Public Health Surveillance: The Indiana State Department of Health’s Syndromic Surveillance System

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Indiana State Department of Health
Objectives

- Provide background on the syndromic surveillance system at ISDH
- Describe how data is collected for the system
- Describe how ISDH analyzes the data in the system
- Provide examples of how the system has improved public health in Indiana
Public Health Emergency Surveillance System (PHESS)
Syndromic Surveillance

- Syndromic surveillance can be defined as the ongoing collection and assessment of health-related data that:
  - Are “real-time”
  - Precede diagnosis and lab results
  - Identify sufficient probability that a case or an outbreak may warrant a public health response
PHESS Overview

- Public Health Electronic Surveillance System (PHESS) is a database containing emergency department visit data submitted by hospitals in Indiana.
  - State requirement for reporting
  - ESSENCE-tool for analyzing the data
  - Data is transmitted and updated in ESSENCE anywhere from near-real-time to every 3 hours
  - Analyses are performed to assess unusual occurrences among these visits
PHESS Development

- Development of the collection of PHESS data began in 2004 with collaboration from the Regenstrief Institute
- By 2006, data was being transferred from 13 hospitals
- Indiana Administrative Code was established in 2008 to require all hospitals to submit data for emergency department visits (410 IAC 1-2.4)
- As of April 2016, there are currently 118 hospitals and 2 urgent care facilities contributing emergency department visit data
Indiana Administrative Code 410 IAC 1-2.4

- Rule 2.4- Electronic Reporting of Emergency Department Visit Abstract Data by Hospitals

Defines:
- Who the rule applies to
- How they should transmit the data
- When they should transmit the data
- What data elements to send
- When they need to be connected by
- Why the data is being collected
- Confidentiality and security of the data
Data Elements Included in Rule 2.4

1. Unique Hospital Identifier
2. Patient Name and Medical Record Number (MRN)
3. Patient DOB
4. Patient Sex
5. Patient Address
6. City
7. State
8. Zip
9. County
10. Date and Time of Emergency Room Visit
11. Patient’s Free-Text Chief Complaint
1. ED patient chief complaints & basic demographic information captured & sent to health information exchanges (HIE) or ISDH*

2. If information is sent to a HIE, it processes, batches, and sends data to ISDH in near-real-time to every 3 hours

3. ISDH ESSENCE server codes chief complaints for key syndromes and runs outbreak detection algorithms

4. ISDH monitors ESSENCE output for significant changes in case volume or syndrome clusters by area or time frame
User Access to PHESS Data

- Hospitals have the ability to access their own ED visit data

- County health departments have access to hospital ED visit data in their county, and any visits made to any hospital in the state for their residents

- ISDH monitors statewide data twice daily for trends or alerts to detect potential outbreaks of infectious disease or environmental events
ESSENCE
PHESS Data Analysis (ESSENCE)

- ESSENCE—Electronic Surveillance System for the Early Notification of Community-Based Epidemics

- Tool used to analyze PHESS data in an easily viewed way to detect events of public health significance

- Data assessed in ESSENCE/PHESS is de-identified but precautions should be used if reported publicly, if at all
12 different syndromes are categorized in ESSENCE and can be used to monitor specific symptoms

Each syndrome is broken down by a set of “sub-syndromes” containing a defined list of keywords
There are more than 80 different subsyndromes that can be selected to run specific reports based on symptom(s).
Public Health Response

Syndromic Surveillance Epidemiologist

Needs Public Health Action?

ISDH SME/Field Epidemiologist

Hospital (IP, ED)  Local Health Department
ISDH Field Epidemiology

- 10 Districts
- 1 Field Epidemiologist for each district
  - Regular communication with LHD
  - Provide assistance when requested by LHD for outbreak investigations, reporting of communicable disease, etc.
Syndromic Surveillance Activities

- Data is scanned twice daily for any potential alerts
  - Checking on the data quality
  - Retrospective analysis of activity in the last 90 days
    - Also have the ability to look historically for seasonality and/or temporality among conditions or populations
  - Looking for keywords or ‘chief complaints of interest’
Statewide ED Visit Counts

Daily Data Counts

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000 11,000
01 Jan 16 14 Jan 16 21 Jan 16 28 Jan 16 04 Feb 16 11 Feb 16 18 Feb 16 25 Feb 16 08 Mar 16 14 Mar 16 21 Mar 16 28 Mar 16 04 Apr 16

Data: Normal  Data: Warning  Data: Alert

Indiana State Department of Health
### Daily Alert List

#### Region/Syndrome Based Temporal Alerts

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<thead>
<tr>
<th>Links</th>
<th>date</th>
<th>Data Source</th>
<th>District</th>
<th>Age</th>
<th>Sex</th>
<th>Syndrome</th>
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<td>ER by Patient</td>
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Investigate a Time Series
# Investigate a Line List

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<td>Female</td>
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<td>Male</td>
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<td>Resp; Resp; Resp</td>
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<td>Resp; Resp; Resp</td>
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<td>Female</td>
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<td>22</td>
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<td>51</td>
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<td>Resp; Resp; Resp</td>
<td>Resp; Resp; Resp</td>
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</table>
Data Details

- **Age Group**
  - 16-44
  - 45-64
  - 65+
  - 00-34

- **Sex**
  - Female
  - Male

- **Medical Subgrouping**
  - Cough
  - Difficulty Breathing
  - Shortness of Breath
  - Sore Throat
  - Chest Congestion
  - Lower Respiratory Infection
  - Miscellaneous
  - Upper Respiratory Infection
  - Wheezing
Hospital Overview

- Additional quality assurance of data transmission is monitored once daily for each hospital submitting data.

- Any sudden change in ED visits can initiate follow-up for checking for unusual activity or an issue in data transfer.

- Any interruption in data transfer is referred to the appropriate interface support personnel.
Data Analysis

- Sort by ZIP Code
  - Are cases geographically concentrated?
- Sort by Demographics
  - Case concentration in one group (age)?
- Sort by Chief Complaint
  - Same complaint?
- Sort by Time of Visit
  - Are cases temporally concentrated?
Data Analysis

- Are these complaints common?
- Are they associated with many causes, or a single cause?
- Are these symptoms unexpected for this time of year? Or with this age group?

*Have we identified sufficient probability that an alert warrants a public health response?*
Weekly percent ILI - this is a different way of looking at the data as compared to running a report showing counts of ED visits reporting ILI

Total count of ED visits by syndrome or subsyndrome
ED Visit Counts Reporting ILI

Daily Data Counts

- Blue: Normal
- Yellow: Warning
- Red: Alert

Indiana State Department of Health
ED Visit Percentage Reporting ILI
ED Visit Percentage Reporting ILI

Yearly Data

Indiana State
Department of Health
Utilization of ESSENCE

- Local Health Departments and Hospitals
  - Accessing ESSENCE data to provide situational awareness

- No alert analysis responsibilities
  - This is performed at the state level and will be identified and routed to LHD through the field epidemiologist
Individual Hospital ILI Visits

Daily Data Counts

- Data: Normal
- Data: Warning
- Data: Alert

Indiana State Department of Health
Queries and Outbreak Detection
Building Unique Queries

- ESSENCE includes the capability to perform queries that are unique to a given exposure or circumstance.

- These have been used during outbreaks, for case finding, and scanning for bioterrorism threats.

  - Examples:
    - Meningitis clusters
    - County fair swine exposure
    - Anthrax exposure
Alert of a significant increase in ED visits (11) reporting “Meningitis Exposure at Work” was detected in February 2016

Follow up on this alert revealed the patient didn’t have typical meningococcal symptoms and wasn’t in droplet precautions, and was then transferred to another facility before final blood culture results were available.
Meningitis Alerts
Time Series from 1/7/16 to 4/6/16
## County Fair Monitoring

### Data Configuration

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<td>Allen, IN</td>
<td></td>
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<tr>
<td>Bartholomew, IN</td>
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<td>Benton, IN</td>
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<td>0-4</td>
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<td>5-17</td>
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<table>
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<th>Select Sex:</th>
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<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
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**Inclusion terms:** pig, swine, hog, bird, chicken, bird, cow, 4H, H3N2v, HPAI

**Exclusion terms:** epigastric, pox
Anthrax Detection 2012

Daily Data Counts

Data: Normal, Data: Warning, Data: Alert

Graph Options  Download
Anthrax Detection June 2012

- Field epidemiologist contacted the LHD, who reached out to the hospital IP
- Chief complaint was entered during a bioterrorism preparedness activity
Example: Public Health Event Detected with ESSENCE

**Rash Spatial Alert: 6/2/2015 Lake County**

- 10 Rash cases appear in same hospital, from the same ZIP code, all between the ages 2 and 21, and within 52 minute
Example: Public Health Event Detected with ESSENCE

<table>
<thead>
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<th>Date</th>
<th>Time</th>
<th>Hospital/Name</th>
<th>Zipcode</th>
<th>Orig Zipcode</th>
<th>Region</th>
<th>Age Group</th>
<th>Age</th>
<th>Sex</th>
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Example: Public Health Event Detected with ESSENCE

- Hand, Foot and Mouth Disease
  - Not reportable
Questions?
Contact Information

Greg Budney
Syndromic Surveillance Epidemiologist
gbudney@isdh.in.gov