Development and Application of Syndromic Surveillance for Severe Weather Events in New Jersey Following Hurricane Sandy

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Outline

- Introduction
- Syndromic surveillance during Sandy
- Syndromic surveillance enhancement
- Concluding thoughts

Syndromic Surveillance - October 2012

- EpiCenter – a syndromic surveillance system used in NJ and other states
  - 68 of 80 (85%) of facilities participating at time of storm (at least one in each county)
  - Real-time data
  - Built-in tools for classification, mapping and analysis of data were very helpful
  - Custom classifier capability
    - Useful in emerging threat situation like a storm or large event

Storm Warnings ➔ Planning

- Surveillance planning
  - Conference calls and emails
    - Partners: Local Epidemiologists & Hospital Emergency Departments (EDs)
    - Requested facilities use “Sandy” or “storm” as a keyword in chief complaint for ED visits related to storm
  - Syndromic surveillance system
    - Established a “Hurricane” classifier including related keywords
**Disaster strikes**
- Early hours October 29, 2012, Sandy came ashore near Atlantic City, NJ
  - All 21 counties impacted; nine heavily
  - Storm surge flooding (9 ft)
  - Wind damage along coast & also far inland
  - Sustained power outages in many areas

**During and After Sandy**
- Daily emergency department summary report
  - “Hurricane” classification increased efficiency
  - Keyword examples: CO, flood, storm, power outage, hurricane
  - Shared with local epidemiologist/surveillance staff by email
  - Shared with emergency preparedness staff, posting on Hippocrates gallery

**Hurricane Sandy Related ED Visits**

**EpiCenter Enhancements**
- Create a severe weather classifier
  - Focus on weather-related events
  - Use ED chief complaints/reasons of visit
  - Remove the need for communication to facilities about using a specific keyword
  - Established and validated ahead of an event
Severe Weather Classifier

- Existing classifications
  - CO poisoning, GI, respiratory, MVA
- Newly evaluated classifications
  - Disrupted medical care (oxygen, dialysis, medication refills)
  - Mental health related
  - Tree related injury
  - Hypothermia
  - Cardiovascular disease

Keyword Validation

- Identify ICD codes for health/mental health conditions
  - Review/evaluate keywords in chief complaints for each health condition to be included
  - Review cases with keywords of interest but not containing ICD codes meeting case definition
- Prepare a list of keywords for each classification
  - Export data from EpiCenter for a defined study period to calculate the sensitivity and positive predictive value

Results

- Carbon monoxide poisoning
- Disrupted outpatient medical care
  - Dialysis
  - Medication refills
  - Oxygen needs
- Mental health
  - Anxiety and adjusted disorders
  - Substance use (methadone/opiate)

Cluster of Carbon Monoxide Poisoning

Data source for estimated days with power outage after Sandy: Rutgers University, School of Public Affairs and Administration, Stephanie Hoopes Halpin, PhD
Disrupted Outpatient Medical Care in New Jersey:
ED Visits per 1,000, Oct. 21-Nov. 17, 2012

Disrupted Outpatient Medical Care/Needs by Impact Level

Rate per 1,000 ED Visits

Impacted Area (8 Counties)

Disrupted Outpatient Medical Care by Impacted Area Rate per 1,000 ED Visits, October 22 - November 17, 2012

Data can be broken out to show impact in hardest hit areas vs. those not as hard hit.

Anxiety and Adjustment Disorders

Methadone/Opiate/Heroin related ED Visits

Anxiety/Adjustment Disorders ED Visits
Weekly trend in New Jersey (July 2012 – September 2014)

Methadone/Opiate/Heroin ED Visits in New Jersey (September 2012 – December 2012)
Keyword Validation Results

<table>
<thead>
<tr>
<th>Classification</th>
<th>Sensitivity</th>
<th>Positive Predictive Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialysis</td>
<td>80.0%</td>
<td>53.3%</td>
</tr>
<tr>
<td>Medicine Refills</td>
<td>82.6%</td>
<td>65.0%</td>
</tr>
<tr>
<td>Oxygen Needs</td>
<td>61.6%</td>
<td>16.6%</td>
</tr>
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</table>

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<tr>
<th>Classification</th>
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<tbody>
<tr>
<td>Mental Health Related/ Substance Use Classifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety/Adjustment Disorders</td>
<td>58.60%</td>
<td>77.60%</td>
</tr>
<tr>
<td>Mood Disorders</td>
<td>57.10%</td>
<td>88.60%</td>
</tr>
<tr>
<td>Psychotic Disorders</td>
<td>63.20%</td>
<td>52.60%</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td>93.70%</td>
<td>66.60%</td>
</tr>
<tr>
<td>Suicide/Self-Inflicted Injury</td>
<td>37.60%</td>
<td>51.20%</td>
</tr>
<tr>
<td>Methadone/Opiate/Heroin Use</td>
<td>64.70%</td>
<td>14.40%</td>
</tr>
</tbody>
</table>

Concluding thoughts

- Syndromic surveillance has proven utility for NJDOH in severe weather event
- While not precise, gives a good overview of ED activity statewide during event
- Ongoing evaluation to add additional classification (e.g. occupational injury)

Acknowledgements

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  - Pauline Thomas, MD
  - Petros Levounis, MD
- Health Monitoring System (HMS), Inc.
  - Andrew Walsh, PhD
  - Kevin Hutchison
  - Elizabeth Kostial
### Questions & Comments

- Email: Stella.Tsai@doh.state.nj.us
- Phone: 609-826-5964

### Severe Weather Classifier Validation Results

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<tr>
<td>Carbon Monoxide Poisoning</td>
<td>98.4%</td>
<td>73.5%</td>
</tr>
<tr>
<td>Hypothermia/Other Cold Related Injuries</td>
<td>87.5%</td>
<td>73.5%</td>
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<tr>
<td>Hypothermia/Other Cold Related Injuries</td>
<td>96.9%</td>
<td>22.9%</td>
</tr>
<tr>
<td>Respiratory Failure - Opiate</td>
<td>96.9%</td>
<td>77.9%</td>
</tr>
<tr>
<td>Respiratory Failure - Alcohol</td>
<td>75.6%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Cardiopulmonary Arrests</td>
<td>95.8%</td>
<td>52.7%</td>
</tr>
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<td>93.9%</td>
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<td>68.5%</td>
<td>85.0%</td>
</tr>
<tr>
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<td>76.2%</td>
<td>77.4%</td>
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<td>73.6%</td>
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- **High Sensitivity/PPV (N=10)**
- **Low Sensitivity or PPV (N=10)**
- **Moderate Sensitivity/PPV (N=20)**
- **Not Validated - Using current existing classifications in the EpiCenter (N=1)**

Tree Related Injury cannot be computed due to lack of specific diagnostic codes.