**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

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## 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

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## 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

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## 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
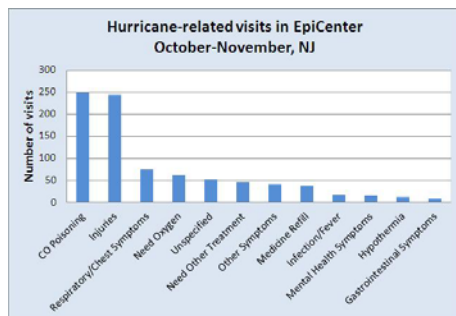  - Sustained power outages in many areas

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## 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

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## Hurricane Sandy Related ED Visits



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## 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

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## 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

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## 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
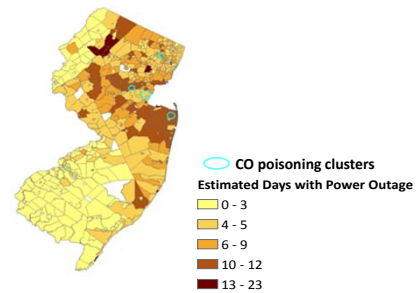
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## Results

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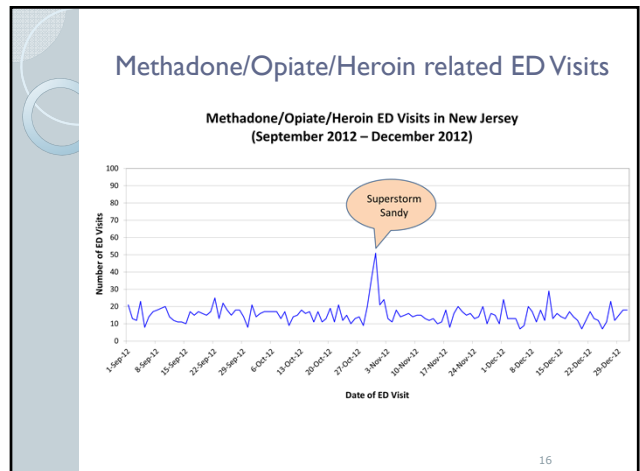  - Substance use (methadone/opiate)

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## Cluster of Carbon Monoxide Poisoning



CO poisoning clusters
**Estimated Days with Power Outage**
- 0 - 3
- 4 - 5
- 6 - 9
- 10 - 12
- 13 - 23
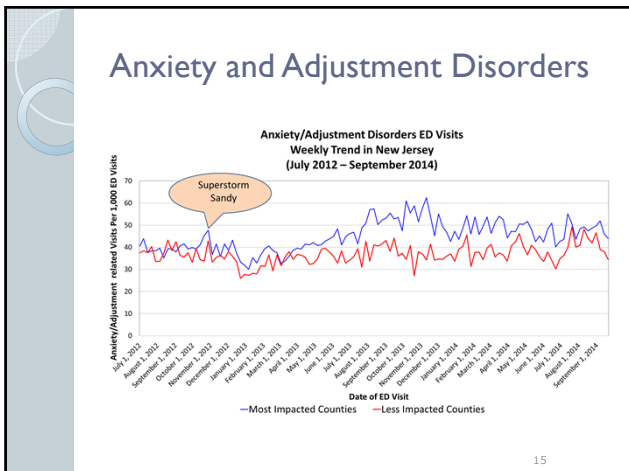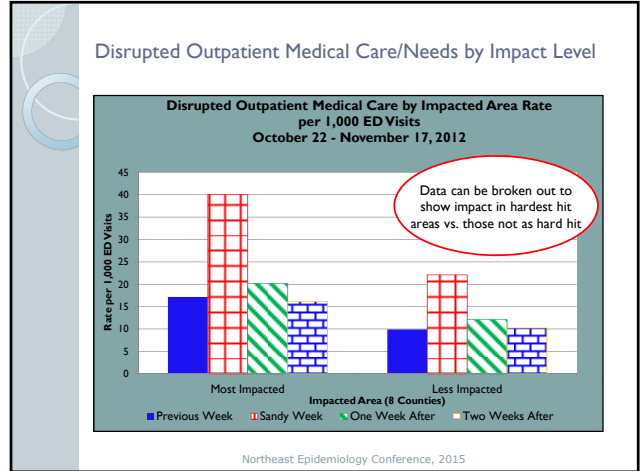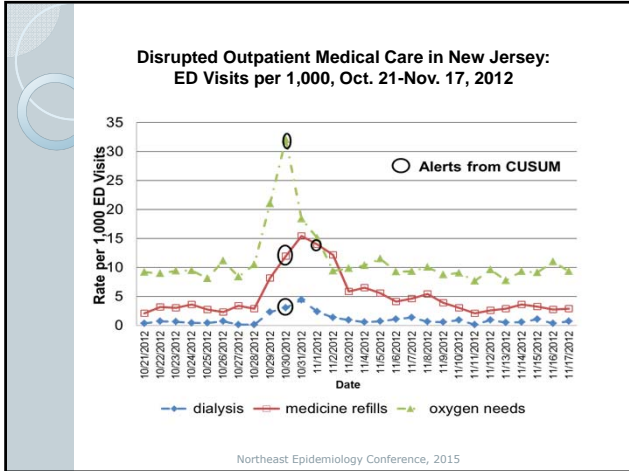
Data source for estimated days with power outage after Sandy:
Rutgers University, School of Public Affairs and Administration,
Stephanie Hoopes Halpin, PhD

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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



Anxiety and Adjustment Disorders



Methadone/Opiate/Heroin related ED Visits

## Keyword Validation Results

- Disrupted Outpatient Medical Care Classifications

| Classification | Sensitivity | Positive Predictive Value |
|---|---|---|
| *Dialysis* | 80.0% | 53.3% |
| *Medicine Refills* | 82.6% | 65.0% |
| *Oxygen Needs* | 61.6% | 16.6% |

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## Keyword Validation Results

- Mental Health Related/ Substance Use Classifications

| Classification | Sensitivity | Positive Predictive Value |
|---|---|---|
| *Anxiety/Adjustment Disorders* | 58.60% | 77.60% |
| *Mood Disorders* | 57.10% | 88.60% |
| *Psychotic Disorders* | 63.20% | 52.60% |
| *Alcohol Use* | 93.70% | 66.60% |
| *Suicide/Self-Inflicted Injury* | 37.60% | 51.20% |
| *Methadone/Opiate/Heroin Use* | 64.70% | 14.40% |

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## 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)

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## Questions & Comments

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### Severe Weather Classifier Validation Results

| Classification | Sensitivity | Positive Predictive Value | |
|---|---|---|---|
| Carbon Monoxide Poisoning | 98.4% | 73.5% | High Sensitivity/PPV (N=10) |
| Hypothermia/Other Cold Related Injuries | 87.5% | 77.8% | |
| Disrupted Outpatient Medical Care - Medicine Refills | 82.6% | 65.0% | |
| Disrupted Outpatient Medical Care - Dialysis | 80.0% | 53.3% | |
| Respiratory Illness -URI | 76.2% | 77.4% | |
| Respiratory Illness -Asthma | 73.6% | 60.4% | |
| Cardiovascular Disease | 66.0% | 62.7% | |
| Mental Health Related Illness - Psychotic Disorders | 63.2% | 52.6% | |
| Mental Health Related Illness - Anxiety/Adjustment Disorders | 58.6% | 77.6% | |
| Mental Health Related Illness - Mood Disorders | 57.1% | 88.6% | |
| Gastrointestinal Illness | 40.4% | 25.0% | Moderate Sensitivity/PPV |
| Mental Health Related Illness - Suicide/Self-Inflicted Injury | 37.6% | 51.2% | |
| Disrupted Outpatient Medical Care - Oxygen Needs | 64.1% | 16.6% | Low Sensitivity or PPV |
| Substance Use - Methadone/Opioid/Heroin | 65.9% | 17.7% | |
| Mental Health Related Illness - Post-Traumatic Stress Disorder (PTSD) | 18.2% | 80.0% | |
| Tree Related injury | Can not be computed due to lack of specific diagnostic codes | | |
| Heat Related Illness | | | Not Validated – Using current exiting classifications in the EpiCenter |
| Motor Vehicle Accident | | | |
| Substance Use - Alcohol Use | | | |