In response to the H1N1 pandemic, Washington required reporting of laboratory-confirmed H1N1 influenza deaths from April through August 2009, and deaths due to laboratory-confirmed influenza of any type from September through December 2009. Hospitals and healthcare providers reported cases to local health jurisdictions (LHJs), who then reported to Washington Department of Health (DOH) using PHIMS, a secure web-based application for disease surveillance (Figure 1).

The purposes of laboratory-confirmed influenza death surveillance are to:

- Monitor epidemiology of severe influenza infections
- Estimate severity of influenza season
- Maintain situational awareness and actionable data

OBJECTIVES

- To assess usefulness of PHIMS laboratory-confirmed influenza death surveillance
- To assess sensitivity and other attributes of PHIMS laboratory-confirmed influenza death reporting

EVALUATION METHODS

1. Usefulness
- Reviewed objectives of system and assessed actions resulting from surveillance activities

2. Sensitivity
- Approximated sensitivity using capture-recapture methods, with 2009 death registry and PHIMS as independent sources
- Among death records, laboratory-confirmed influenza death defined as record with:
  a) J09 or J10 ICD-10 coding in any cause of death field, or
  b) Influenza listed as cause of death in literal fields
- Death records with text indicating suspect or probable influenza diagnosis excluded

3. Timeliness
- Assessed time difference between date variables in reporting process

4. Data Quality
- Determined completeness of variables through proportion of valid responses

5. Flexibility and Acceptability
- Examined ability of PHIMS to adapt to changing reporting requirements
- Surveyed both LHJ and DOH PHIMS users

RESULTS 1: Usefulness
- Surveillance enabled DOH to:
  a) Monitor epidemiology of severe influenza infections
  b) Estimate severity of circulating strains
  c) Maintain situational awareness and positioning to initiate public health intervention
  d) Create weekly reports, which were disseminated to LHJs and healthcare providers

RESULTS 2: Sensitivity
Capture-Recapture Estimate, PHIMS

<table>
<thead>
<tr>
<th>Death Registry (+)</th>
<th>PHIMS (+)</th>
<th>PHIMS (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death Registry (+)</td>
<td>63</td>
<td>26</td>
</tr>
<tr>
<td>Death Registry (-)</td>
<td>31</td>
<td>x.13</td>
</tr>
</tbody>
</table>

- An estimated 133 laboratory-confirmed influenza deaths occurred during the study period
- 94 (71%) present in PHIMS
- 120 (90%) captured using PHIMS and death registry together

RESULTS 3: Timeliness

<table>
<thead>
<tr>
<th>Reporting Process Interval</th>
<th>Median Time (days)</th>
<th>Range (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom onset to LHJ notification</td>
<td>8</td>
<td>0 – 45</td>
</tr>
<tr>
<td>LHJ notification to DOH visibility</td>
<td>1</td>
<td>0 – 129</td>
</tr>
<tr>
<td>LHJ record create to DOH visibility</td>
<td>0*</td>
<td>0*</td>
</tr>
</tbody>
</table>

*Once created by LHJ, PHIMS record visible instantaneously to DOH

RESULTS 4: Data Quality

<table>
<thead>
<tr>
<th>Variable</th>
<th>Completeness (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Information</td>
<td></td>
</tr>
<tr>
<td>Birth date</td>
<td>94/94 (100)</td>
</tr>
<tr>
<td>Gender</td>
<td>94/94 (100)</td>
</tr>
<tr>
<td>Ethnicity/Race</td>
<td>79/94 (84)</td>
</tr>
<tr>
<td>Clinical Information</td>
<td></td>
</tr>
<tr>
<td>Onset date</td>
<td>94/94 (100)</td>
</tr>
<tr>
<td>Predisposing Conditions</td>
<td>94/94 (100)</td>
</tr>
<tr>
<td>Pregnant</td>
<td>22/28 (79)</td>
</tr>
<tr>
<td>Hospitalized</td>
<td>94/94 (100)</td>
</tr>
</tbody>
</table>

RESULTS 5: Flexibility and Acceptability
- Mandatory reporting of laboratory-confirmed influenza deaths incorporated into 2011 Washington Administrative Code (WAC) revision, receiving no pushback from Washington State Board of Health or LHJs
- Minimal informatics support required to add influenza death reporting to PHIMS: drop-down menus manipulated during summer 2009 to allow for new variables

CONCLUSION
- Any dramatic changes in the epidemiology of influenza deaths would be detected, allowing for response
- System allows DOH to monitor risk factors for severe influenza infections, estimate severity of influenza season and detect changes in severity of circulating strains
- The timeliness, data quality, flexibility and acceptability of PHIMS laboratory-confirmed influenza death reporting supports continued use of the system for surveillance
- Use of PHIMS alone for influenza death surveillance is less sensitive than use of PHIMS and the death registry together; periodic death registry review would increase case finding

FUTURE PLANS
- Periodically review death registry for potential laboratory-confirmed influenza deaths

ACKNOWLEDGEMENTS
WA DOH: Ann Lima, Rita Altamore, Marcia Goldoft, Phyllis Reed, Tracy Sandler, Natasha Close
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This study was supported in part by an appointment to the Applied Epidemiology Fellowship Program administered by the Council of State and Territorial Epidemiologists (CSTE) and funded by the Centers for Disease Control and Prevention (CDC) Cooperative Agreement Number U58HM004114