ENHANCING INFLUENZA SURVEILLANCE FOR REAL-TIME BURDEN OF DISEASE ASSESSMENT

IOWA DEPARTMENT OF PUBLIC HEALTH (IDPH)
STATE HYGIENIC LABORATORY (SHL)
Presentation Overview

- Iowa influenza surveillance measures
- Overview of flu testing
- Review recent flu seasons in Iowa
- Gaps in surveillance
- Current efforts to improve Iowa flu surveillance
- Q & A
Raise Your Hand If You Used … During the 2018-19 Season

- CDC Fluview
- Iowa Influenza Surveillance Report
Iowa Influenza Surveillance Network (IISN) Overview

- The IISN is a collaborative effort between IDPH, SHL and many other partners.
- Some surveillance is seasonal and some is throughout the year.
- Objectives of the surveillance are:
  - Establish when and where influenza is present in Iowa.
  - Monitor severity and prevalence of influenza.
  - Determine characteristics of, and changes in, the virus.
  - Provide timely information to providers and the public.
IISN Program Components

- Outpatient illness-like illness (ILINet)
- Influenza-associated hospitalizations
- Public health and clinical laboratories
- Long-term care facility outbreaks
- Influenza-related mortality
- School absences due to illness
- Non-influenza respiratory testing
IISN Weekly Report

Iowa Influenza Surveillance Network (IISN)
Influenza-like Illness (ILI) and Other Respiratory Viruses
Weekly Activity Report
For the week ending May 19, 2018 - Week 20

Iowa Influenza Geographic Spread

Quick Stats

Percent of influenza rapid test positive 4% (17/396)
Percent of RSV rapid tests positive 5% (2/43)
Influenza-associated hospitalizations 2/254 inpatients
Percent of outpatient visits for ILI 0.36% (baseline 1.9%)
Percent school absence due to illness 1.40%
Number of long-term care influenza outbreaks 0
Number of schools with ≥10% absence due to illness 2
Influenza-associated mortality - all ages (Cumulative) 270
Influenza-associated pediatric mortality (Cumulative) 0

idph.iowa.gov/influenza/reports
Flu Testing at the State Hygienic Laboratory

- Influenza Testing at SHL contributes to state, national and global surveillance goals
- Determine when and where influenza is circulating in the state
- Provides virus strains for further characterization to determine if the current vaccine is a good match to what is circulating
  - Subset are sent to regional lab for Next Generation Sequencing for sequence typing which can also identify changes to antibody recognition and virulence
Flu Testing and the State Hygienic Laboratory

- Contributes to determination of next year’s vaccine selection
- Identify novel strains and zoonotic transmissions
  - Influenza strains that circulate in pigs or birds that can occasionally make people sick
- Monitor for resistance to influenza drugs
  - Subset sent for sequencing to identify if resistance genes are present that make antiviral drugs ineffective
- SHL performs CDC assay using RT-PCR including subtyping for pdm2009H1, H3, B genotypes Yamagata and Victoria, H5, H7
Flu Testing and the State Hygienic Laboratory

- Last year was a high severity influenza season in Iowa and most of the United States, with a long period of very high activity.
- Influenza A (H3N2) was the predominant strain circulating.
  - Typically, in years that influenza A (H3N2) circulates, vaccine effectiveness is low and severity of illness and deaths are high.
  - Also, a relatively high level of influenza A (H1N1)pmd09 and influenza B co-circulated last season.
Flu Testing and the State Hygienic Laboratory

- This season influenza A (H1N1)pmd09 predominated the beginning of the season and it started off as a much more mild flu season.
- However, that changed in February with an increase of H3 subtype which is why we monitor through the entire year.
Flu Testing and the State Hygienic Laboratory

Comparison of influenza type and strain

- A(H3)
- A(H1N1)pdm09
- B(Victoria)
- B(Yamagata)

Number of RT-PCR positives

Month/MMWR week

Oct 2018

Nov 2018

Dec

Jan

Feb

March

April

May 2019

June

July

Aug

Sept
SHL Respiratory Survey

- SHL also collects supplemental respiratory data via an only survey tool
- Surveys over 100 sentinel laboratories throughout Iowa weekly, rapid and PCR based
- Additional respiratory pathogens, including respiratory syncytial virus (RSV) test results
- A statewide summary of previous week’s survey results are reported back to submitters and are included in the weekly Iowa Department of Health (IDPH) Influenza Surveillance Report.
Clinical Labs Rapid Flu Testing

![Graph showing the number of tests performed and the percent of tests positive over time from 2014 to 2019.](image-url)
Outpatient Influenza-Like illness

Note: Influenza-like Illness is defined as a fever of ≥100° F as well as cough and/or sore throat.
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Flu Hospitalizations
Flu Hospitalizations
Clinical Labs Rapid Flu Testing

Number of tests performed vs Percent of tests positive over time.
Positives at SHL vs Clinical Labs

Month / MMWR Week

Number of tests performed

SHL Positive

Rapid Positive Percent

Percent of tests positive


Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar
Influenza Detected at SHL by Subtype

A(H3)  A(H1N1)pdm09  B(Victoria)  B(Yamagata)

Number of RT-PCR positives

Month/MMWR week

131  41  90  103  104  54
## Long-term Care Flu Outbreaks

<table>
<thead>
<tr>
<th>Season</th>
<th>Number of outbreaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-15</td>
<td>63</td>
</tr>
<tr>
<td>2015-16</td>
<td>7</td>
</tr>
<tr>
<td>2016-17</td>
<td>56</td>
</tr>
<tr>
<td>2017-18</td>
<td>90</td>
</tr>
<tr>
<td>2018-19 through week 10</td>
<td>37</td>
</tr>
</tbody>
</table>
## Influenza Mortality

<table>
<thead>
<tr>
<th>Ages</th>
<th>2014-15</th>
<th>2015-16</th>
<th>2016-17</th>
<th>2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-60</td>
<td>11</td>
<td>18</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>61-80</td>
<td>30</td>
<td>15</td>
<td>32</td>
<td>81</td>
</tr>
<tr>
<td>81 and over</td>
<td>134</td>
<td>11</td>
<td>89</td>
<td>161</td>
</tr>
<tr>
<td>Total</td>
<td>175</td>
<td>44</td>
<td>135</td>
<td>270</td>
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</table>
School Illness Reported by Year

*School absences data not reported for week 52 due to holiday break*
## Season Comparison

<table>
<thead>
<tr>
<th>Season</th>
<th>Predominate strain</th>
<th>ILI &gt; baseline</th>
<th>Cumulative Hospital</th>
<th>Deaths</th>
<th>LTCF Outbreaks</th>
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<tbody>
<tr>
<td>2014-15</td>
<td>AH3</td>
<td>1191 6(71/10K)</td>
<td>175</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>2015-16</td>
<td>A(H1N1)pdm09</td>
<td>352 1(21/10K)</td>
<td>44</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>2016-17</td>
<td>AH3</td>
<td>1078 5(63/10K)</td>
<td>135</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>2017-18</td>
<td>AH3</td>
<td>1889 10(96/10K)</td>
<td>259</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>2018-19</td>
<td>A(H1N1)pdm09</td>
<td>552 8(41/10K)</td>
<td>25</td>
<td>37</td>
<td></td>
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<td></td>
<td>259</td>
<td>91</td>
</tr>
<tr>
<td>2018-19</td>
<td>A(H1N1)pdm09</td>
<td>841 8(52/10K)</td>
<td></td>
<td>69</td>
<td>52</td>
</tr>
</tbody>
</table>
What Are the Gaps in Surveillance?

- How much outpatient and hospitalization ILI as well as school illness is due to influenza?
- What causes the differences in severity among various persons with influenza?
- How can we compare different influenza seasons accurately?
- What about underrepresented areas of the state or age groups?
CSTE Enhanced Influenza Surveillance Project

- SHL and Iowa Department of Public Health (IDPH) are collaborating on a new Influenza project
- Funded by the Council of State and Territorial Epidemiologists (CSTE)
- Partially utilized some of our current sentinel influenza surveillance sites
- Utilized SHL Information Technology (IT) personnel to add new data sent to the CDC electronically
  - Added hospitalized inpatient or outpatient
  - Could link severity to sequence changes
The goals of the project are to:

- better estimate the burden of disease in real-time by determining how much respiratory illness is caused by flu versus other respiratory pathogens
- determine the level of care associated with influenza positive specimens tested at SHL (which could identify a more virulent strain rapidly)
- provide better estimates of population based rates of influenza
Inpatient/ Outpatient Reporting

- IDPH/SHL held annual state-wide Influenza webinar
  - Solicited labs who send specimens to SHL for testing fill out Hospitalized (inpatient) yes/no boxes on the SHL test request form
  - Amazing compliance to fill out this request
  - As of week 10, ending March 9, 2019 there were 572 inpatient specimens and 676 outpatient specimens tested at SHL and data transmitted electronically to the CDC.
ILI Attributable to Influenza

![Graph showing the percentage of patients with ILI from October 2018 to March 2019. The graph compares ILI at all sites, project sites, and estimated flu cases. The y-axis represents the percent of patients with ILI, ranging from 0.0% to 5.0%. The x-axis represents the month/week, with months labeled as Oct, Nov, Dec, Jan, Feb, and March, and weeks labeled from 40 to 52. The lines for All sites ILI, Project Sites ILI, and Estimated Flu are visible, showing fluctuations in ILI cases.]
Non-Influenza Testing

![Graph showing trends in positive tests for adenovirus, rhinovirus/enterovirus, RSV, and coronavirus over different years and months.](#)
<table>
<thead>
<tr>
<th>Subtype</th>
<th>Outpatient</th>
<th>Hospitalized</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (H1N1)pdm09</td>
<td>134</td>
<td>83</td>
<td>217</td>
</tr>
<tr>
<td>A(H3)</td>
<td>76</td>
<td>43</td>
<td>119</td>
</tr>
<tr>
<td>B(Victoria or Yamagata lineage)</td>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>216</strong></td>
<td><strong>116</strong></td>
<td><strong>342</strong></td>
</tr>
</tbody>
</table>
# Hospitalization Status, Influenza Subtype and Age, 2018-2019

<table>
<thead>
<tr>
<th>Subtype</th>
<th>0-4</th>
<th>5-24</th>
<th>25-49</th>
<th>50-64</th>
<th>65 Plus</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (H1N1)pdm09</td>
<td>11</td>
<td>1</td>
<td>13</td>
<td>29</td>
<td>29</td>
<td>83</td>
</tr>
<tr>
<td>A(H3)</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>15</td>
<td>26</td>
<td>43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12</td>
<td>1</td>
<td>14</td>
<td>44</td>
<td>55</td>
<td>126</td>
</tr>
</tbody>
</table>
Future Directions

- Age rates for ILI and hospitalization
- Real-time severity assessment based on historic thresholds
- Compare illness and severity with antigenic and genetic characterization
- Rapid identification of mismatch to vaccine especially if contributing to hospitalization
IDPH Contact Information

To learn more about our influenza surveillance Programs, to become a participant, or to sign up for the surveillance report email list, please contact

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