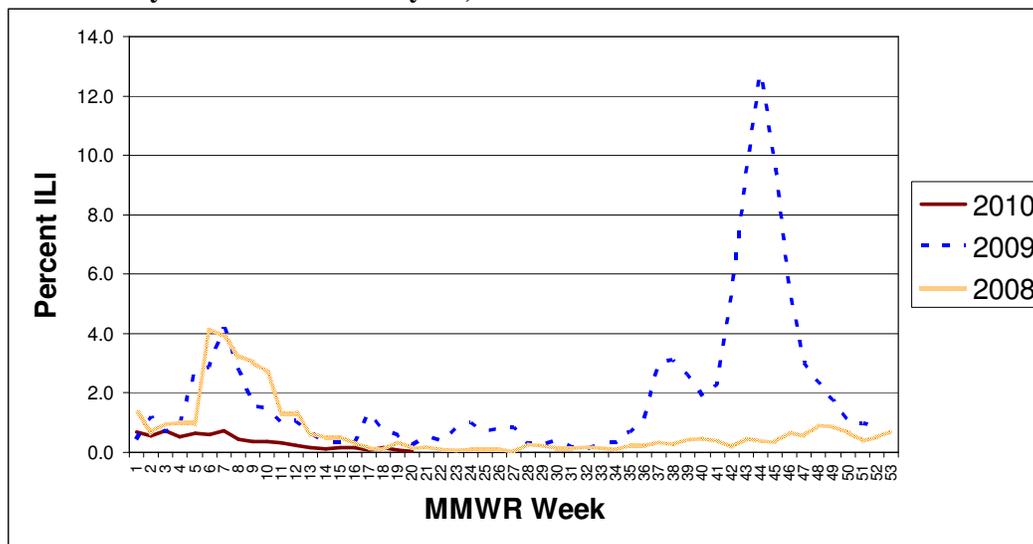
The surveillance data provided by the Influenza Sentinel Provider Surveillance System during the pandemic show two distinct waves of activity, after the seasonal peak had passed. The initial wave is represented by the small spike in percent ILI observed in early to mid-May 2009; followed by a large surge in influenza activity in the fall (**Figure 1**). Peak activity occurred at MMWR week 44 (ending November 7, 2009) with an ILI rate for sentinel provider visits of 12.73%. For comparison to seasonal years, the highest recorded ILI activity in the last 5 influenza seasons has not been higher than 5%. By mid-December, percent ILI reported by the sentinels subsided to low levels, dropping below the regional baseline of 1.2% (**Appendix B: Region 1**) for the remainder of the season. This pattern was completely different from the usual seasonal epidemic curve.

Seasonal peak activity in percent ILI occurred during February of the previous 2-years. The 2007-2008 peak was at Week 6 (ending February 9, 2008) with 4.11% ILI, and peak

ILI activity for the 2008-2009 season occurred at Week 7 (ending February 21, 2009) with 4.20% ILI (**Figure 1**).

All Influenza Sentinel Provider Surveillance System figures are presented using the U.S. Centers for Disease Control and Prevention (CDC) Morbidity and Mortality Weekly Report (MMWR) week number. The corresponding dates are provided in **Appendix C**.

Figure 1. Percentage of Sentinel Provider Visits for influenza-like illness (ILI) by MMWR week and year, RI 2007-2010

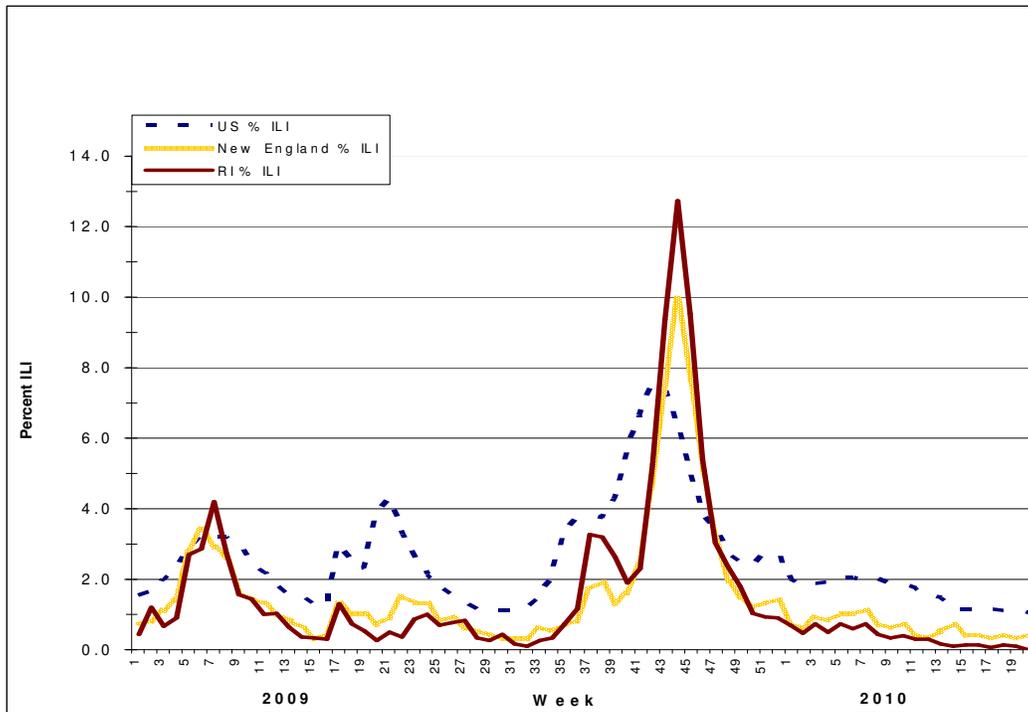


Note: There were 53 MMWR Weeks for the 2008 calendar

Rhode Island Sentinel Surveillance Compared with National and Regional Data

The ILI activity reported in Rhode Island during the 2009 H1N1 pandemic mirrored the pattern to that reported regionally (Region 1: New England) and nationally. Nationwide, there was a more pronounced initial peak at the start of the pandemic (spring 2009) relative to Rhode Island and New England, for which milder increases in ILI activity were observed. The peak ILI activity in Rhode Island took place during the second wave (fall 2009) of the pandemic, occurring during the first week of November (Week 44), and, although slightly higher (12.73%), corresponded to that of New England (9.97%). The national peak in ILI activity happened slightly earlier, in late October (**Figure 2**), and at lower levels (7.54%). Rhode Island and New England had similar sentinel ILI rates that were below the national rates until the fall wave of the 2009 H1N1 pandemic (Week 43 through Week 46), after which they dropped back to below national levels.

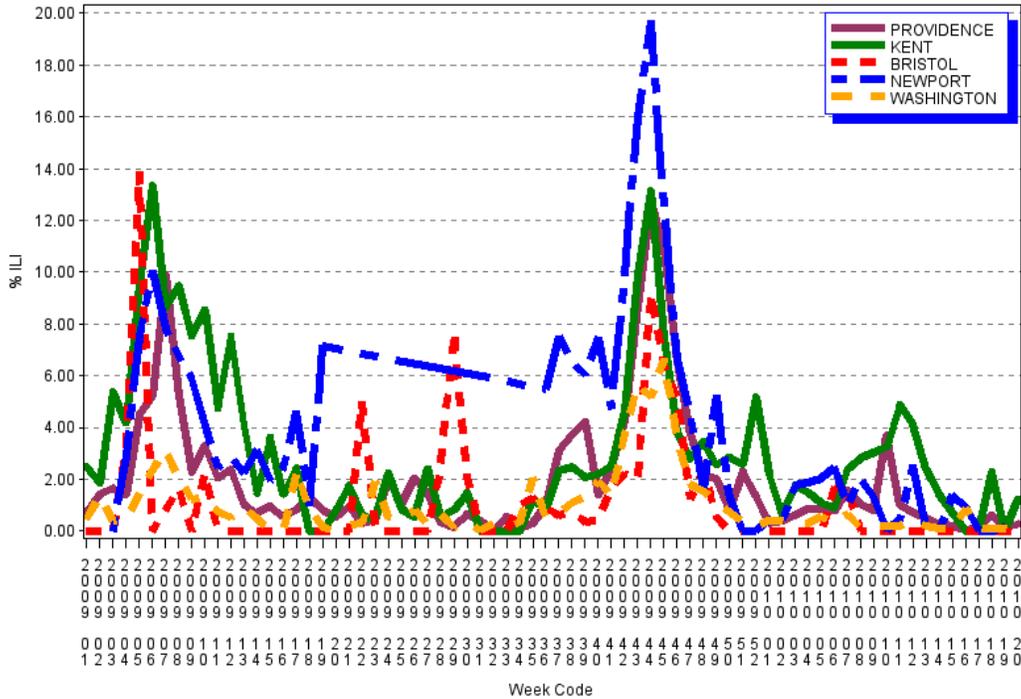
Figure 2. Percentage of Sentinel Provider Visits for influenza-like illness (ILI) for RI, New England and the United States, MMWR 2009 Week 1 (ending January 10, 2009) – 2010 Week 20 (ending May 22, 2010)



Rhode Island Sentinel Provider Data by County

During the 2009 H1N1 pandemic, sentinel ILI frequencies followed similar patterns across all 5 Rhode Island counties (**Figure 3**), with peak activity for 4 of the 5 occurring at Week 44 (ending November 7, 2009); Washington County peaked at Week 45 (ending November 14, 2009).

Figure 3. Percent of Rhode Island Sentinel Provider Visits for influenza-like illness (ILI) by RI County, MMWR 2009 Week 1 (ending January 10, 2009) – 2010 Week 20 (ending May 22, 2010)



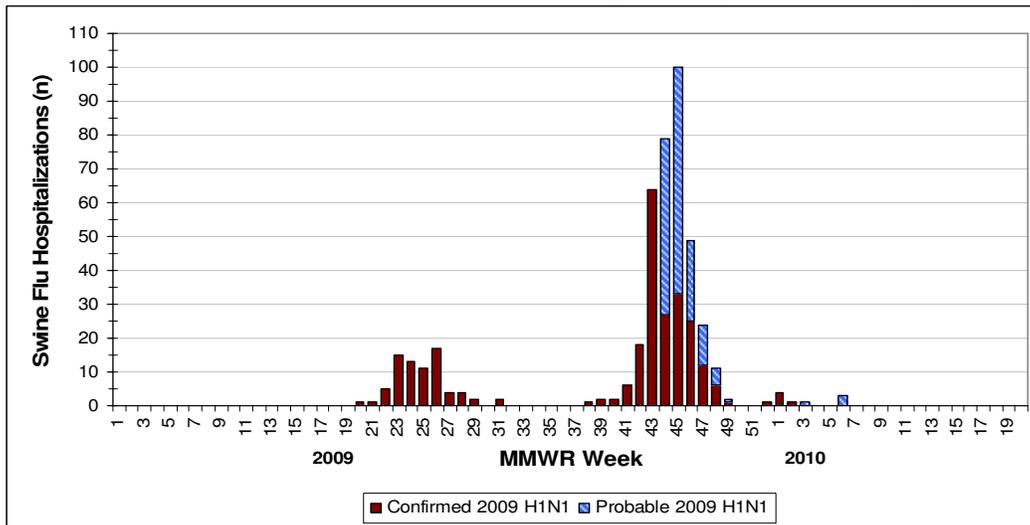
Source: RI Department of Health

7. H1N1-Associated Hospitalizations

Influenza hospitalization is a mandatory reportable event in Rhode Island. The pre-pandemic convention was to collect weekly aggregate data from hospital laboratories on positive influenza tests from their in-patient population (PCR, culture or rapid test). With the advent of the pandemic, reporting was ramped up to include demographic and pertinent clinical information, as well starting October 12, 2009, collection of data on underlying conditions was initiated. Hospitalized cases were also required to have swabs laboratory confirmed at the State Health Laboratory. Additionally, as of November 9, 2009, Lifespan Health System, which includes 3 acute care hospitals in Rhode Island, began influenza testing via the Luminex assay, which is a bead-based PCR platform that is able to accurately type and subtype seasonal influenza strains. However, the Luminex platform was not specific for 2009 H1N1, therefore samples that tested as influenza A, unsubtypeable were considered by the RI Department of Health to be ‘probable’ 2009 H1N1 cases.

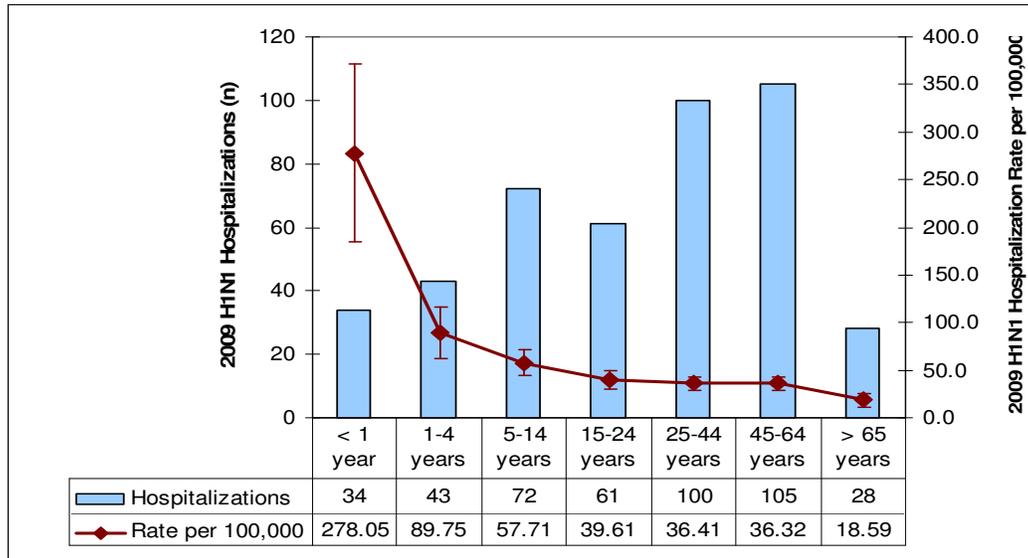
There were 443 confirmed and probable (Luminex positive) cases of pandemic H1N1 influenza reported between April, 2009 and May 22, 2010. The corresponding number for the nation was reported at an estimated 274,000 (as of April 10, 2010). Influenza hospitalizations in Rhode Island also followed a biphasic distribution (**Figure 4**), mirroring the trends seen in other surveillance systems during the pandemic. The smaller first wave of hospitalizations occurred during the spring/summer phase of the pandemic (MMWR 2009 Weeks 20-31), with the number of hospitalizations peaking at 17 during Week 26 (ending July 4, 2009). The second wave of hospitalizations coincided with the fall 2009 phase of the pandemic, occurring from MMWR 2009 Weeks 38-49, with a peak of 100 hospitalizations during Week 45 (ending November 14, 2009). The last influenza hospitalization that was positive for 2009 H1N1 was reported on MMWR 2010 Week 6 (ending February 13, 2010), with 3 hospitalizations occurring during that week.

Figure 4. Total Confirmed and Probable 2009 H1N1 (Swine flu) Hospitalizations by Week for Rhode Island, (weeks ending January 10, 2009 – May 22, 2010)



The average age of patients hospitalized with 2009 H1N1 in Rhode Island during the pandemic was 29.4 years (median = 26.0 years), although there was substantial variability with a range of less than 1 year to 83 years old. Pediatric residents had the highest 2009 H1N1-associated hospitalization rate in Rhode Island (**Figure 5**), while residents aged 65 years and older had the lowest rate. Infants less than 1 year old were particularly at risk of severe illness requiring hospitalization, with a rate of 278.05 hospitalizations per 100,000 RI residents in that age-group. By contrast, adults 65 years and older had a rate of 18.59 hospitalizations per 100,000 RI residents in that age-group.

Figure 5. 2009 H1N1-associated Hospitalizations (N: 443) and Corresponding Rate for Rhode Island Patients by Age-Group, April 19, 2009 – May 22, 2010



Note: Error bars represent 95% confidence intervals for the hospitalization rate; Hospitalization rates are based on U.S. Census 2009 age-specific estimates for RI

Women had a slightly higher rate of 2009 H1N1 hospitalizations (43.57 per 100,000 RI women; **Table 1**) than men (40.27 per 100,000 RI men), although the difference was non-significant ($P = 0.41$). Black Rhode Islanders had a significantly higher 2009 H1N1 hospitalization rate (70.43 per 100,000 Black RI residents; $P < 0.001$) compared to their White counterparts (29.84 per 100,000 White RI residents); and residents identifying as Hispanic or Latino ethnicity had a significantly higher 2009 H1N1 hospitalization rate (62.39 per 100,000 Hispanic/Latino residents; $P < 0.001$) relative to non-Hispanic/Latino residents (21.70 per 100,000 non-Hispanic/Latino residents).

Table 1. 2009 H1N1-associated Hospitalizations by Gender, Race and Ethnicity, April 19, 2009 – May 22, 2010

| | Rhode Island | | | |
|---------------------------|------------------|-------------|------------------|-----------------|
| | Hospitalizations | Population* | Rate per 100,000 | 95% CI |
| Gender† | | | | |
| Male | 206 | 511490 | 40.27 | (34.77 - 45.77) |
| Female | 236 | 541719 | 43.57 | (38.01 - 49.13) |
| Race‡ | | | | |
| White | 282 | 945192 | 29.84 | (26.36 - 33.32) |
| Black | 55 | 78095 | 70.43 | (51.82 - 89.04) |
| Asian or Pacific Islander | 8 | 36529 | 21.90 | (6.72 - 37.08) |
| Ethnicity¥ | | | | |
| Hispanic or Latino | 82 | 131425 | 62.39 | (48.89 - 75.89) |
| Not Hispanic or Latino | 205 | 940715 | 21.79 | (18.81 - 24.77) |

Abbreviations: 95% CI = 95% confidence intervals for hospitalization rates

* Based on U.S. Census 2009 gender and race/ethnicity-specific population estimates for RI

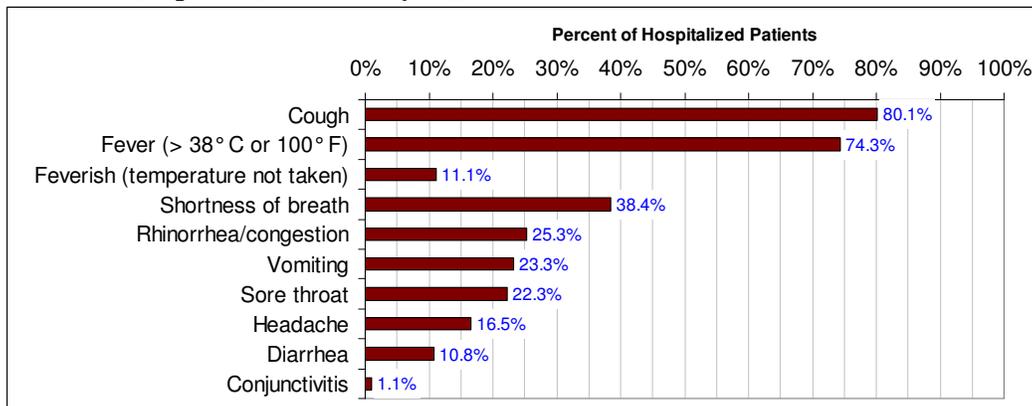
† 1 missing gender (0.2%)

‡ 44 missing or unknown (9.9%) and 54 reporting as "Other"

¥ 156 missing or unknown (35.2%)

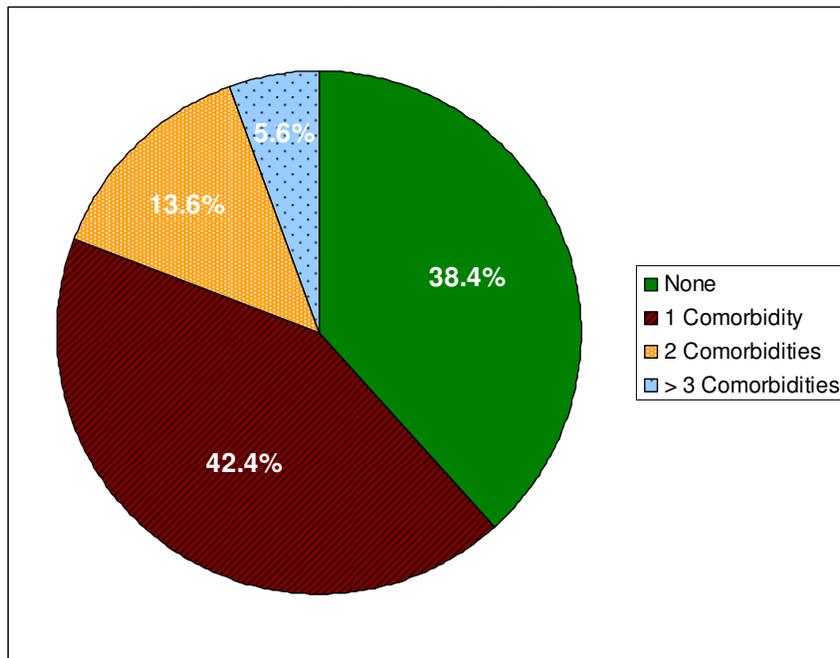
The vast majority of patients hospitalized with 2009 H1N1 were initially treated in the emergency department (94.9%). Among those hospitalized, 15.8% were admitted to the intensive care unit (ICU), and 4.4% required mechanical ventilation. Clinically, 45.0% had radiographic evidence of pneumonia and 5.7% were diagnosed with acute respiratory distress syndrome (ARDS) as a consequence of their influenza illness. The most common symptom among patients hospitalized with 2009 H1N1 (**Figure 6**) was fever (> 38° C or 100° F) or feverish (temperature not taken), reported for 85.4% of patients, followed by coughing, reported for 80.1% of patients. Other symptoms, including shortness of breath, rhinorrhea/congestion, vomiting, sore throat, headache and diarrhea, were reported in lower proportions.

**Figure 6. Symptom Frequency, 2009 H1N1-associated Hospitalizations
RI, April 19, 2009 – May 22, 2010**



Comorbid conditions were prevalent among the patients hospitalized with 2009 H1N1. In Rhode Island, approximately every 3 out of 5 hospitalized cases (61.6%) were reported to have at least 1 comorbid condition (**Figure 7**), 19.2% had 2 or more comorbidities and 5.6% had 3 or more.

Figure 7. Frequency of Comorbidities† for 2009 H1N1-associated Hospitalizations RI, October 22, 2009 – May 22, 2010*

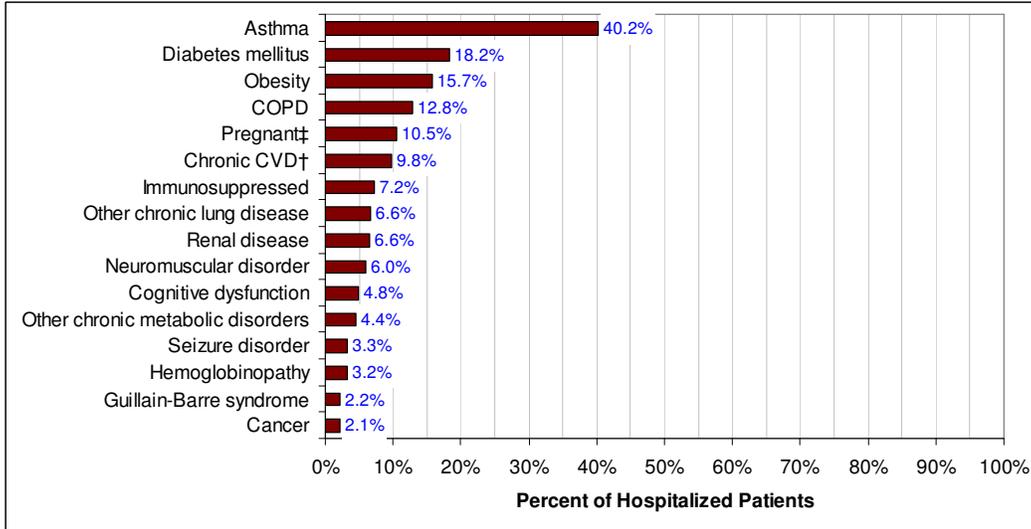


† Includes cognitive dysfunction, seizure disorder, neuromuscular disorder, Guillain-Barre syndrome, asthma, COPD or other chronic lung disease, diabetes or other chronic metabolic conditions, cardiovascular disease (excluding hypertension), hemoglobinopathy, renal disease, cancer or immunosuppression

* The RI Department of Health began collection of comorbid conditions for 2009 H1N1-associated hospitalizations beginning October 22, 2009

Asthma was by far the most commonly reported underlying condition among H1N1 flu hospitalizations (40.2%; **Figure 8**). By contrast, the prevalence of asthma in Rhode Island is 10.6% for adult residents (U.S. Centers for Disease Control and Prevention, BRFSS) and 11.3% for children (Rhode Island Department of Health, RI BRFSS). Diabetes was the next most prevalent comorbidity with a prevalence of 18.2% among hospitalized cases. This was highest among patients aged 45 years and older: hospitalized cases aged 45-64 years had a prevalence rate of 37.5% for diabetes and those aged 65 years or older had a prevalence rate of 35.7%, compared to respective rates of 8.8% and 16.8% among like age-groups for the Rhode Island general population (Rhode Island Department of Health, Diabetes Health profile). Pregnant women were also disproportionately affected, with pregnancy reported for 10.5% of women hospitalized with 2009 H1N1. Several other comorbid or underlying conditions were reported at lower frequencies (**Figure 8**).

Figure 8. Frequency of Underlying Conditions for 2009 H1N1-associated Hospitalizations RI, April 19, 2009 – May 22, 2010



Abbreviations: CVD = cardiovascular disease; COPD = chronic obstructive pulmonary disease

† Excludes hypertension

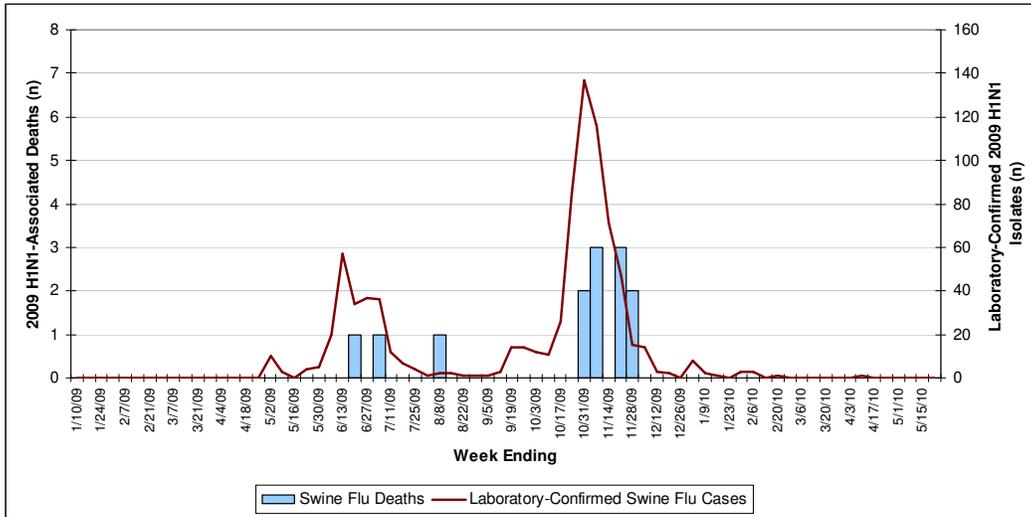
‡ Women only

8. 2009 H1N1-Associated Mortality

Influenza-associated deaths in children was a mandated reportable event prior to the pandemic. During the 2009 H1N1 pandemic, influenza associated deaths in all age categories was made a reportable event. Deaths had to be reported to the Office of the Medical Examiner who in turn decided about jurisdiction over the case. This was a new system activated during the pandemic.

13 influenza-associated deaths were reported, all of which were laboratory-confirmed positive for 2009 H1N1. Three of the deaths occurred during the initial spring/summer 2009 wave of the pandemic, while the remaining 10 occurred during the fall wave (**Figure 9**). The 2009 H1N1-associated mortality rate in Rhode Island was 1.23 per 100,000 RI residents, based on 2009 state population estimates derived from the 2000 U.S. Census.

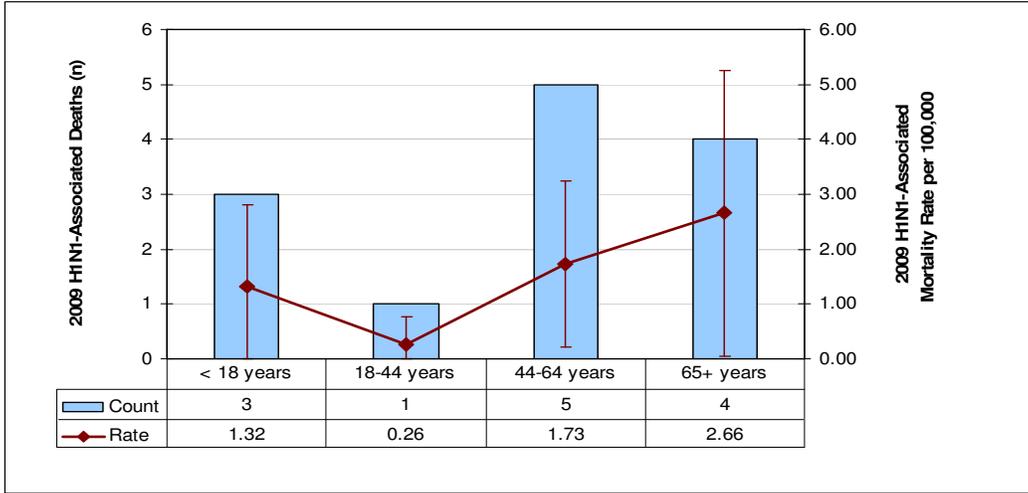
Figure 9. 2009 H1N1-associated Deaths with Epidemic Curve of Lab Confirmed Cases Superimposed RI, (weeks ending April 25, 2009 – May 22, 2010)



The average age of 2009 H1N1 Rhode Island decedents was 49.1 years (median = 54 years), although there was great variability, with ages ranging from 12 to 81 years. The age-specific 2009 H1N1-associated mortality rate (**Figure 10**) was lowest among Rhode Islanders aged 18-44 years, at 0.26 deaths per 100,000 RI residents of like-age and highest for those 65 years and older, at 2.66 deaths per 100,000 RI residents of like-age, although none of the differences were statistically significant.

The majority of the 2009 H1N1 fatalities were women (n = 10), while only 3 were men. With respect to race, 11 of 13 decedents identified as White; race was unknown for the remaining 2. Eleven of 13 decedents identified as non-Hispanic and 1 as Hispanic, with 1 decedent of unknown ethnicity.

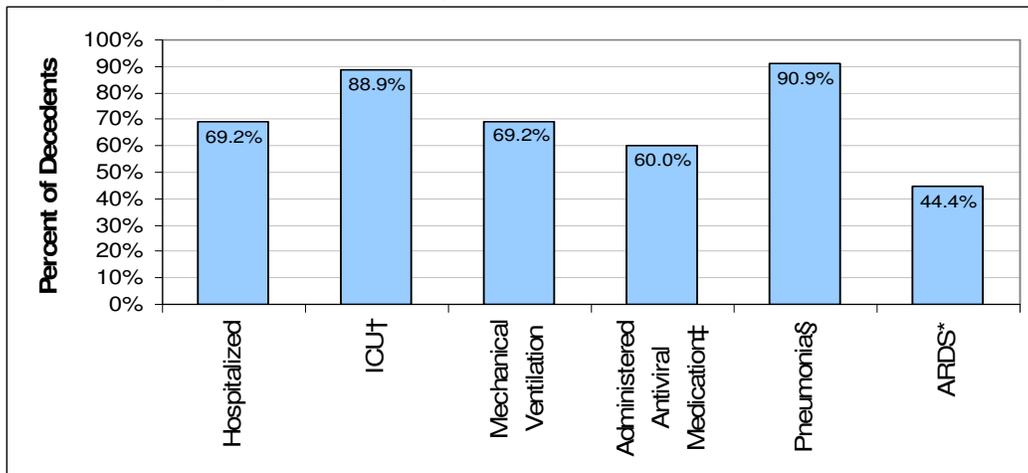
Figure 10. 2009 H1N1-associated Deaths and Age Specific Rate RI, (April 19, 2009 – May 22, 2010)



Note: Error bars represent 95% confidence intervals for the mortality rate; Mortality rates are based on U.S. Census 2009 age-specific population estimates for RI

Basic information on the treatment and clinical characteristics of the 2009 H1N1 fatalities were collected by the Rhode Island Department of Health. The majority of the deceased were hospitalized prior to death (9 of 13, 69.2%; **Figure 11**). Eight of the 9 (88.9%) hospitalized fatalities were admitted to the intensive care unit (ICU). Most of the decedents (90.9%) had radiologic evidence of pneumonia, 69.2% were treated with mechanical ventilation, and 44.4% were diagnosed with acute respiratory distress syndrome (ARDS). Sixty percent of decedents were administered antiviral medication prior to death.

Figure 11. 2009 H1N1 Deaths, Treatment and Clinical Characteristics RI, (April 19, 2009 – May 22, 2010)



Abbreviations: ICU = intensive care unit; ARDS = acute respiratory distress syndrome

† Includes hospitalized decedents only (n = 9)

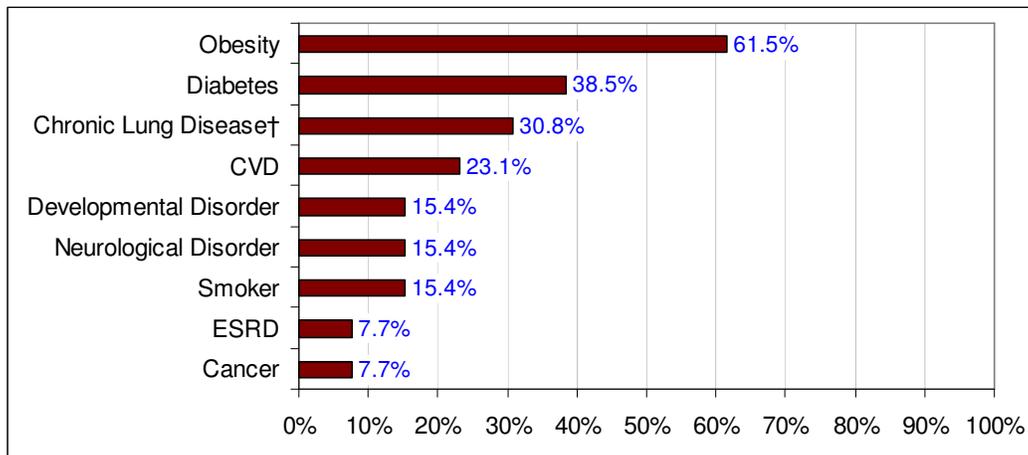
‡ Out of 10 decedents - antiviral status was unknown for 3/13 decedents

§ Out of 11 decedents - pneumonia status was unknown for 2/13 decedents

- Out of 9 decedents – ARDS status was unknown for 4/13 decedents

The Rhode Island Department of Health also gathered data on comorbidities and underlying conditions for 2009 H1N1 fatalities (**Figure 12**). The most common underlying condition reported was obesity (61.5%), defined as having a body mass index (BMI) of 30 kg/m² or greater, and calculated as BMI = (weight in kilograms) / (height in meters)². The average BMI among the deceased was 35.3 kg/m² (median = 34.9 kg/m²), and ranged from 15.8 to 58.2 kg/m² ($\sigma = 12.9$ kg/m²). Of the 5 decedents not reported as obese, 2 of the 4 individuals for whom there was sufficient information to directly calculate BMI were at the upper end of overweight (BMI = 28.3 and 29.2 kg/m²). Diabetes and chronic lung conditions (including asthma) were the next highest reported comorbidities, at 38.5% and 30.8%, respectively. Several other comorbidities were also reported in lesser proportions (**Figure 12**). None of the fatalities in RI was pregnant.

Figure 12. 2009 H1N1-associated Deaths, Underlying Conditions, RI (April 19, 2009 – May 22, 2010)



Abbreviations: CVD = cardiovascular disease; ESRD = end-stage renal disease

† Including asthma

9. 2009 H1N1-Associated Pediatric Mortality

Pediatric influenza-associated mortality became a nationally reportable event in 2004. Laboratory-confirmed influenza-associated deaths in children (< 18 years) are reported through the Influenza-Associated Pediatric Mortality Surveillance System. At the national level, influenza-associated mortality took a much higher toll on children during the 2009 H1N1 pandemic than it has during past influenza seasons. There were 341 influenza-associated pediatric deaths during the pandemic (from April 26, 2009 through May 22, 2010), 285 of which were positive for 2009 H1N1 (FluView: 2009-2010

Influenza Season Week 20). This was more than triple what was reported in prior seasons, with 77 and 88 pediatric deaths reported for the 2007-2008 and 2008-2009 influenza seasons, respectively. Deaths involving the young and healthy result in many more potential years of life lost compared to those of older adults and of those with chronic illness.

In Rhode Island, there were 3 cases of influenza-associated pediatric mortality during the 2009 H1N1 pandemic, all of whom were laboratory-confirmed positive for 2009 H1N1. The pediatric influenza-associated mortality rate for Rhode Island during the Pandemic was 1.32 per 100,000 children, based on 2009 age-specific population estimates for Rhode Island, derived from the 2000 U.S. Census. The average age was 13.3 years, ranging from 12-16 years old. Two of the 3 pediatric fatalities had underlying conditions, and the third developed a rare complication of influenza.

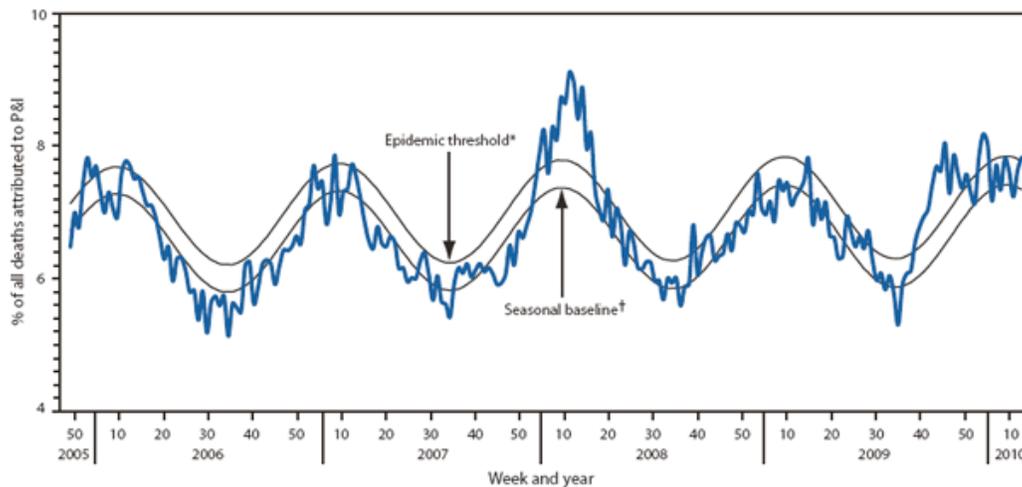
10. Pneumonia and Influenza Mortality (122 Cities)

The U.S. Centers for Disease Control and Prevention (CDC) receives weekly reports from the offices of vital records from 122 U.S. cities providing the number of total death certificates received and the number of those certificates that list pneumonia or influenza as an underlying or contributing cause of death, by age-group. P&I deaths are reported weekly for the City of Providence, from the Office of the Providence City Registrar (City Hall), to the 122 Cities Mortality Reporting System and published in the Morbidity and Mortality Weekly Report (MMWR) published by the U.S. Centers for Disease Control and Prevention (CDC): <http://www.cdc.gov/mmwr/>.

A baseline and epidemic threshold level for percentage of deaths from pneumonia or influenza is calculated and cyclically fluctuates to coincide with annual influenza seasons (i.e. a higher threshold in the winter months). When the percentage of deaths attributable to pneumonia and influenza (P&I) crosses the threshold, it represents an epidemic. Nationally the second wave of the 2009 H1N1 pandemic (fall 2009) was evidenced by the excess P&I mortality reported between MMWR 2009 Week 39 (ending October 3, 2009) and Week 52 (ending January 2, 2010; **Figure 13**). There was also a large excess of P&I mortality reported during the usual influenza season in the winter of 2008.

During the 2009 H1N1 pandemic, Providence reported 229 P&I deaths out of 3,282 total deaths (7.0%). This number is similar to what one would see during a single seasonal flu year, except for the fact that the pandemic mortality occurred ‘off season’ in the summer and fall months. Due to noise as a result of low numbers, no definite patterns can be discerned during this time frame (data not shown).

Figure 13. 122 Cities Mortality Reporting System: Percentage of deaths attributed to pneumonia and influenza (P&I) by surveillance week and year, 2005 - 2010



Source: [Influenza Activity - United States, August 30, 2009 - March 27, 2010, and Composition of the 2010 - 11 Influenza Vaccine](#). U.S. Centers for Disease Control. *Morbidity and Mortality Weekly Report*. April 16, 2010;59(14); p423-430.

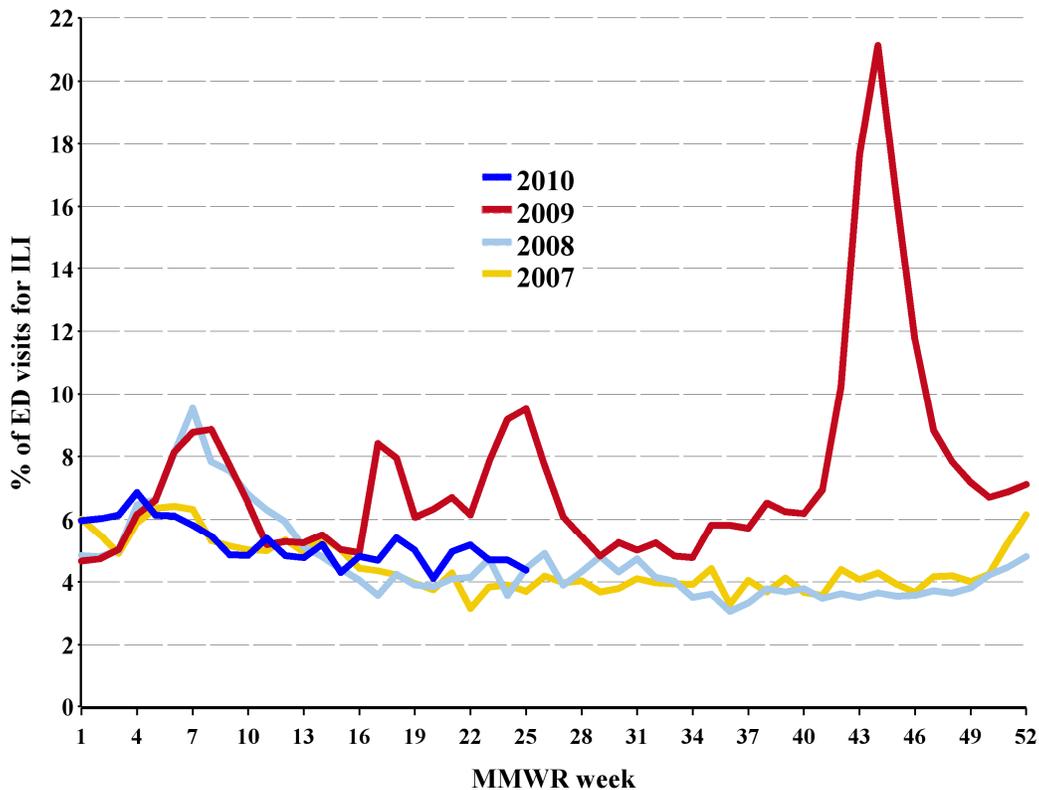
11. Syndromic Surveillance

Epidemiology has implemented syndromic surveillance using the Real-time Outbreak and Disease Surveillance (RODS) system at 9 of the 11 hospitals in the state. The data is then analyzed based on predefined syndromes, classified based on symptoms selected from a list of available chief complaints, and total emergency department visits in order to detect patterns potentially indicative of disease outbreaks. The system updates every 4 hours, and is able to generate alerts based on statistically significant deviations from a threshold norm calculated from historic data. Constitutional Syndrome” chief complaints were used for monitoring the pandemic, as well as a custom mix of chief complaints (fever/chills, flu-like symptoms or mention of influenza), which are used as surrogates for influenza activity.

The RODS data for 2009-2010 shows 3 spikes in emergency department (ED) visits for chief complaints resembling those of influenza syndrome (**Figure 14**). There was elevated seasonal syndromic activity for Rhode Island in early 2009 from MMWR Weeks 4-12 (late January – late March), which coincides with typical influenza seasons and is observed for 2008 and, with milder peaks during this time, in 2007 and 2010. The early peak is followed by a wave of increased influenza syndrome-related ED visits from MMWR 2009 Weeks 17-27 (early May – early July), followed by a lull and then by another large wave in fall 2009, peaking at Week 44 (ending November 7, 2009) and tapering off into 2010. By stark contrast, no increases in emergency department visits for

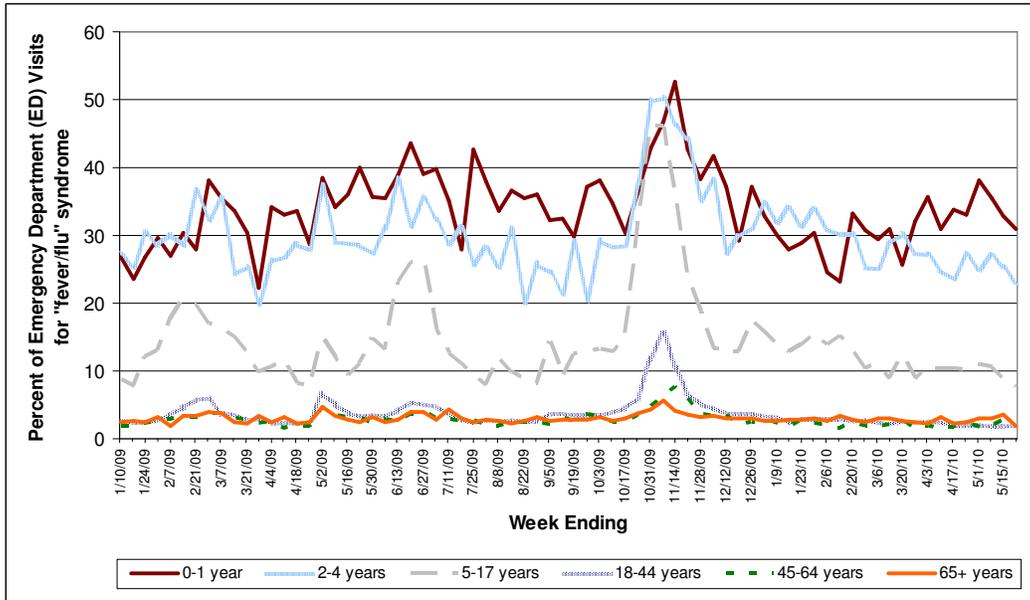
influenza-related syndrome were observed during the late spring/summer or fall for 2007 or 2008 (**Figure 14**).

Figure 14. RODS System: Percentage of total Rhode Island emergency department (ED) visits for “flu/fever” syndrome, 2007 – 2010 (through MMWR 2010 Week 20, ending 5/22/2010)



During the 2009 H1N1 pandemic, increases in influenza-related syndrome visits to Rhode Island emergency departments were particularly elevated in pediatric populations which was most evident among the 5-17 year age-group (**Figure 15**). Some moderate activity was observed in the 18-44 year age-group, with an obvious peak coinciding with the larger second wave of the pandemic. Little increased activity in influenza-related syndromic surveillance was observed among adults ≥ 44 years, with the lowest change occurring among adults ≥ 65 years old.

Figure 15. RODS system: Percentage of total Rhode Island emergency department (ED) visits for “fever/flu” syndrome category by age - group, weeks ending January 10, 2009 – May 22, 2010

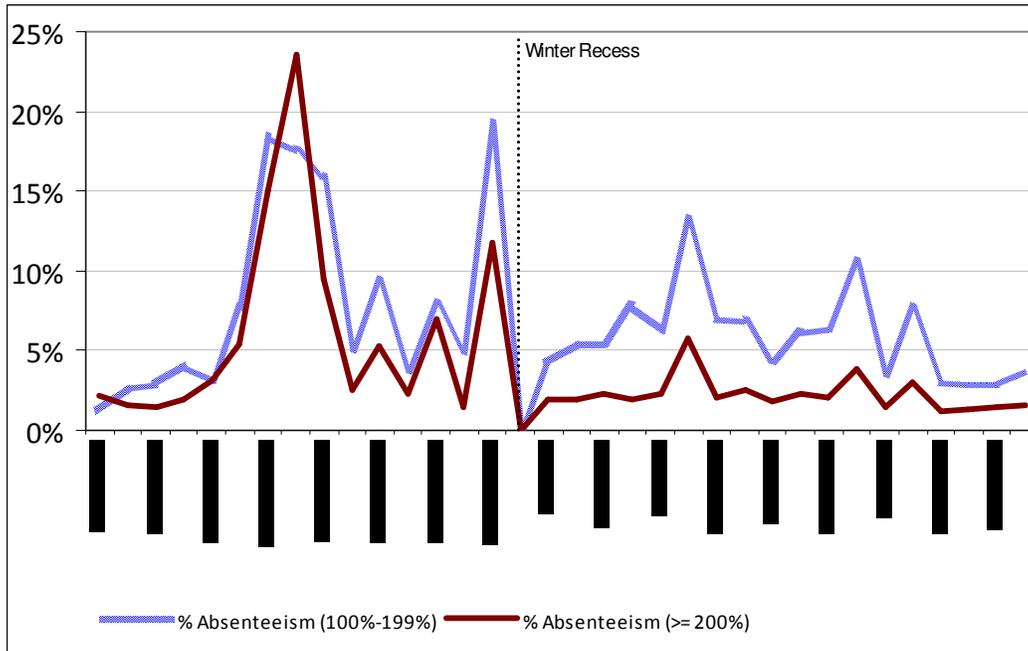


12. School Absenteeism

Planning for school absenteeism surveillance (as a surrogate measure of widespread influenza circulation among school-age children) was initiated in RI at the beginning of the pandemic. Liaison was set up with the RI Department of Education to develop data exchange. Baseline absenteeism was found to vary considerably from school to school, therefore baseline absenteeism percentages were recorded for a 6 week period. Deviations from the baseline (100% and 200%) were recorded daily and reported on throughout the pandemic; for example if a school had a baseline absenteeism of 3% and it reached 6% or more it would trigger a call to the school to ask if ILI was responsible for such an increase in absenteeism. In addition the process measure of percentage of schools reporting daily was tracked. Increases above normal trends in school absenteeism can serve as a surrogate measure of widespread influenza circulation amongst school-aged pediatric populations.

There was a large peak in absenteeism from mid-October through mid-November 2009, which corresponds with the fall wave of the 2009 H1N1 pandemic in Rhode Island. A second large peak occurred just prior to winter recess and therefore is most likely, at least in part, an artifact due to early withdrawal of kids from school prior to winter vacation. Another smaller peak occurred in early-February, which again may relate to early withdrawal of children from school prior to February break (Fig 16).

Figure 16. Percentage of Schools (aggregated weekly) Reporting Absenteeism in Excess of Baseline at 100 and 200% levels), RI September 14, 2009 – May 22, 2010

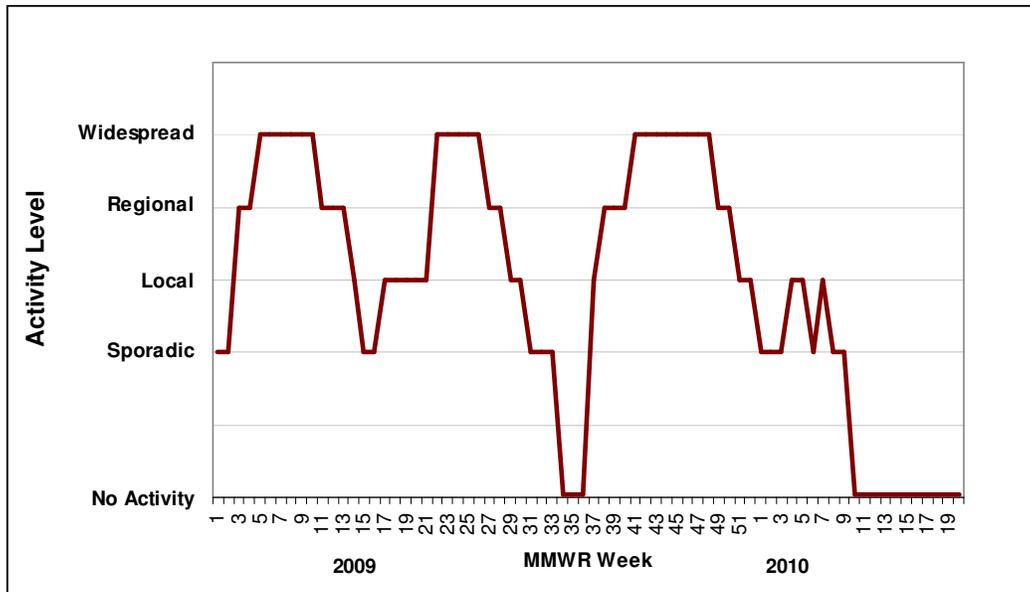


13. State Epidemiologists’ Weekly Report on Influenza Activity

During each annual influenza season and throughout the 2009 H1N1 pandemic, State Health Departments provide the CDC with estimated levels of influenza activity in their respective states on a weekly basis. Definitions for these activity levels are provided in **Appendix D**.

During 2009-2010, regional and widespread activity levels in Rhode Island corresponded with the 2009 seasonal influenza season, followed by a lull and then high activity levels marking the first wave of the 2009 H1N1 pandemic in the spring/summer of 2009, followed by another lull, including a period of no activity in late-August to early September, and then high activity levels again during the fall wave of the pandemic (**Figure 17**). From MMWR 2010 Week 10 (ending March 7, 2010) through the end of the 2009-2010 influenza season (MMWR 2010 Week 20, ending May 22, 2010), the activity level in Rhode Island has been “no activity”.

Figure 17. Influenza activity level reported by Rhode Island State Epidemiologist to the U.S. Centers for Disease Control and Prevention (CDC), MMWR 2009 Week 1 (ending January 10, 2009) – 2010 Week 20 (ending May 22, 2010)

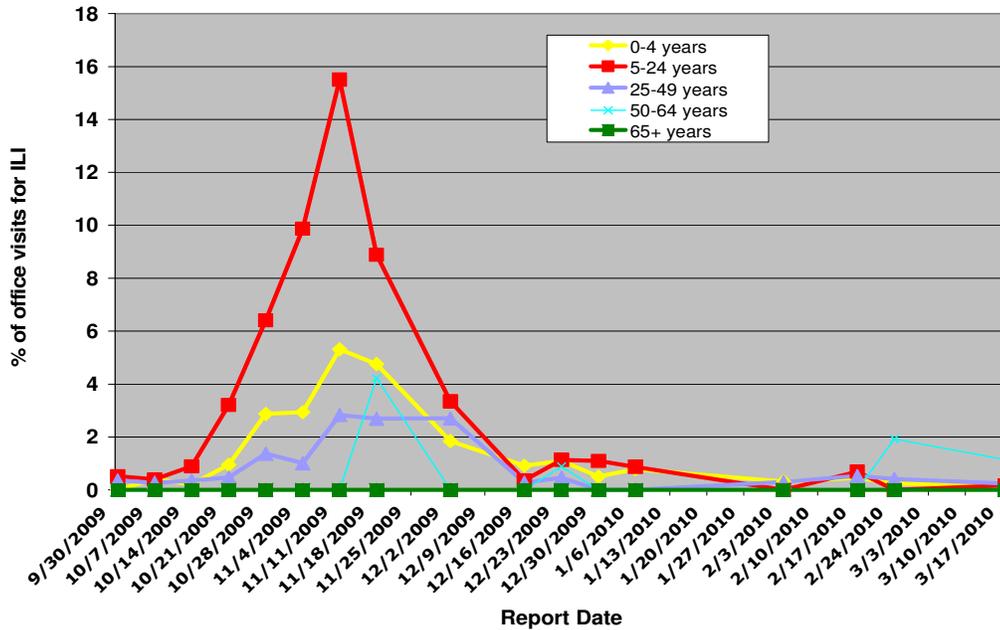


14. Neighborhood Health Plan RI & Providence Community Health Center Surveillance

Neighborhood Health Plan RI (NHPRI) is a Medicaid managed care plan in Rhode Island that is committed to increasing access to care, particularly among vulnerable populations. Providence Community Health Center (PCHC) is the largest network of Federally Qualified Health Centers providing primary health care in Providence with 5 Health Centers. NHPRI (billing data) and PCHC (encounter data) provided Epidemiology with the weekly number of visits for influenza-like illness (ILI) and total overall weekly visits by age-group during the 2009 H1N1 pandemic. This data provided information on the impact of influenza on out-patient clinics.

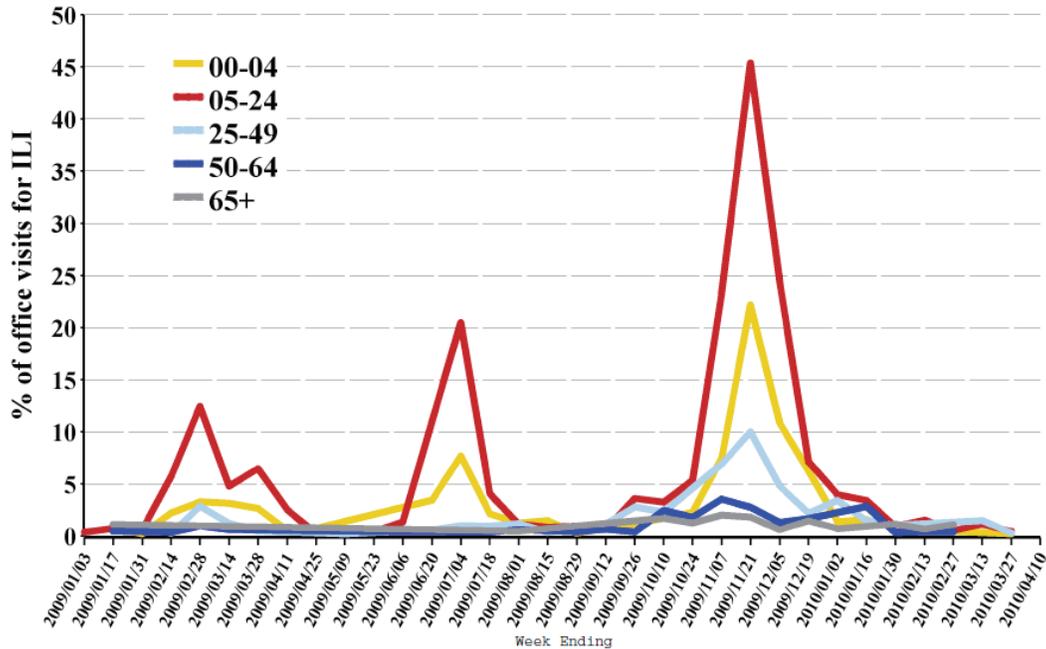
Neighborhood Health Plan provided the Rhode Island Department of Health with data on ILI office visits for its members from weeks ending September 30, 2009 through March 17, 2010. There was a substantial increase in percent ILI coinciding with the fall wave of the 2009 H1N1 pandemic (**Figure 18**), peaking during the week ending November 18, 2009. During this peak, the 5-24 year age-group had the highest percent of office visits for ILI, followed by the 0-4 year age-group. There was no reported increase in percent ILI for enrollees 65 years or older, with a percent of office visits for ILI remaining around 0.0%. Though prior year information is not available, the baseline before and after the fall wave is in the realm of less than 2% ILI visits compared to 15% at the peak of the wave. The wave lasted about 8 weeks.

Figure 18. Percentage of healthcare provider visits for influenza-like illness (ILI) for Neighborhood Health Plan RI enrollees by age-group, weeks ending September 30, 2009 – March 17, 2010



Providence Community Health Centers provided data for office visits for ILI to their 5 clinics from weeks ending January 3, 2009 through April 10, 2010. Three distinct peaks were observed (**Figure 19**): the first and smallest increase was attributable to the 2008-09 seasonal flu outbreak, peaking during the week ending February 28, 2009; the second coincided with the initial spring/summer wave of the pandemic, peaking during the week ending July 4, 2009; and the third and largest occurred during the larger second wave of the pandemic, peaking on November 21, 2009. As was observed with the NHPRI data, the age-group with the highest percent of office visits to PCHC clinics for ILI was the 5-24 year group, followed by the 0-4 year group. Again, the lowest percent ILI was observed among the 65 years and older age-group, although a slight increase in percent ILI was observed for them at PCHC during fall 2009.

Figure 19. Percentage of visits for influenza-like illness (ILI) reported by the Providence Community Health Center (PCHC) clinics by age-group, RI (weeks ending January 3, 2009 – April 10, 2010)



15. Antiviral Medication Prescription Surveillance System

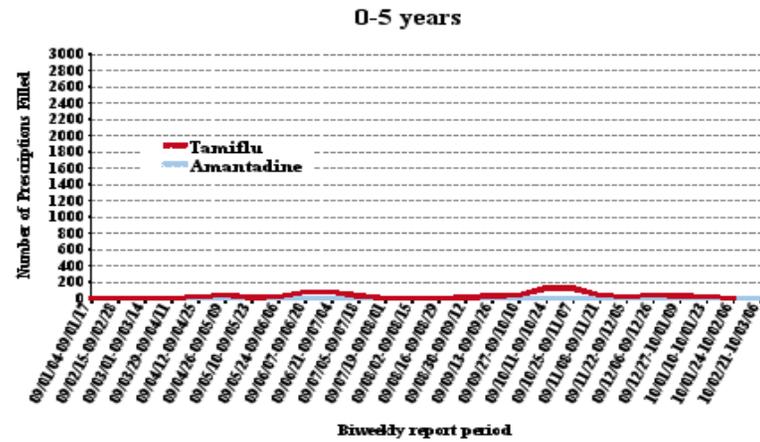
Epidemiology began monitoring antiviral medication prescriptions filled in Rhode Island through the Surescripts electronic prescription system. “Surescripts” is a company (see <http://www.surescripts.com/>) that supports a national network for electronic prescribing. The Dept of Health through a contract was able to obtain RI specific e-prescribing data on a periodic basis (approximately every 2 weeks), on antiviral medication prescriptions filled at Rhode Island pharmacies. Medications monitored by this system included Oseltamivir (®Tamiflu), Zanamivir (®Relenza), Amantadine (®Symmetrel) and Rimantidine (®Flumadine). Data became available in late October 2010 for antiviral prescription information dating from January 2009. Monitoring of antiviral medications indicated for influenza acts as a surrogate for elevated influenza activity.

Updated recommendations for use of antivirals for the treatment of influenza, including pediatric dosing, can be found at: <http://www.cdc.gov/H1N1flu/recommendations.htm>.

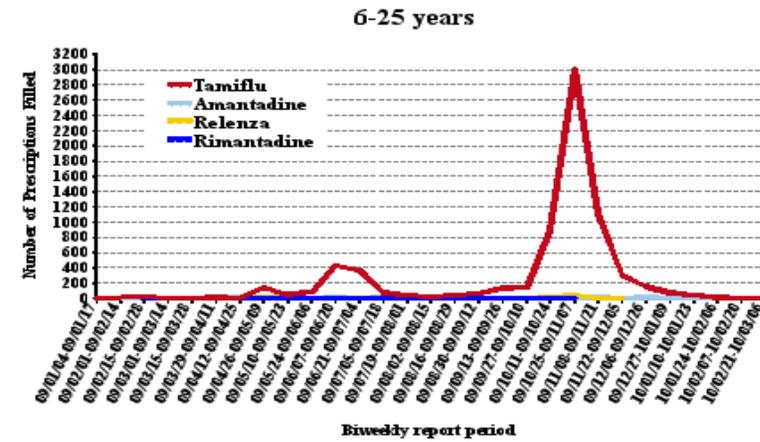
Tamiflu was the dominant antiviral chosen by RI prescribers during the pandemic. Among the 6-25 year and 26-65 year age-groups, a small rise in antiviral prescriptions was observed in Rhode Island from late-April through early-July 2009, coinciding with the initial wave of the 2009 H1N1 pandemic (Figure 20). A much larger second increase in prescriptions was observed from mid-September through mid-December 2009,

corresponding with the occurrence of the larger fall wave of the pandemic. Antiviral medication was not heavily prescribed in Rhode Island among the 0-4 year and 66 years and older age-groups during the 2009 H1N1 pandemic.

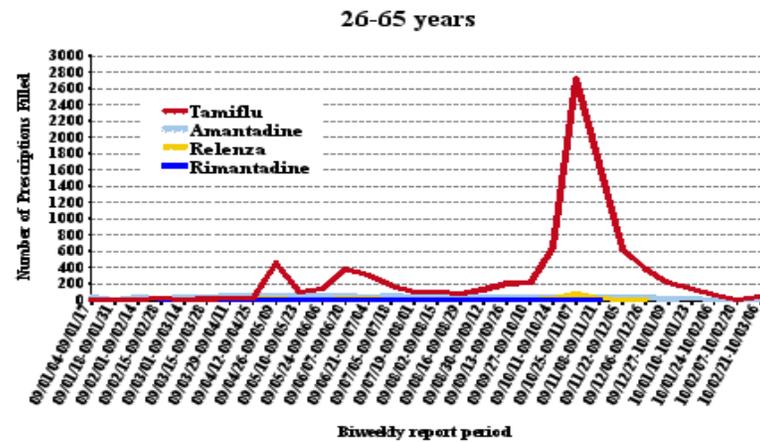
Figure 20. Influenza Antiviral Prescriptions Filled in Rhode Island, January 4, 2009 – March 06, 2010



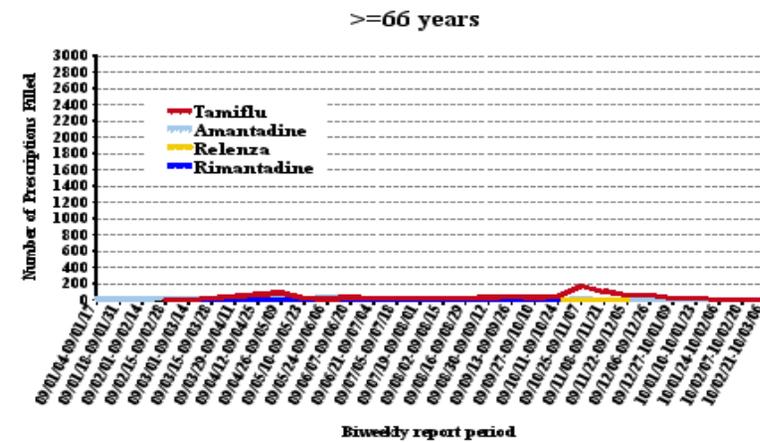
SureScripts



SureScripts



SureScripts



SureScripts

Note: Dates for biweekly report period are listed as YY/MM/DD

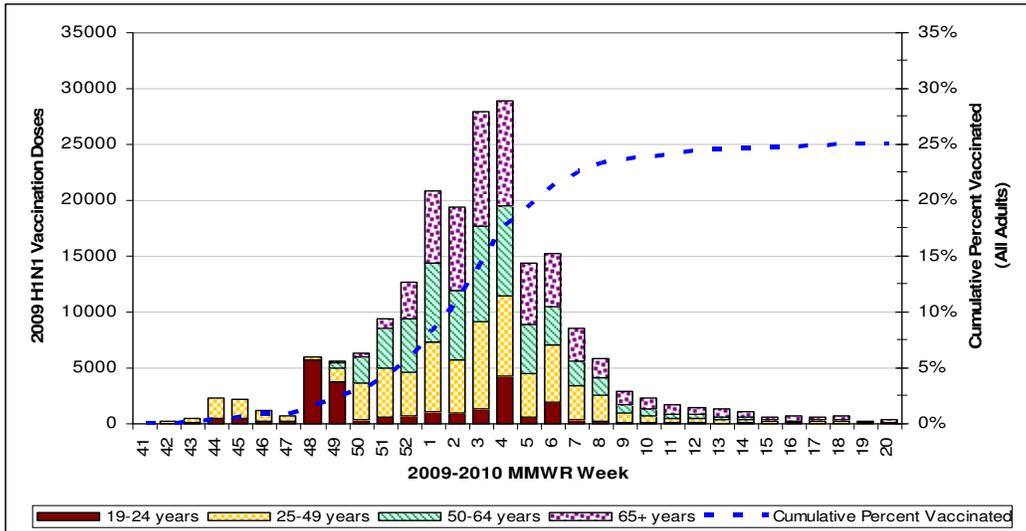
16. 2009 H1N1 Vaccinations

A monovalent vaccine for 2009 H1N1 was shipped to RI in mid-October 2009. It was available as an inactivated injectable vaccine or as a live attenuated influenza vaccine (LAIV) nasal spray. Adults and children 10 years or older were recommended to receive 1 dose of vaccine, while children aged 6 months to 9 years old were recommended to receive 2 doses 4 weeks apart. Vaccination was not recommended for children less than 6 months of age and LAIV was not recommended for children less than 2 years or adults older than 49 years of age. Additional information on 2009 H1N1 monovalent vaccine dosage, administration and storage is available at: <http://www.cdc.gov/h1n1flu/vaccination/dosage.htm>

Weekly aggregate doses of 2009 H1N1 vaccine administered to all patients were reported by Rhode Island providers to the Rhode Island Department of Health through the H1N1 reporting system (for all ages) as well as KIDSNET (RI's pediatric immunization registry) for pediatric populations, 18 and younger. The aggregate data set was used to measure uptake of vaccine for individuals 19 years of age and older.

Adults: There were a total of 202,491 doses of the 2009 H1N1 vaccine recorded as administered to adults in Rhode Island as of May 22, 2010, with an estimated cumulative adult vaccination rate of 25.0% (**Figure 21**). Peak vaccine administration for all adults occurred during the week ending January 30, 2010 (MMWR Week 4), although the peak administration for the higher-risk young adult age-group (aged 19-24 years) took place during the week ending December 5, 2009 (MMWR Week 48). It should be noted that these numbers represent doses given in Rhode Island and therefore do not reflect vaccinations received by Rhode Island residents from out-of-state providers and may include non-residents receiving care in Rhode Island.

Figure 21. 2009 H1N1 (Swine flu) vaccination doses and estimated cumulative vaccination rate for adults (> 18 years) in RI through MMWR Week 20 (ending May 22, 2010)

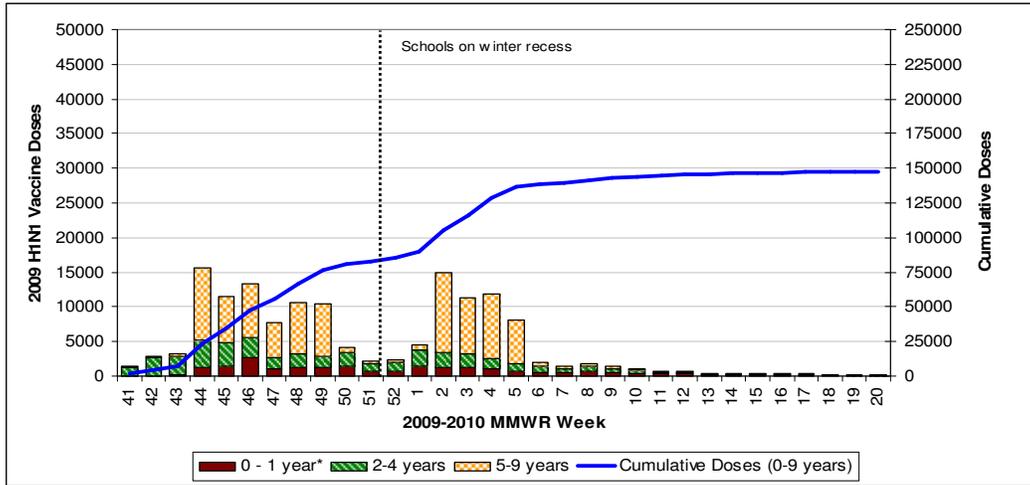


Note: Estimated cumulative percent vaccination is based on reported doses and US Census 2009 age-specific population estimates for Rhode Island

Children (Birth to 10 yrs): KIDSNET is an integrated child health information system for pediatric residents of Rhode Island, one of the functions of which is to serve as the State immunization registry. Rhode Island providers receiving vaccine from the State are required to report on all doses of vaccine administered to pediatric patients (18 years or younger). Children aged 6 months to 9 years old, for whom 2 doses of 2009 H1N1 vaccine were recommended, received 147,600 total cumulative doses through May 22, 2010 (**Figure 22**). Note that numbers represent doses and not persons for this graphic. Administered doses followed a biphasic distribution, with a lull coinciding with winter recess for schools, peaking in the late fall and again in early winter (**Figure 22**). School age children in this age category were vaccinated largely at school based clinics, whereas pre-school age children were vaccinated by their pediatricians.

Vaccine penetration varied by age category within the birth to 10 yr age category (Table 2), with school age children faring the best. Age is recorded at time of administration. For children receiving 2 doses, the data reflect the age at the time of the first dose. Many children received their first dose in one age category and their second dose in another age category. For this reason, the totals in this table are not equivalent to the age totals reported for the individual doses in Fig 24, and should be regarded to be a close estimate.

Figure 22. KIDSNET: 2009 H1N1 weekly and cumulative vaccination doses for pediatric Rhode Island residents aged 0-9 years, through MMWR Week 20 (ending May 22, 2010)



* 135 doses were provided to children < 6 months, although vaccination was not recommended for this age-group

Table 2. Pediatric vaccination rates for birth to 9yrs age (estimated) October 2009 to May 22, 2010

| Age Cohorts | 6mo to 1yr | | 2-4 years | | 5-9yrs | |
|--------------------|--------------|-------------|--------------|-------------|--------------|-------------|
| | # Children | % | # Children | % | # Children | % |
| 1 dose only | 4835 | 19.4 | 11061 | 30.7 | 12451 | 20.6 |
| 2 doses | 9347 | 37.6 | 14353 | 39.8 | 28015 | 46.5 |
| Zero doses | 10695 | 43 | 10643 | 29.5 | 19838 | 32.9 |

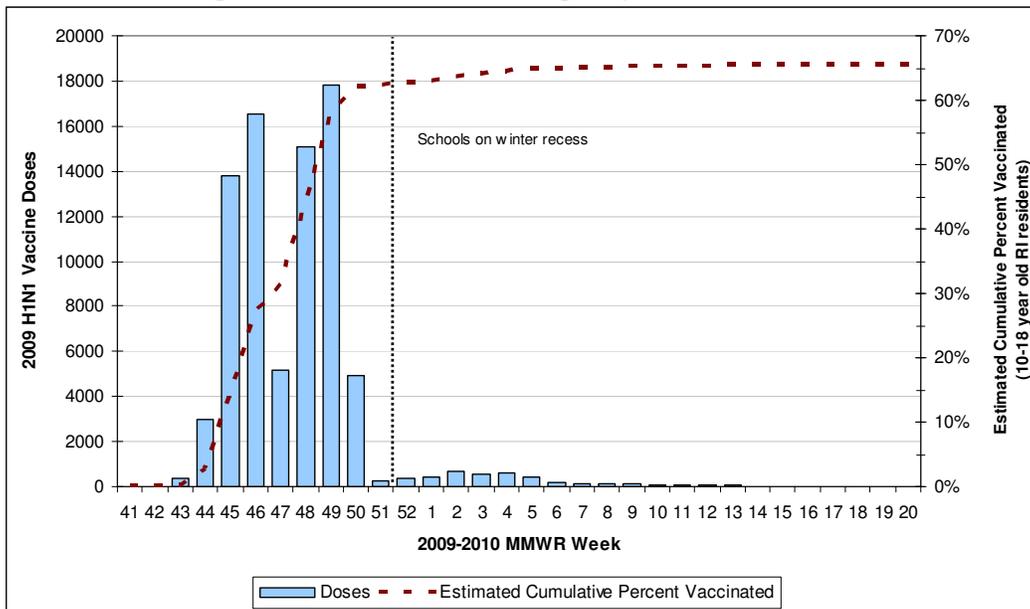
| Age Cohorts | 6mo to 1yr | 2-4 years | 5-9yrs |
|---|------------|------------|------------|
| Proportion completing series that started series | 57% | 71% | 67% |

Note: Rates are based on US Census 2009 age-specific population estimates
2 doses are recommended for children ages 6 months to 9 years

Children (10 to 18yrs):

There were a total of 80,714 doses of the 2009 H1N1 vaccine given to children aged 10 to 18 years in Rhode Island through May 22, 2010, with an estimated cumulative vaccination rate of 65.5% (Figure 23). It should be noted that these numbers represent doses given in Rhode Island and thus do not reflect vaccinations received by Rhode Island residents from out-of-state providers and may include non-residents receiving care in Rhode Island. The high rate of vaccine uptake in this school age population as well as noted in the 5-9 yr age category (for complete 2 dose vaccination) is a testament to the success of Rhode Island’s policy to utilize the strategy of mass vaccination in the school setting.

Figure 23. KIDSNET: 2009 H1N1 vaccination doses and estimated cumulative vaccination rate for pediatric Rhode Island residents aged 10-18 years, through MMWR Week 20 (ending May 22, 2010)

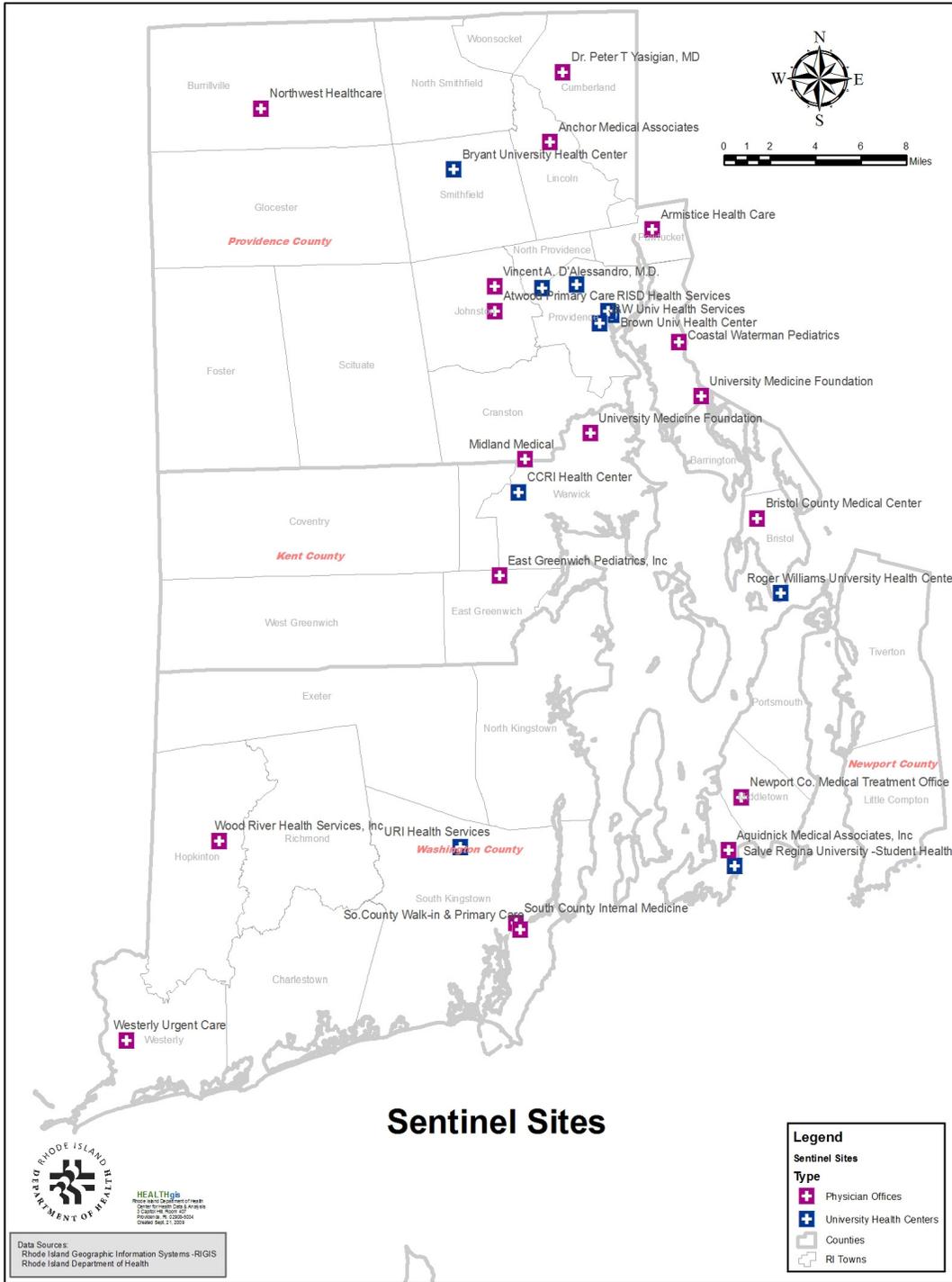


Note: Estimated cumulative percent vaccination is based on reported doses and US Census 2009 age-specific population estimates for Rhode Island

Appendix A: List of RI Sentinel Providers

We would like to express our gratitude to our network of sentinel providers:

THANK YOU SENTINELS!



1. Dr. Rex Appenfeller, MD
Anchor Medical Associates
1 Commerce Street
Lincoln, RI 02865
2. Dr. Jennifer Salm, MD
Aquidneck Medical Associates, Inc
50 Memorial Boulevard
Newport, RI 02840
3. Dr. Karl Felber, DO
Armistice Health Care
209 Armistice Boulevard
Pawtucket, RI 02860
4. Dr. Stephen Scott, MD
Atwood Primary Care
1526 Atwood Avenue
Johnston, RI 02919
5. Dr. Alane Torf, MD
Bristol County Medical Center
1180 Hope Street
Bristol, RI 02809
6. Dr. Edward Wheeler, MD
Brown University Health Center
13 Brown Street
Providence, RI 02912
7. Dr. Stephen Hokeness, MD
Bryant University Health Center
1150 Douglas Pike
Smithfield, RI 02917
8. Dr. John Finigan, MD
Coastal Waterman Pediatrics
900 Warren Avenue
East Providence, RI 02914
9. Dr. Peter T. Yasigian, MD
2 Meehan Lane
Cumberland, RI 02640
10. Dr. Claire McMillan, MD
East Greenwich Pediatrics, Inc
1377 South County Trail, Suite 2B
East Greenwich, RI 02818
11. Dr. William Palumbo, MD
Johnson & Wales University Health
Services
8 Abbot Park
Providence, RI 02903
12. Dr. Stephen Beaupre, MD
Midland Medical
1312 Oaklawn Avenue
Cranston, RI 02920
13. Dr. Robert Gordon, MD
Newport County Medical Treatment Office
67 Valley Road
Middletown, RI 02842
14. Dr. Suzanne Bornschein, MD
Providence College Health Center
1 Cunningham Square, Bedford Hall
Providence, RI 02918
15. Lynn Wachtel, RNP
Rhode Island College – Health Services
600 Mt. Pleasant Avenue, Brown Hall
Providence, RI 02908
16. Dr. Robert Meringolo, MD
Rhode Island School of Design Health
Services
55 Angell Street
Providence, RI 02903
17. Dr. Jeff Hamilton, MD
Roger Williams University Health Center
1 Old Ferry Road
Bristol, RI 02809
18. Dr. William Levin, MD
Salve Regina University – Student Health
100 Ochre Point Avenue
Newport, RI 02840
19. Dr. Monica Gross, MD
South County Walk-In & Primary Care
360 Kingstown Road, Suite 104
Narragansett, RI 02883
20. Dr. Nitin Damle, MD
South County Internal Medicine
481 Kingstown Road
Wakefield, RI 02879
21. Dr. Louis J Moran, DO
University Medicine Foundation
1035 Post Road
Warwick, RI 02888
22. Dr. Edward J Stulik, MD
University Medicine Foundation
1525 Wampanoag Trail, Suite 202
East Providence, RI 02915
23. Chad Henderson, MBA
University of Rhode Island – Health
Services
6 Butterfield Road, Potter Building
Kingston, RI 02881
24. Vincent A. D'Alessandro, MD
1857 Atwood Avenue
Johnston, RI 02919
25. Joan Mullaney, RNP
Well One Primary Medical
36 Bridge Way
Pascoag, RI 02825
26. Dr. Rocco J Andreozzi III, DO
Westerly Urgent Care
77 Franklin Street
Westerly, RI 02891
27. Dr. Christopher Campagnari, MD
Wood River Health Services, Inc.
823 Main Street
Hope Valley, RI 02832

Appendix B: Regional ILI Baselines for the 2009-2010 Flu Season

National and regional baselines for the 2009-2010 influenza season are:

- **National** — 2.3%
All 50 states, the District of Columbia and the U.S. Virgin Islands
- **Region 1** — 1.2%
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont
- **Region 2** — 2.3%
New Jersey, New York, Puerto Rico and the U.S. Virgin Islands
- **Region 3** — 3.0%
Delaware, District of Columbia, Maryland, Pennsylvania, Virginia and West Virginia
- **Region 4** — 2.0%
Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee
- **Region 5** — 1.7%
Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin
- **Region 6** — 4.6%
Arkansas, Louisiana, New Mexico, Oklahoma and Texas
- **Region 7** — 1.8%
Iowa, Kansas, Missouri and Nebraska
- **Region 8** — 1.3%
Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming
- **Region 9** — 2.8%
Arizona, California, Guam, Hawaii and Nevada
- **Region 10** — 3.3%
Alaska, Idaho, Oregon and Washington

Data source: Centers for Disease Control (CDC). Seasonal influenza – flu activity & surveillance.
<http://www.cdc.gov/flu/weekly/fluactivity.htm>. Accessed June 2, 2010.

Appendix C: MMWR Week Number and Corresponding Dates

| MMWR WEEKS | | | | | | |
|------------|-----------|--------------------|-----------|--------------------|-----------|--------------------|
| | 2009-2010 | | 2008-2009 | | 2007-2008 | |
| MMWR WEEK | MMWR YEAR | WEEK ENDING DATE | MMWR YEAR | WEEK ENDING DATE | MMWR YEAR | WEEK ENDING DATE |
| 40 | 2009 | October 10, 2009 | 2008 | October 4, 2008 | 2007 | October 6, 2007 |
| 41 | 2009 | October 17, 2009 | 2008 | October 11, 2008 | 2007 | October 13, 2007 |
| 42 | 2009 | October 24, 2009 | 2008 | October 18, 2008 | 2007 | October 20, 2007 |
| 43 | 2009 | October 31, 2009 | 2008 | October 25, 2008 | 2007 | October 27, 2007 |
| 44 | 2009 | November 7, 2009 | 2008 | November 1, 2008 | 2007 | November 3, 2007 |
| 45 | 2009 | November 14, 2009 | 2008 | November 8, 2008 | 2007 | November 10, 2007 |
| 46 | 2009 | November 21, 2009 | 2008 | November 15, 2008 | 2007 | November 17, 2007 |
| 47 | 2009 | November 28, 2009 | 2008 | November 22, 2008 | 2007 | November 24, 2007 |
| 48 | 2009 | December 5, 2009 | 2008 | November 29, 2008 | 2007 | December 1, 2007 |
| 49 | 2009 | December 12, 2009 | 2008 | December 6, 2008 | 2007 | December 8, 2007 |
| 50 | 2009 | December 19, 2009 | 2008 | December 13, 2008 | 2007 | December 15, 2007 |
| 51 | 2009 | December 26, 2009 | 2008 | December 20, 2008 | 2007 | December 22, 2007 |
| 52 | 2009 | January 2, 2009 | 2008 | December 27, 2008 | 2007 | December 29, 2007 |
| 53 | | | 2009 | January 3, 2009 | | |
| 1 | 2009 | January 9, 2010 | 2009 | January 10, 2009 | 2008 | January 5, 2008 |
| 2 | 2010 | January 16, 2010 | 2009 | January 17, 2009 | 2008 | January 12, 2008 |
| 3 | 2010 | January 23, 2010 | 2009 | January 24, 2009 | 2008 | January 19, 2008 |
| 4 | 2010 | January 30, 2010 | 2009 | January 31, 2009 | 2008 | January 26, 2008 |
| 5 | 2010 | February 6, 2010 | 2009 | February 7, 2009 | 2008 | February 2, 2008 |
| 6 | 2010 | February 13, 2010 | 2009 | February 14, 2009 | 2008 | February 9, 2008 |
| 7 | 2010 | February 20, 2010 | 2009 | February 21, 2009 | 2008 | February 16, 2008 |
| 8 | 2010 | February 27, 2010 | 2009 | February 28, 2009 | 2008 | February 23, 2008 |
| 9 | 2010 | March 6, 2010 | 2009 | March 7, 2009 | 2008 | March 1, 2008 |
| 10 | 2010 | March 13, 2010 | 2009 | March 14, 2009 | 2008 | March 8, 2008 |
| 11 | 2010 | March 20, 2010 | 2009 | March 21, 2009 | 2008 | March 15, 2008 |
| 12 | 2010 | March 27, 2010 | 2009 | March 28, 2009 | 2008 | March 22, 2008 |
| 13 | 2010 | April 3, 2010 | 2009 | April 4, 2009 | 2008 | March 29, 2008 |
| 14 | 2010 | April 10, 2010 | 2009 | April 11, 2009 | 2008 | April 5, 2008 |
| 15 | 2010 | April 17, 2010 | 2009 | April 18, 2009 | 2008 | April 12, 2008 |
| 16 | 2010 | April 24, 2010 | 2009 | April 25, 2009 | 2008 | April 19, 2008 |
| 17 | 2010 | May 1, 2010 | 2009 | May 2, 2009 | 2008 | April 26, 2008 |
| 18 | 2010 | May 8, 2010 | 2009 | May 9, 2009 | 2008 | May 3, 2008 |
| 19 | 2010 | May 15, 2010 | 2009 | May 16, 2009 | 2008 | May 10, 2008 |
| 20 | 2010 | May 22, 2010 | 2009 | May 23, 2009 | 2008 | May 17, 2008 |
| 21 | 2010 | May 29, 2010 | 2009 | May 30, 2009 | 2008 | May 24, 2008 |
| 22 | 2010 | June 5, 2010 | 2009 | June 6, 2009 | 2008 | May 31, 2008 |
| 23 | 2010 | June 12, 2010 | 2009 | June 13, 2009 | 2008 | June 7, 2008 |
| 24 | 2010 | June 19, 2010 | 2009 | June 20, 2009 | 2008 | June 14, 2008 |
| 25 | 2010 | June 26, 2010 | 2009 | June 27, 2009 | 2008 | June 21, 2008 |
| 26 | 2010 | July 3, 2010 | 2009 | July 4, 2009 | 2008 | June 28, 2008 |
| 27 | 2010 | July 10, 2010 | 2009 | July 11, 2009 | 2008 | July 5, 2008 |
| 28 | 2010 | July 17, 2010 | 2009 | July 18, 2009 | 2008 | July 12, 2008 |
| 29 | 2010 | July 24, 2010 | 2009 | July 25, 2009 | 2008 | July 19, 2008 |
| 30 | 2010 | July 31, 2010 | 2009 | August 1, 2009 | 2008 | July 26, 2008 |
| 31 | 2010 | August 7, 2010 | 2009 | August 8, 2009 | 2008 | August 2, 2008 |
| 32 | 2010 | August 14, 2010 | 2009 | August 15, 2009 | 2008 | August 9, 2008 |
| 33 | 2010 | August 21, 2010 | 2009 | August 22, 2009 | 2008 | August 16, 2008 |
| 34 | 2010 | August 28, 2010 | 2009 | August 29, 2009 | 2008 | August 23, 2008 |
| 35 | 2010 | September 4, 2010 | 2009 | September 5, 2009 | 2008 | August 30, 2008 |
| 36 | 2010 | September 11, 2010 | 2009 | September 12, 2009 | 2008 | September 6, 2008 |
| 37 | 2010 | September 18, 2010 | 2009 | September 19, 2009 | 2008 | September 13, 2008 |
| 38 | 2010 | September 25, 2010 | 2009 | September 26, 2009 | 2008 | September 20, 2008 |
| 39 | 2010 | October 2, 2010 | 2009 | October 3, 2009 | 2008 | September 27, 2008 |

Appendix C: Definitions for Estimated Level of Influenza Activity

State health departments report the estimated level of influenza activity in their respective states each week. These levels are defined as follows (note that *region* corresponds to *county* in Rhode Island).

- **No Activity:** Overall clinical activity remains low and there are no laboratory-confirmed cases.
- **Sporadic:** Isolated cases of laboratory-confirmed influenza in the state with no increase in ILI activity; OR a laboratory-confirmed outbreak in a single institution in the state with no increase in ILI activity.
- **Local:** Increased ILI within a single region AND recent (within the past 3 weeks) laboratory evidence of influenza in the region but ILI activity in other regions is not increased; OR two or more institutional outbreaks (ILI or laboratory-confirmed) within a single region AND recent laboratory-confirmed influenza in that region but other regions do not have increased ILI and virus activity is no greater than sporadic in those regions.
- **Regional:** Increased ILI in two or more but less than half of the regions AND recent laboratory-confirmed influenza in the affected regions; OR institutional outbreaks (ILI or laboratory-confirmed) in two or more but less than half of the regions AND recent laboratory-confirmed influenza in the affected regions.
- **Widespread:** Increased ILI and/or institutional outbreaks (ILI or laboratory-confirmed) in at least half of the regions AND recent (within past 3 weeks) laboratory-confirmed influenza in the state.

Appendix D: Glossary of Terms

Sentinel Provider: A healthcare provider who serves to monitor outpatient visits for influenza-like illness (ILI) during influenza season. The Rhode Island sentinel providers are part of the National Sentinel Provider Network, which is a collaborative effort between CDC and state health departments. Rhode Island sentinel providers report ILI information to CDC on a weekly basis. The percent ILI for each state is calculated based on the total number of ILI-visits during a given week divided by the sum total of all patient visits during the same week.

Influenza-Like Illness (ILI): Defined as a temperature of $\geq 100.0^{\circ}$ F (37.8° C) and either a cough or sore-throat in the absence of known cause.

National Baseline: Percent (%) influenza-like illness (ILI) that would be expected if influenza viruses were not circulating. The national baseline is 2.3% for the 2009-2010 influenza season. The national baseline is calculated as the mean weighted percentage of visits for ILI during non-influenza season weeks, plus two standard deviations.

Swine flu: A novel strain of type A H1N1 influenza that emerged in April 2009 resulting in a global influenza pandemic.

Seasonal flu: Seasonal (or common) flu is a contagious respiratory illness caused by influenza virus that can be transmitted from person to person. It can cause mild to severe illness and at times may result in death. Young children, the elderly and those with certain underlying conditions are at greatest risk for influenza-associated complications or death. Most people have some immunity to seasonal influenza strains and each year a vaccine is produced based on predicted circulating strains for that season.

Outbreak: A localized increase in rate of disease during a given time period and place.

Epidemic: The occurrence of cases of an illness or health-related event in a community or region that exceeds what would normally be expected (i.e. a large-scale outbreak).

Pandemic: An epidemic on a global scale.

Appendix E: Additional Resources and Contact Information

Additional Resources:

The 2009 H1N1 Influenza Pandemic: field and Epidemiologic Investigations
Clinical Infectious Diseases. Volume 52 suppl 1 January 1, 2011.
http://cid.oxfordjournals.org/content/52/suppl_1.toc

Rhode Island Department of Health (HEALTH), influenza
<http://www.health.ri.gov/flu/index.php>

U.S. Centers for Disease Control and Prevention (CDC), 2009 H1N1 flu
<http://www.cdc.gov/h1n1flu/>

FluView: 2009-2010 Influenza Season Week 20 Ending May 22, 2010. U.S. Centers for Disease Control and Prevention. May 28, 2010. Accessed June 21, 2010. Available at:
<http://cdc.gov/flu/weekly/fluactivity.htm#MS>

Interim results: state specific influenza A (H1N1) 2009 monovalent vaccination coverage – United States, October 2009 – January 2010. U.S. Centers for Disease Control. *Morbidity and Mortality Weekly Report*. April 2, 2010; 59(12):p363-369.
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5912a2.htm>

World Health Organization (WHO), pandemic (H1N1) 2009
<http://www.who.int/csr/disease/swineflu/en/>

Morbidity & Mortality Weekly Reports on 2009 H1N1 (Swine Flu),
U.S. Centers for Disease Control (CDC)
<http://www.cdc.gov/h1n1flu/pubs/>

U.S. Food and Drug Administration (FDA), 2009 H1N1 (Swine) flu page
(antiviral and H1N1 vaccine information)
<http://www.fda.gov/NewsEvents/PublicHealthFocus/ucm150305.htm#vaccine>

Rules and regulations pertaining to the reporting of communicable, environmental and occupational diseases in Rhode Island
<http://www2.sec.state.ri.us/dar/regdocs/released/pdf/DOH/5335.pdf>

“Take 3” – Steps to Fight the Flu brochure

English version: http://www.cdc.gov/flu/freeresources/2009-10/pdf/h1n1_take3.pdf

En espanol: http://www.cdc.gov/flu/freeresources/2009-10/pdf/h1n1_take3_sp.pdf

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Laboratory: Robert Ireland PhD.....Chief, Biological Sciences Laboratory

