

Iowa Influenza Surveillance Network Final Report 2007-2008



Background

The Iowa Influenza Surveillance Network (IISN) was formally established in 2004, though surveillance has been conducted at the Iowa Department of Public Health (IDPH) for more than ten years. The IISN is comprised of four primary surveillance systems- sentinel health care providers, hospital-based, laboratory-based, and school-based. Sentinel health care providers are part of the U.S. Influenza Sentinel Provider Surveillance System. All systems, except certain sentinel sites, report October-March.

Schools and long-term care facilities report data weekly into a Web-based reporting system. Schools report the number of students absent due to illness and the total enrolled. Long-term care facilities report cases of influenza and vaccination status of each case. Both passively report outbreaks of illness, including influenza, to IDPH.

Laboratory surveillance has two components- influenza confirmatory testing and rapid influenza test reporting. All sentinel and hospital surveillance sites are encouraged to submit influenza specimens to the University Hygienic Laboratory (UHL), though many hospitals, clinics, and laboratories outside the IISN also submit specimens for testing. In 2007-2008, UHL began collecting weekly rapid influenza positive test results from laboratories throughout the state. The percent positive was plotted in the IISN weekly reports.

IDPH submits data weekly to the 122 Cities Mortality Reporting System for the city of Des Moines, however, the data drawn from this effort has yet to be useful for seasonal flu surveillance due to low mortality and population density.

Hospital-based surveillance began in 2006 with 18 hospitals enrolled. Thirteen remained for the 2007-2008 season, including three of lowa's largest hospitals and health care systems. On a weekly basis, hospitals review and report inpatient data for hospitalizations for influenza-associated conditions. All cases must have a positive influenza laboratory result up to two weeks prior to hospitalization. Each inpatient is counted once for each reporting week, and the total by age group (0-4, 5-24, 25-64, >64) is entered into a Web-based reporting system. During the 2007-2008 season lowa surveyed an average of 4,500 inpatients every week out of approximately 15,000 total potential hospitalizations. Limitations with the existing hospital surveillance system include: surveillance only Oct-March, only 13 hospital sites, and no case-specific data other than age.

Collectively, all reporting systems provide the information required to achieve the goals of surveillance which are as follows:

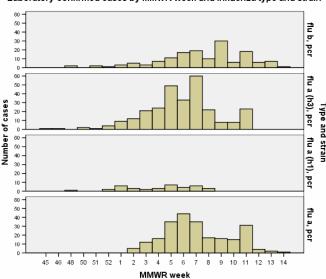
- Determine which age-groups are being impacted by influenza
- Assess severity of influenza disease compared to previous seasons
- Characterize the proportion of hospitalizations attributed to influenza and influenza-associated conditions
- Identify the types and strains of influenza circulating in Iowa
- Detect unusual and/or novel strains of influenza

Summary

The 2007-2008 influenza season was the most severe in the past three years. Activity started slowly with the first case confirmed the week of November 10th. All surveillance indicators rose slowly as in past years and most were elevated above threshold values at MMWR week 6, or the middle of February. This season was unusual in that peak activity levels lasted approximately ten weeks. There are two factors that may have contributed to the unusual duration of this influenza season. First, Iowa experienced a

long, cold winter with near record amounts of precipitation¹. Harsh winter conditions force people to remain indoors and in close proximity to each other thereby facilitating spread of influenza and other viruses. Additionally, the flu virus survives well in cooler, low humidity conditions². A second highly contributory factor is that the influenza vaccine did not match the circulating strains well. Overall vaccine efficacy was believed to be 44 percent, and only 58 percent for the most common strain- AH3. Vaccine effectiveness in sub-optimal years ranges from 74-79 percent³. The majority of lowa laboratory-confirmed cases were influenza AH3 (Figure 1). The vaccine had no efficacy against the influenza B strain circulating in the U.S. in 2007-2008.

Laboratory-confirmed cases by MMWR week and influenza type and strain



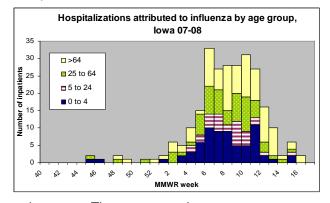
Vaccine strains for each season are determined in February or March of the year prior to the next influenza season. In mid-2007, a new strain of influenza B emerged as the dominant strain in the Southern Hemisphere. The influenza B/Yamagata strain is from a different lineage than the 2007-2008 vaccine strain. By the time the significance of B/Yamagata was established, the vaccine components for 2007-2008 were already set. Influenza strains are highly mutagenic. When a new strain emerges that is an antigenic variant of a known strain, vaccine efficacy may suffer but will not be totally ineffective. Seasons such as this are not common and influenza surveillance becomes more robust every year. This combined with advancing technology in vaccine development may one day mean that there will no longer be severe flu seasons due to vaccine mismatch.

Figure 1

Influenza impacted all age groups this year. The very young, very old and those with chronic health conditions are always at a higher risk for complications from influenza infections.

Surveillance showed that all age groups had similar rates of hospitalization with the exception of the early and late peak weeks (Figure 2). Rates of absence in schools were lower than last year, which was considered a mild flu season. Reports of schools absence due to illness exceeding 10% were much lower than last year.

An influenza death is not a required reportable incident in the State of Iowa. Though such deaths are passively reported to the state, the only ones then reported to the Centers for Disease Control and Prevention (CDC) are pediatric influenza-associated



deaths occurring in children and adolescents 18 years and younger. There were two known influenza-associated pediatric deaths in Iowa in 2007-2008. One death due to influenza AH1 occurred in a five month old who was too young to be vaccinated for influenza. The infant

Figure 2

¹ Iowa State University Department of Agronomy. http://mesonet.agron.iastate.edu/sites/hist.phtml?station=DSM&network=IA_ASOS. Iowa Environmental Mesonet.

² Davis GW, Griesemer RA, Shadduck JA, Farrell RL. Effect of relative humidity on dynamic aerosols of adenovirus 12. Appl Microbiol. 1971 Apr;21(4):676-9.

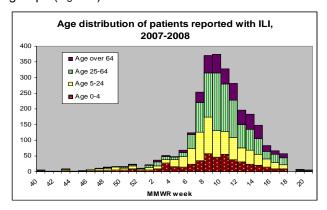
³ Centers for Disease Control and Prevention. Interim Within-Season Estimate of the Effectiveness of Trivalent Inactivated Influenza Vaccine --- Marshfield, Wisconsin, 2007--08 Influenza Season. Morbidity and Mortality Weekly Report, April 18, 2008 / 57(15);393-398.

was also infected with RSV at the time of death. The second death occurred in a three year old child infected with influenza B. This child had been vaccinated though it is known that the vaccine provided no protection against the dominant influenza B strain.

IDPH also investigated a case of AH1N1 swine influenza. Iowa has periodic human cases of this type of influenza that typically infects swine. The case was a young child who had direct contact with swine.

Sentinel surveillance

Influenza-like illness was reported by sentinel sites at percentages comparable to the 2004-2005 flu season (Figure 3). There was significant vaccine mismatch that year which contributed to high percentages of ILI. This season, more patients in the 25-64 year old age group were consistently reported as having ILI compared to other groups, however, that age group contains twice as many years as the other age groups (Figure 4).



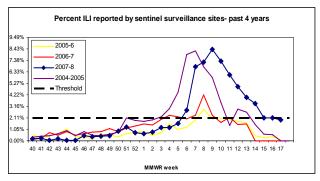


Figure 3

Figure 4

Hospital surveillance

Hospitalizations were much higher this flu season compared to last. Hospitalizations were evenly distributed across all age groups, including middleaged adults. Typically hospitalizations attributed to influenza occur more often in children ages 0-4 and adults over 65.

Long term care facilities reported sporadic cases in both vaccinated and un-vaccinated residents. There were several outbreaks reported in long term care facilities across the state.

School surveillance

The percentage of absence due to illness was elevated during the peak weeks of flu activity. The number of weeks reported above threshold was twelve (Figure 5).

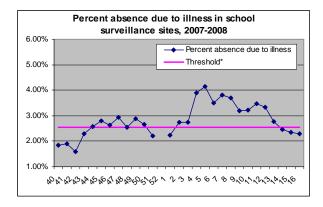
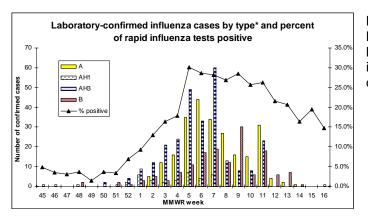


Figure 5

Laboratory surveillance

There were 697 laboratory-confirmed cases reported through the IISN in 2007-2008. Most cases were reported by UHL, though reports were accepted from laboratories conducting confirmatory testing (PCR, DFA, culture, IHC).

Rapid influenza percent positives were reported throughout the influenza season and correlated well with the number of laboratory-confirmed cases.



Both influenza A and B spiked around MMWR week 7 but surged again two weeks later (Figure 6). Late-season increases in influenza B cases are not uncommon compared to previous years.

Figure 6

Conclusions

Influenza surveillance activities were successful in meeting the goals of the network. Influenza prevention measures were targeted at peak times throughout the season and to the appropriate audiences. Next year IDPH may explore the use of weather data to determine when peak activity will occur. Past years' peaks historically follow the coldest week in winter by 3-4 weeks (Figure 7).

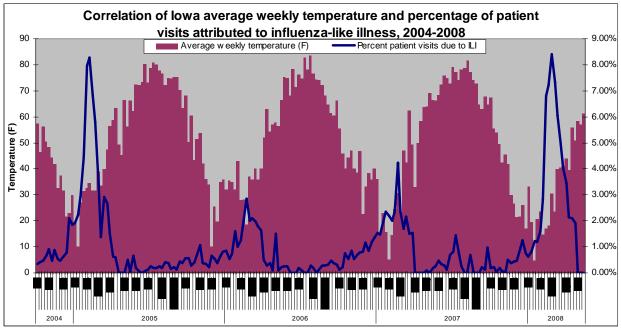


Figure 7

Next season IDPH plans to partner with the University of Iowa to pre-determine the optimal sentinel and hospital surveillance locations. The assessment will be conducted using zip code data and proximity to a health care facility⁴. This will hopefully result in sites that better represent the population of Iowa- both by location and percentage of population surveyed.

In 2008-2009 school and hospital surveillance will be expanded to include more sites than in previous years. All other programs conducted in 2007-2008 will continue into the following year.

⁴ Polgreen PM, Chen Z, Segre MA, Pentella MA, Rushton, G. Optimizing Influenza Sentinel Surveillance at the State Level (Abstract). International Conference of Emerging Infectious Diseases (March 16-19, 2008).