

The Current State of Syndromic Surveillance in the US

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Overview

- What, Who and How of Syndromic Surveillance
- A brief word on standards in syndromic surveillance
- What's next?
- Where to go for more information

What is Syndromic Surveillance?

- Syndromic surveillance is a methodology that systematically collects, analyzes and reports the **timeliest data available** from any type of data provider (**clinical & non-clinical**) to contribute **actionable public health information**.
- Complements other types of surveillance (notifiable disease, environmental, etc.)

Syndromic Surveillance Data Sources

(not a comprehensive list)

- Emergency Dept.*
- Inpatient*
- Ambulatory / Outpt.*
- OTC Drug Sales
- Rx
- EMS
- 911
- Nurse Call Lines
- Shelter / DMAT surveillance
- Electronic death reg.
- School Absenteeism
- Poison Center
- Wildlife Rehab
- Veterinary Lab Data
- Veterinary Clinics
- Social Media
- News Media
- ...

** Included as public health measures in Meaningful Use*

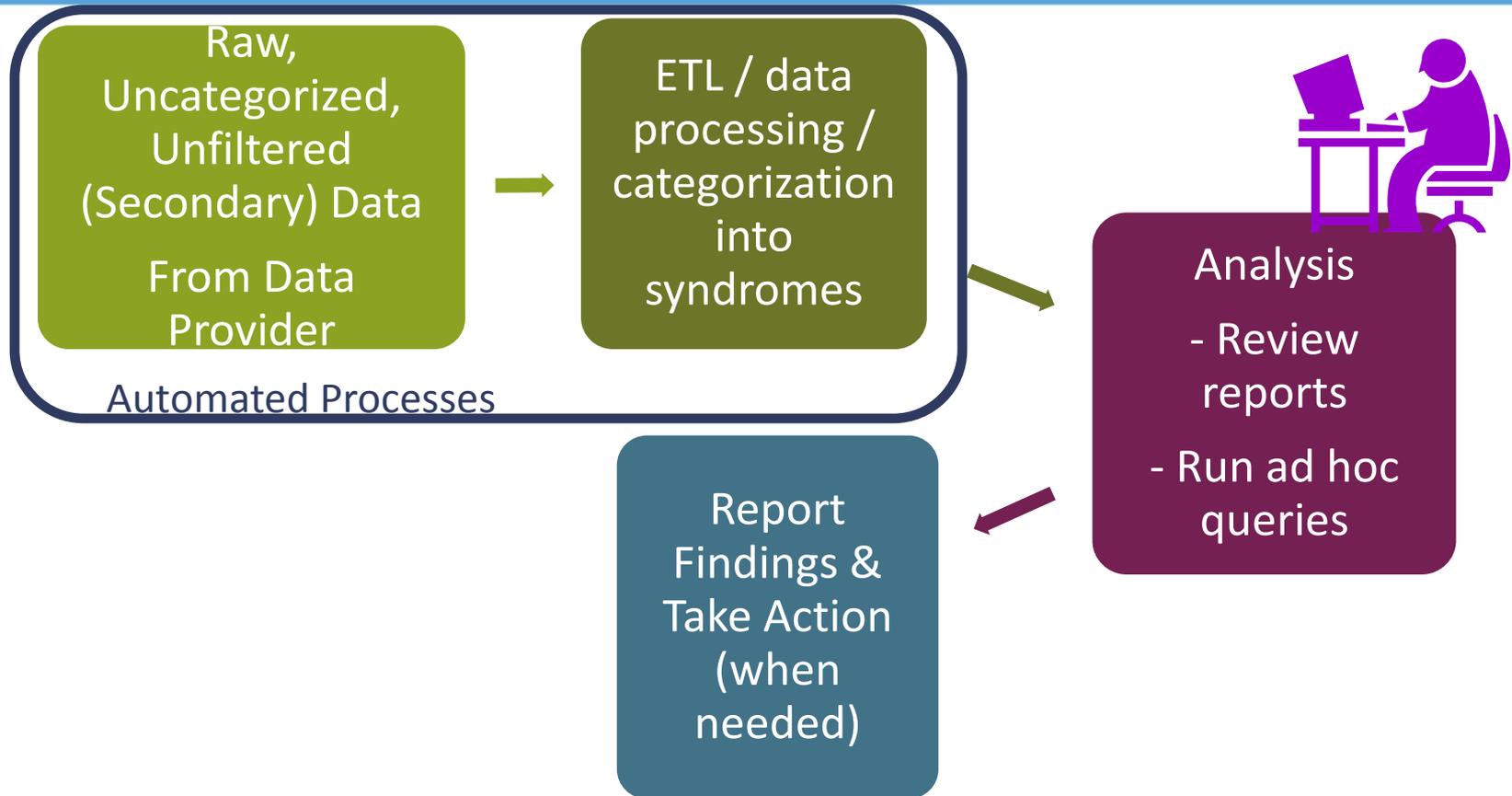
Syndromic Not Limited to “Pre-Diagnostic”

- A “syndromic” data source may include diagnostic data elements
 - Diagnosis codes (ED, inpatient, outpatient)
 - Lab results
 - Provider impressions
 - ...
- “syndromic data” means different things to different people / be specific about data elements, data sources used

Timeliness is Relative

- “Real-time” (instantaneous to weekly)
- “Near real-time” (hourly to weekly)
- “Batch” (hourly to weekly)
- Weekly
- Record updates are sent when available

(Typical) Data Transmission Process



Data Provider does NOT filter or categorize data prior to transmission to public health agency

Sample Free Text Data

Sample Chief Complaints	Sample Triage Notes	Syndrome Classification(s)
Evaluation: mental health	Patient Complaint: Family states he been hallucinating and seeing people this week. Sleeping very little. Has been snorting " bath salts " at times.	Substance abuse: bath salts
Other	possible food poisoning	Food poisoning
ABD PAIN	pt to triage with abd pain, bloody stool. states friend was diagnosed with ecoli yesterday. (ate the same food)	Gastrointestinal; E-coli
HEAT STROKE?	{PT. BROUGHT BY COACH FROM FOOTBALL PRACTICE WITH C/O OVERHEATED ; SHAKY; DIAPHORETIC. PT. HYPERVENTILATING UPON ARRIVAL; C/O CHILLS. IV INIATED UPON ARRIVAL.}	Heat-related illness (keyword); football practice heat-related

Sample Free Text Data

Sample Chief Complaints	Sample Triage Notes
ABD PAIN	c/o abd pain since yesterday. Pain a recurrent cramping sensation. +Nausea denies vomiting +diarrhea. Neg fever. Mask applied at triage. Pink, Warm, and Dry, No Acute Distress, Unlabored Respirations

Syndromic Surveillance in the USA

- Public health agencies in ALL 50 states except Iowa (2016) and Oklahoma conduct syndromic surveillance using
 - CDC's BioSense 2.0 exclusively
 - In-state system exclusively
 - Both in-state system and BioSense 2.0
- Some states have regional systems only at present (CA, CO, TX)
- Public health agencies vary on data sources used, timeliness and representativeness

Syndromic Surveillance Systems

- BioSense 2.0 (National Syndromic Surveillance Program)
 - 36 states & DC
 - <http://www.cdc.gov/biosense/>
 - <http://www.syndromic.org/cop/nsysp-user-group-meeting>
- ESSENCE, OpenESSENCE, SAGES
 - 12 states, DC, & 12 regions
 - <http://www.jhuapl.edu/sages/tools.html#instructions>
 - <http://nstd-ncr5.jhuapl.edu/training/>
- EpiCenter
 - <https://www.hmsinc.com/service/epicenter/syndromic.html>
- RODS
 - <https://www.rods.pitt.edu/site/content/view/15/36/>
- In-house developed, e.g. NC DETECT (n = ?)

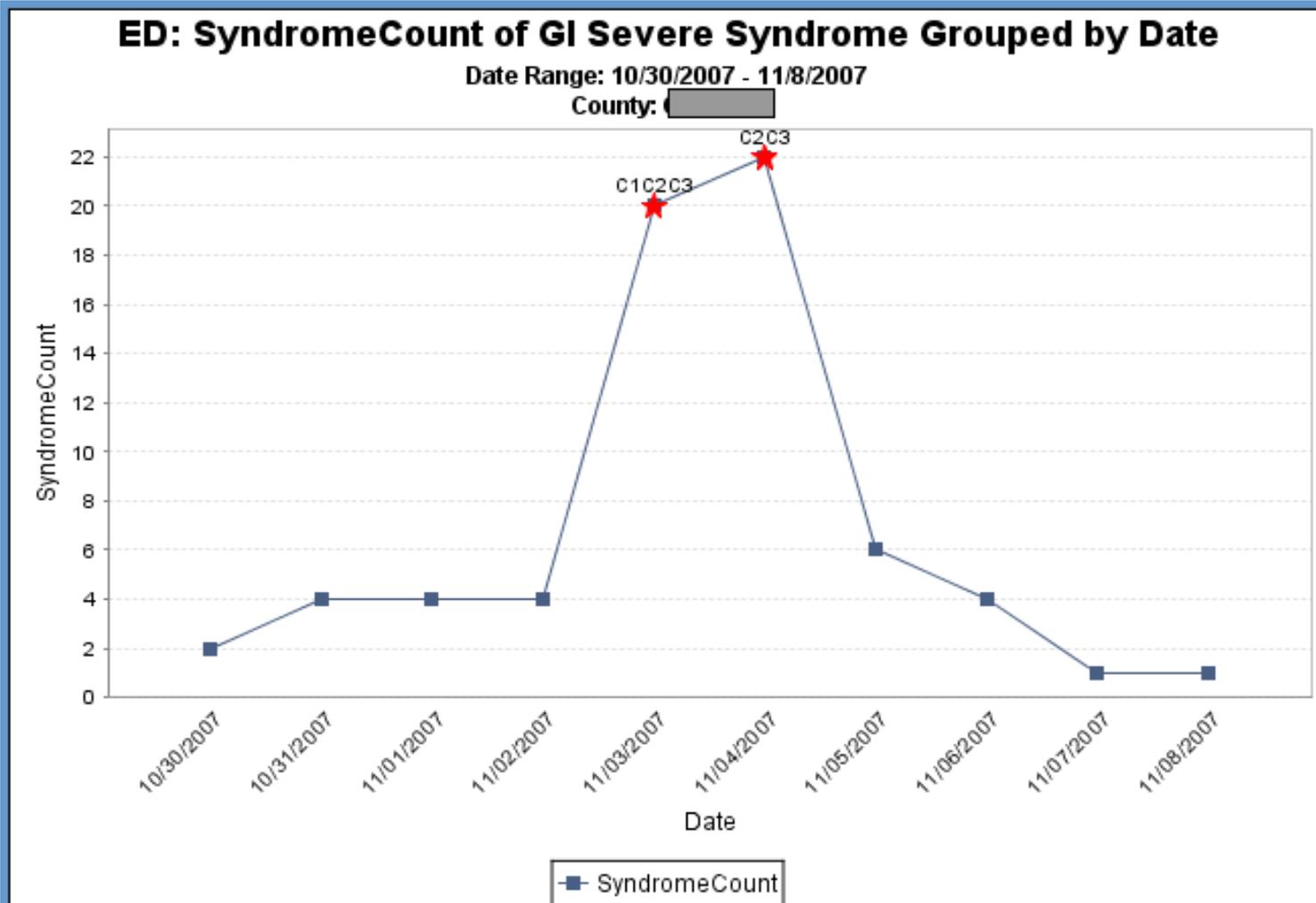
Primary Uses of Syndromic Data

- Early event detection
- Situational Awareness
- (Seasonal) trends
- General surveillance (infectious, NCD, injury, environmental, etc.)
- Case finding
- Rumor control
- Clinical decision support

Early Event Detection

- Look for patterns in the data that may indicate a cluster of cases for X (or a singular case) that require public health action
- Many different detection algorithms available
- <http://www.cs.cmu.edu/~neill/papers/eventdetection.pdf>

GI Outbreak Example



Situational Awareness

- Known event, but trying to predict spread, severity, etc.
- Mass gathering surveillance
- Disaster Surveillance



Epidemiology and Surveillance Situation Report: US Open 2014

Law Enforcement Sensitive: For Official Use Only

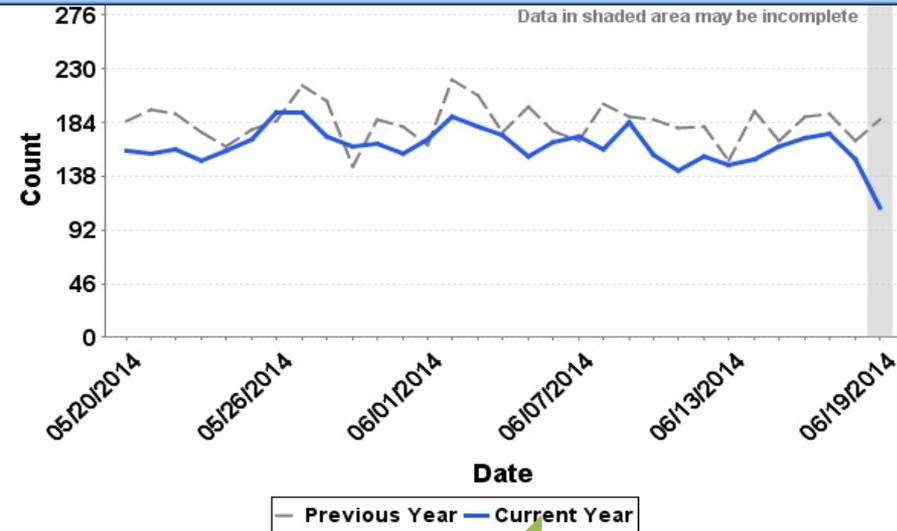
Date:

6/20/14

Time:

1400

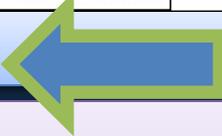
X Regional Hospital Emergency Department Census



Infectious Disease and Environmental Health Investigations and Outbreaks

- No environmental hazards identified
- General communicable disease surveillance AT baseline.
- Urgent communicable disease cases: none
- Outbreak reports/investigations: none

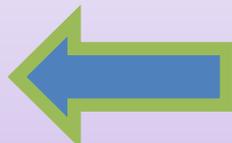
Syndrome Surveillance



- Syndromic surveillance summary report
 - ED census AT baseline.
 - Syndrome summaries for
 - Infectious disease AT baseline.
 - Injuries AT baseline.
 - Poison center calls AT baseline.

Heat Related Illness Surveillance

- **HEAT ADVISORY – Heat Index Max = 99°F**
- Heat Related Illness is **ELEVATED**
 - HRI visits continue at Medical Tents and EMS Carts on 6/19
 - No increase in HRI at Hospitals
- Additional messaging needed:
 - Moore County EM responded: Additional Cooling/Water stations implemented onsite; need to ensure they remain filled.



Hurricane Irene

Disaster & Other Surveillance Overview Report



Notes:

- The ICD-9-CM-based syndromes in the disaster reports (those with ICD-9-CM in the name) use ICD-9-CM codes (most often extracted from hospital billing systems). These are better suited for retrospective surveillance, as some hospitals may take up to three months to send final diagnosis codes.
- Searching by ALL counties or ALL PHRST regions excludes records with NULL and non-NC counties in ED data, search by ALL hospitals.
- [View Case Definitions.](#)

Data Source: ED

Date Range: From: 8/25/2011 To: 9/3/2011

Location Type: Region County Hospital

Note:

Deselect "ALL" before selecting multiple locations. Hold Ctrl to select multiple locations.

--All--	--All--	--All--
PHRST 1	Alamance	Alamance
PHRST 2	Alexander	Albemarle
PHRST 3	Alleghany	Alleghany
PHRST 4	Anson	Angel

View Syndrome by:

- Disaster Module Hurricanes/Severe Floods
- Disease/Syndrome Category Acute Illness

Syndrome:

--All--

Affective Symptoms

Bite/Sting

Stratified by: Location then Syndrome Syndrome then Location

Stratified by Age Display Rows With Signals Only

Search

- Affective Symptoms
- Bite/Sting
- Burn/Fire
- Carbon Monoxide Poison (ICD-9-CM)
- Carbon Monoxide Poison (keyword)
- Chronic Cardio
- Chronic Resp
- Dehydration
- Drowning (ICD-9-CM)
- Drowning (keyword)
- Drug/ETOH
- Electrocution
- Food Safety Threats
- GI Severe
- Jaundice
- Med Refill (ICD-9-CM)
- Med Refill (keyword)
- MenEnc
- Motor Vehicle Collision
- Respiratory
- Suicidal Thoughts
- Trauma**
- Water Safety Threats
- Trauma

Irene: Disaster Overview Report



ED results

County	Syndrome	Day 1 08/25/11	Day 2 08/26/11	Day 3 08/27/11	Day 4 08/28/11	Day 5 08/29/11	Day 6 08/30/11	Day 7 08/31/11	Day 8 09/01/11	Day 9 09/02/11
	All Visits	183	148	96	271	226	208	201	158	184
	Affective Symptoms	0	0	0	1	2	1	1	0	3 C1C2C3
	Bite/Sting	5	3	3	10 C1C2C3	9 C2C3	7 C2C3	2	5	3
	Burn/Fire	1	0	0	3 C1C2C3	2	0	4 C3	2	0
	Chronic Resp	0	0	0	6 C1C2C3	0	0	0	0	0
	Med Refill (ICD-9-CM)	2	1	1	0	3 C1	3 C3	2	0	1
	MenEnc	5 C1C2C3	0	0	2	1	0	3	0	2
	Motor Vehicle Collision	4	11 C1C2C3	2	20 C1C2C3	6	7	7	2	12
	Respiratory	1	0	2	1	3 C1C2C3	2	0	0	0

Custom Event: Tornado

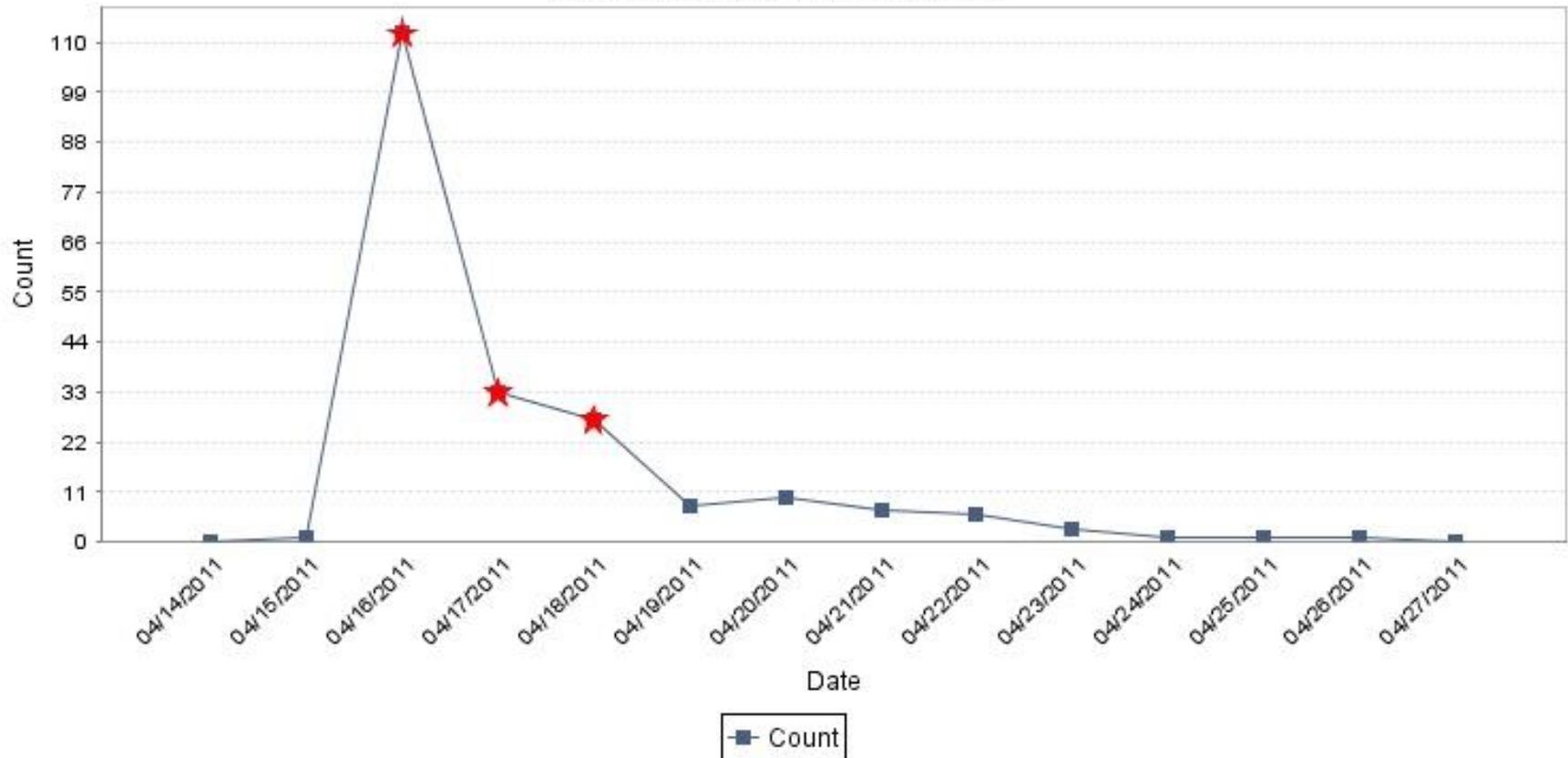
ED: Count of Disaster: Tornado Grouped by Date

Total Count: 210

Date Range: 04/14/2011 - 04/27/2011

Region: PHRST 1, PHRST 2, PHRST 3, PHRST 4, PHRST 5, PHRST 6, PHRST 7

Source: NC DETECT; Generated: 04/27/2011



NC DPH
Sample Daily
Situation
Report on April
2011 tornadoes

Tornado Hospital Emergency Department Surveillance Report

4/19/2011

REASON FOR VISIT	4/16/2011 Counts	4/17/2011 Counts	4/18/2011 Counts
Category			
Injury/Trauma (major, minor)	78	18	9
Major (e.g. broken bones, blunt force injuries, head trauma)	8	1	0
Minor (e.g. scratches, debris in eyes, minor cuts/bruises)	70	17	9
Chronic Disease Exacerbations (e.g. Asthma, Cardiovascular Disease)	4	1	0
Psychiatric/mental health	2	0	1
Prescription refill/medication	4	2	5
Other (if visit does not fit category above, please explain in comments section)	22	12	4
Total	110	33	19

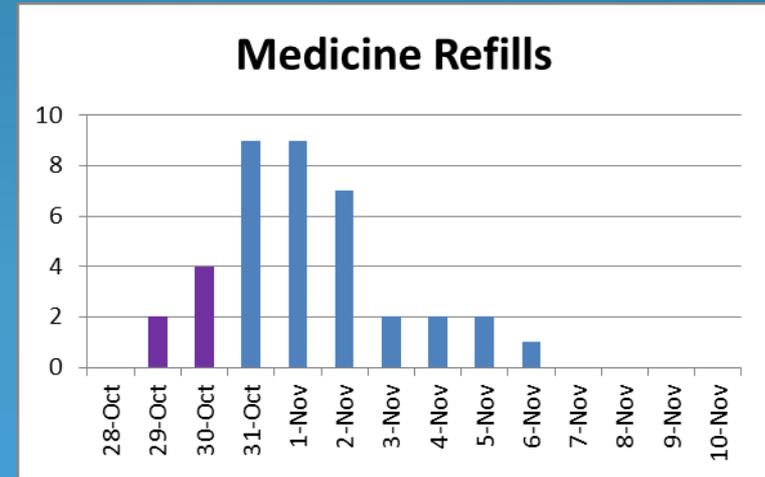
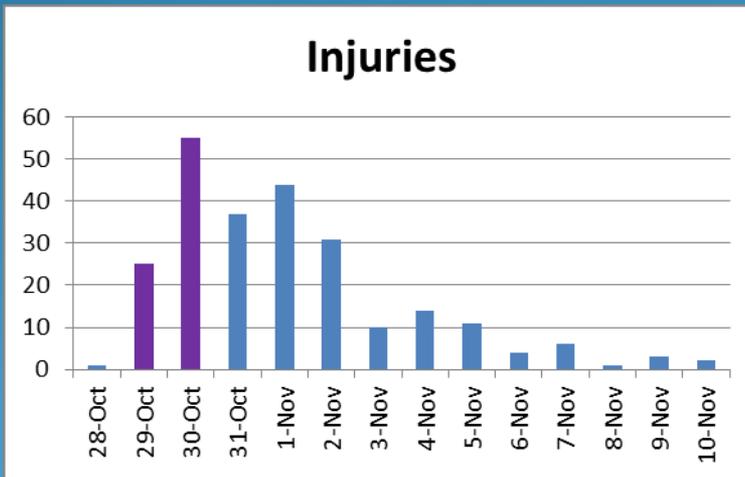
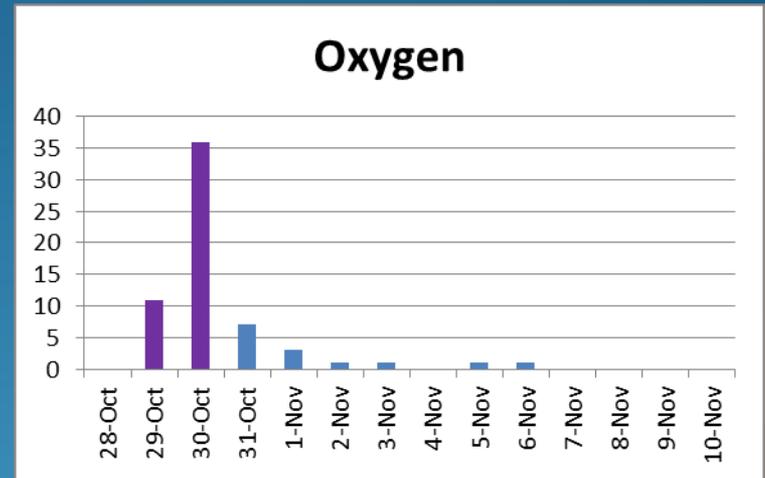
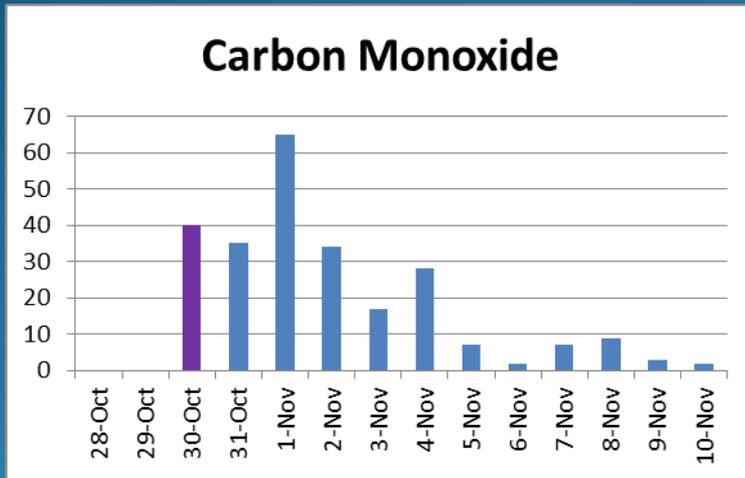
DISCHARGE/ADMITS			
	4/16/2011	04/17/11	04/18/11
	Counts		
Discharged	78	29	12
Admitted	11	1	0
Other	21	3	7
Total	110	33	19

*ED data are based on a keyword search of Tornado OR storm in hospital emergency department (ED) visit chief complaints or triage notes (when available). **Therefore, these data may not include all visits related to the tornado.**

*Due to lag times associated with data transmissions these numbers should be treated as preliminary counts.

Daily Counts of Sandy-Related ED Visits by Category

Data from EpiCenter Syndromic Surveillance System, Oct. 28 – Nov. 10, 2012



Ebola / African Travel Hx Monitoring

Chief Complaint	Triage Notes
Just returned from Africa today-stomach pain	
traveled from nigeria on XX	
Headache	Chief Complaint Subjective: Pt was on a plane from Johannesburg, South Africa today and developed a headache, fever, nausea and stiff neck. Pt with several episodes of vomiting, denies diarrhea.

Case Finding

- Known outbreak; using syndromic surveillance to find additional cases

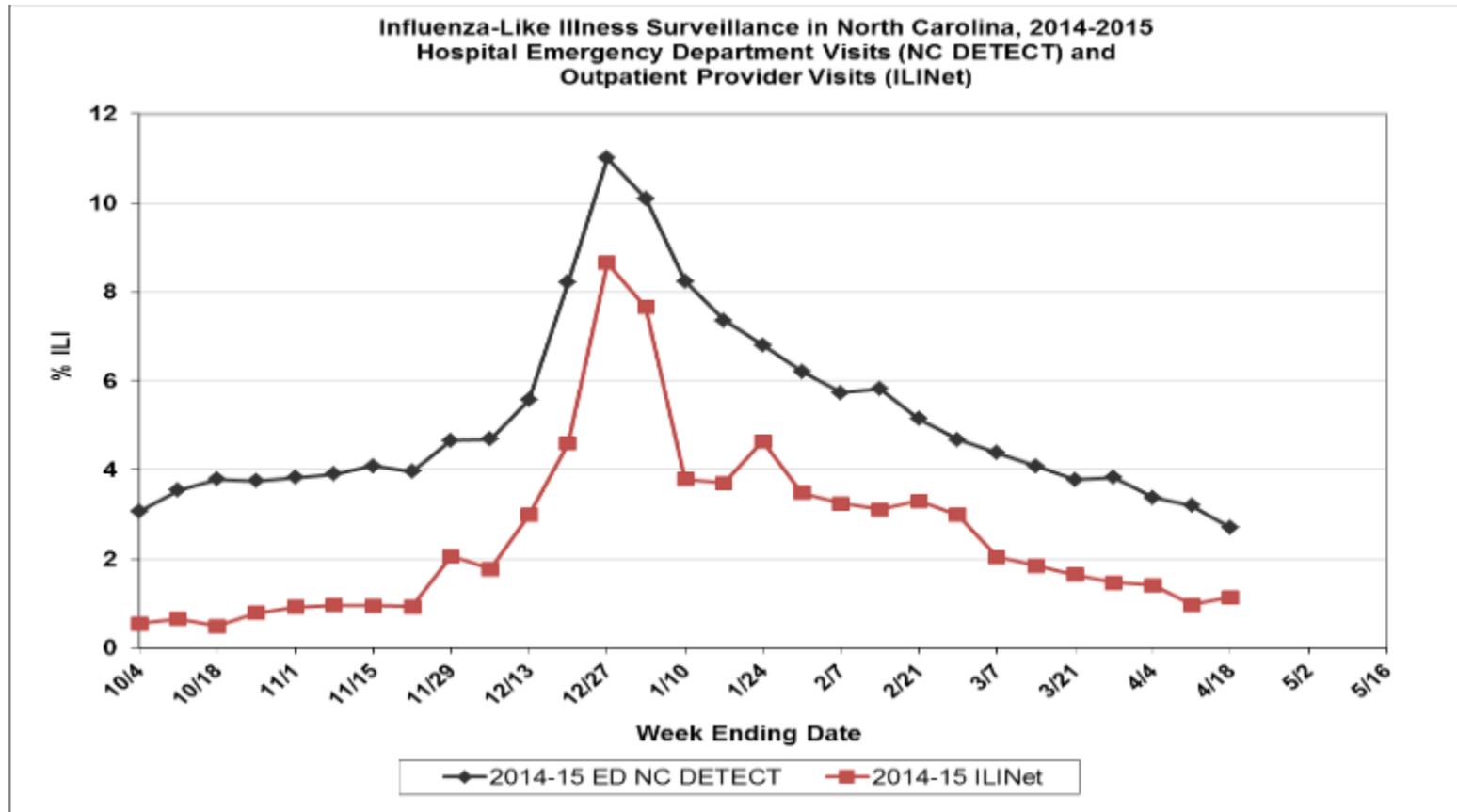
“Chief Complaint: Pt presents to triage room c/o I feel bad. I ate at this the **Olive Garden** and now I have this cough and congestion. It started after I left my appointment yesterday. I found out about the outbreak after I left here and I need to be tested.”

“Reports nausea, decreased appetite, fever at night for one month. Family with pt states that pt had eaten **blue bell ice cream** and was told to come to ER for evaluation.”

Disease Trends / General Surveillance

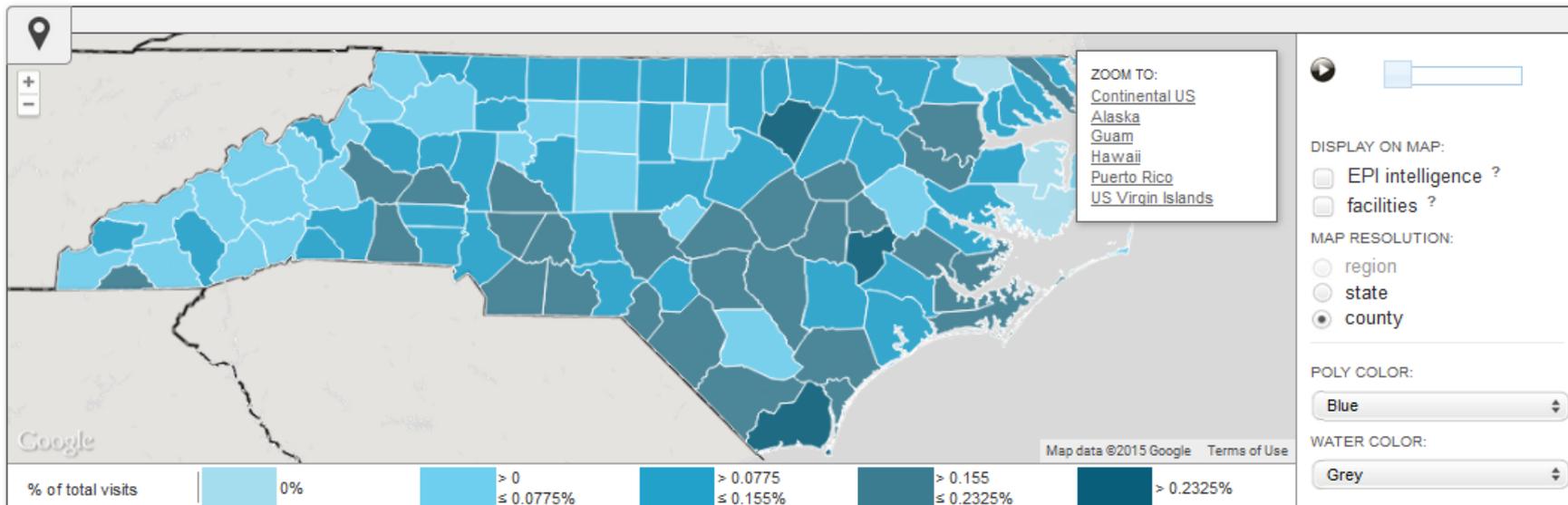
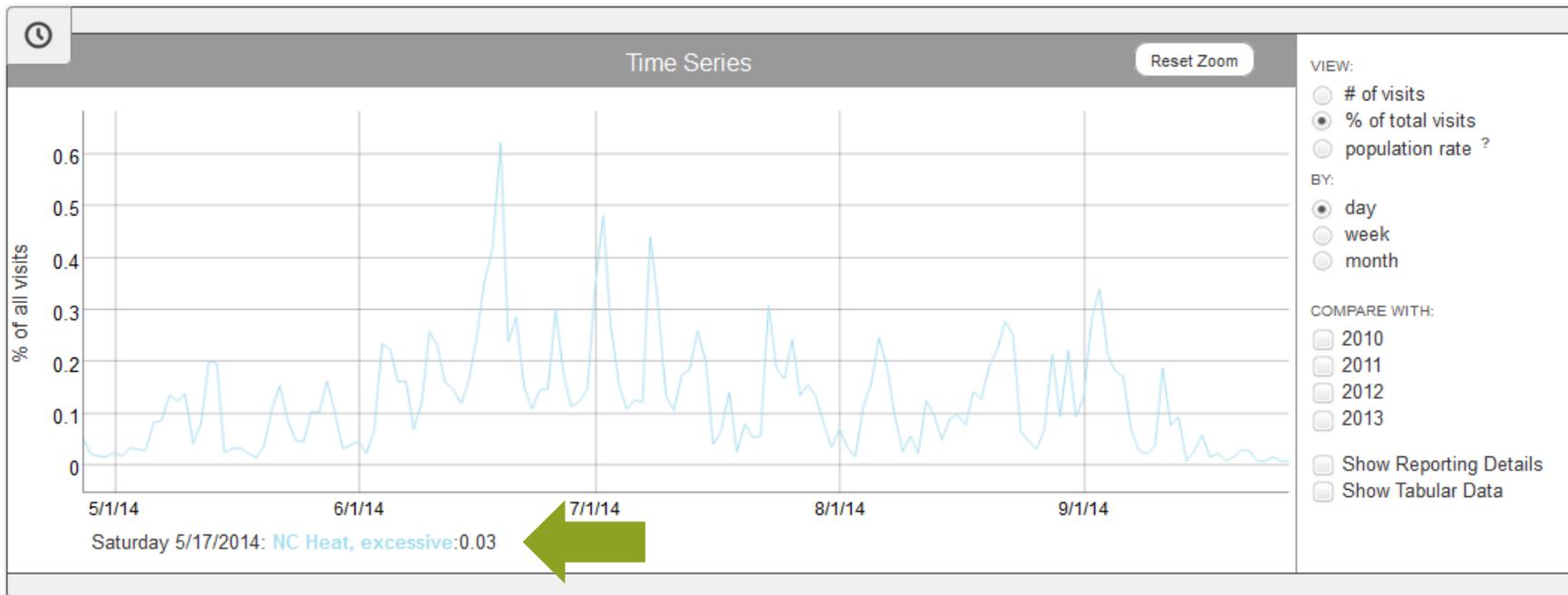
- Influenza-like Illness
- Heat-related illness
- Non-communicable diseases (asthma, heart disease, etc.)
- Injuries
- Dental-related
- ...

Influenza-like Illness



-  save
-  modify
-  analytics
-  notes
-  share
-  export
-  alerts

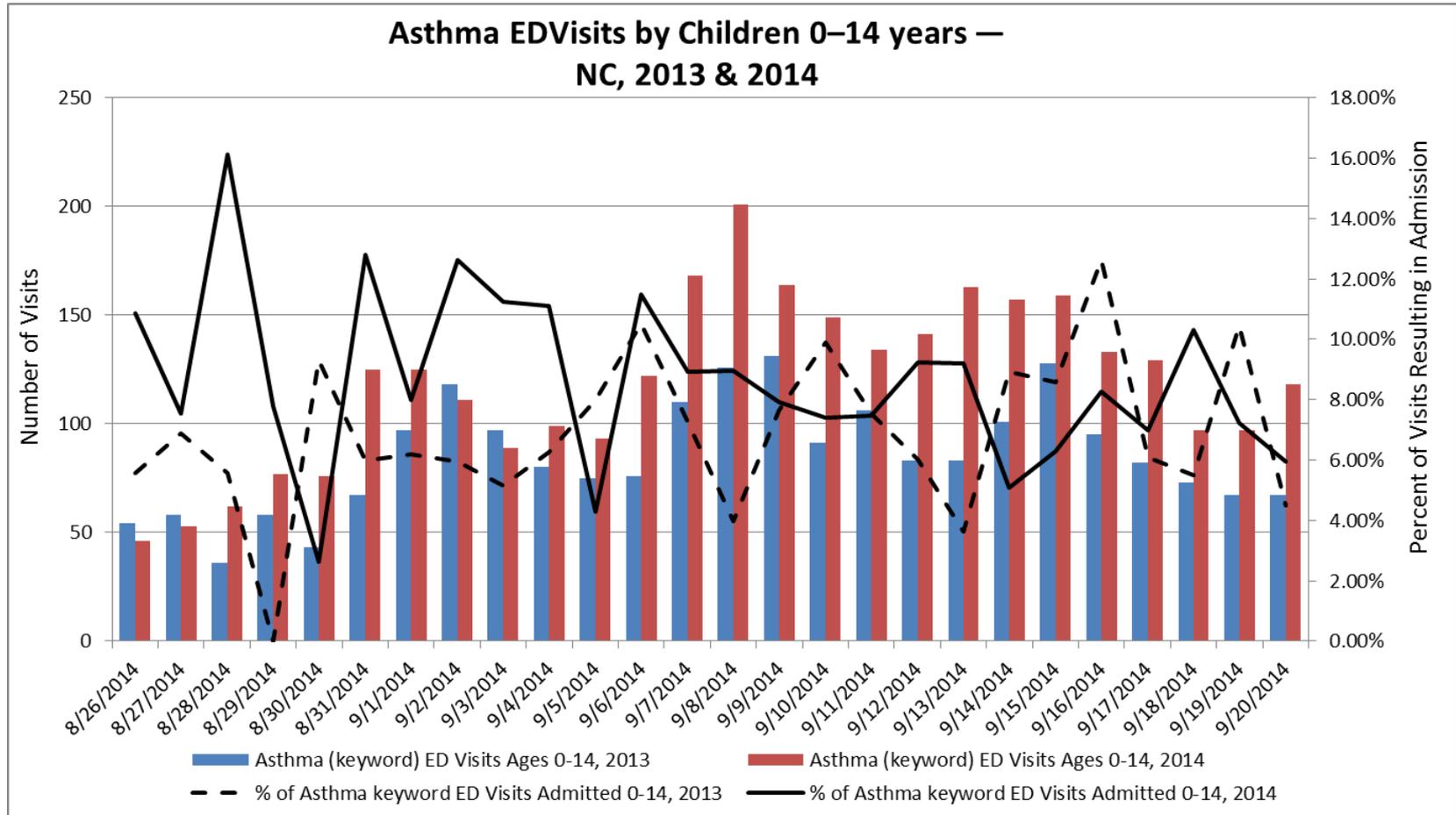
Viewing **2,448** visits for **1** syndrome in **1** location from **4/27/2014 - 9/27/2014** from **1** source for **Male, Female, and Unknown**, ages **all ages**.



% of total visits

0%	> 0 ≤ 0.0775%	> 0.0775 ≤ 0.155%	> 0.155 ≤ 0.2325%	> 0.2325%

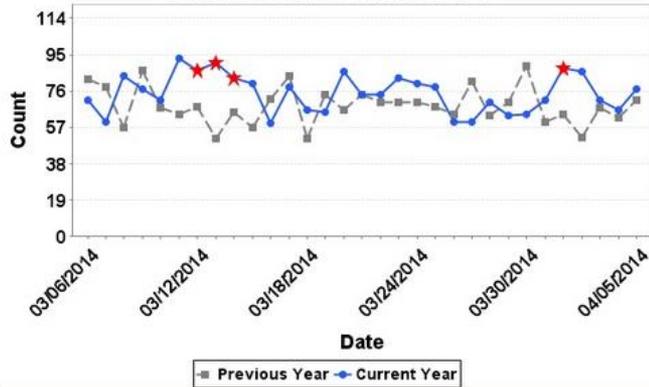
Monitoring Asthma Severity (EV-D68)



Dashboards Medication / Drug OD

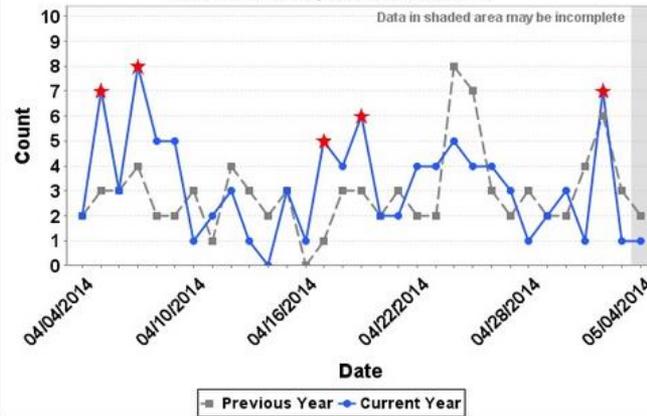
ED: Count of IVPB Medication or Drug Overdose (ICD-9-CM or Keyword) Grouped By Date

Total Count: 2316
 Date Range: 03/06/2014 - 04/05/2014
 County: All NC Counties
 Source: NC DETECT; Generated: 05/05/2014



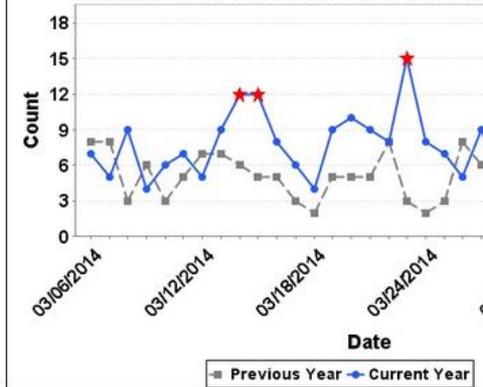
ED: Count of Narcan/Naloxone Grouped By Date

Total Count: 100
 Date Range: 04/04/2014 - 05/04/2014
 County: All NC Counties
 Source: NC DETECT; Generated: 05/05/2014



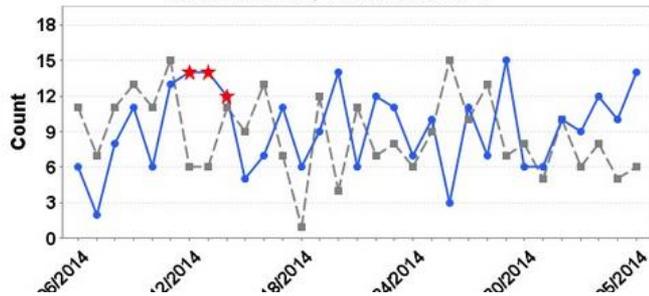
ED: Count of IVPB Heroin-related ED Visits (Keyword) Grouped By Date

Total Count: 245
 Date Range: 03/06/2014 - 04/05/2014
 County: All NC Counties
 Source: NC DETECT; Generated: 05/05/2014



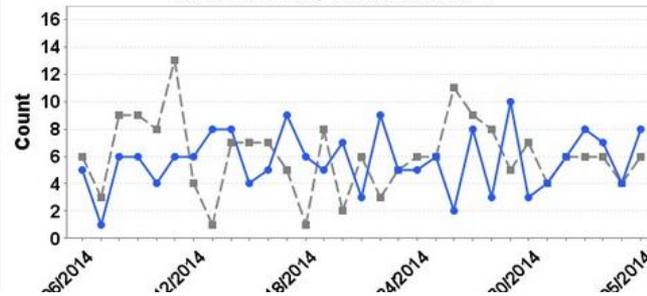
ED: Count of IVPB Opioid Overdose (ICD-9-CM) Grouped By Date

Total Count: 287
 Date Range: 03/06/2014 - 04/05/2014
 County: All NC Counties
 Source: NC DETECT; Generated: 05/05/2014



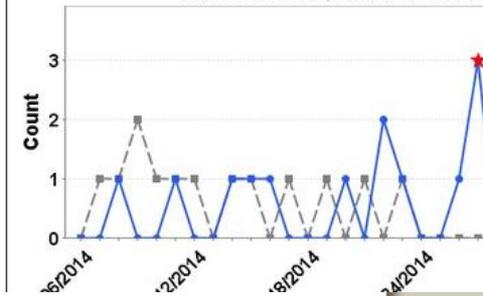
ED: Count of IVPB Prescription Opioid Analgesic Overdose (ICD-9-CM) Grouped By Date

Total Count: 177
 Date Range: 03/06/2014 - 04/05/2014
 County: All NC Counties
 Source: NC DETECT; Generated: 05/05/2014



ED: Count of IVPB Methadone Overdose (ICD-9-CM) Grouped By Date

Total Count: 18
 Date Range: 03/06/2014 - 04/05/2014
 County: All NC Counties
 Source: NC DETECT; Generated: 05/05/2014



Soccer-related Head Injuries

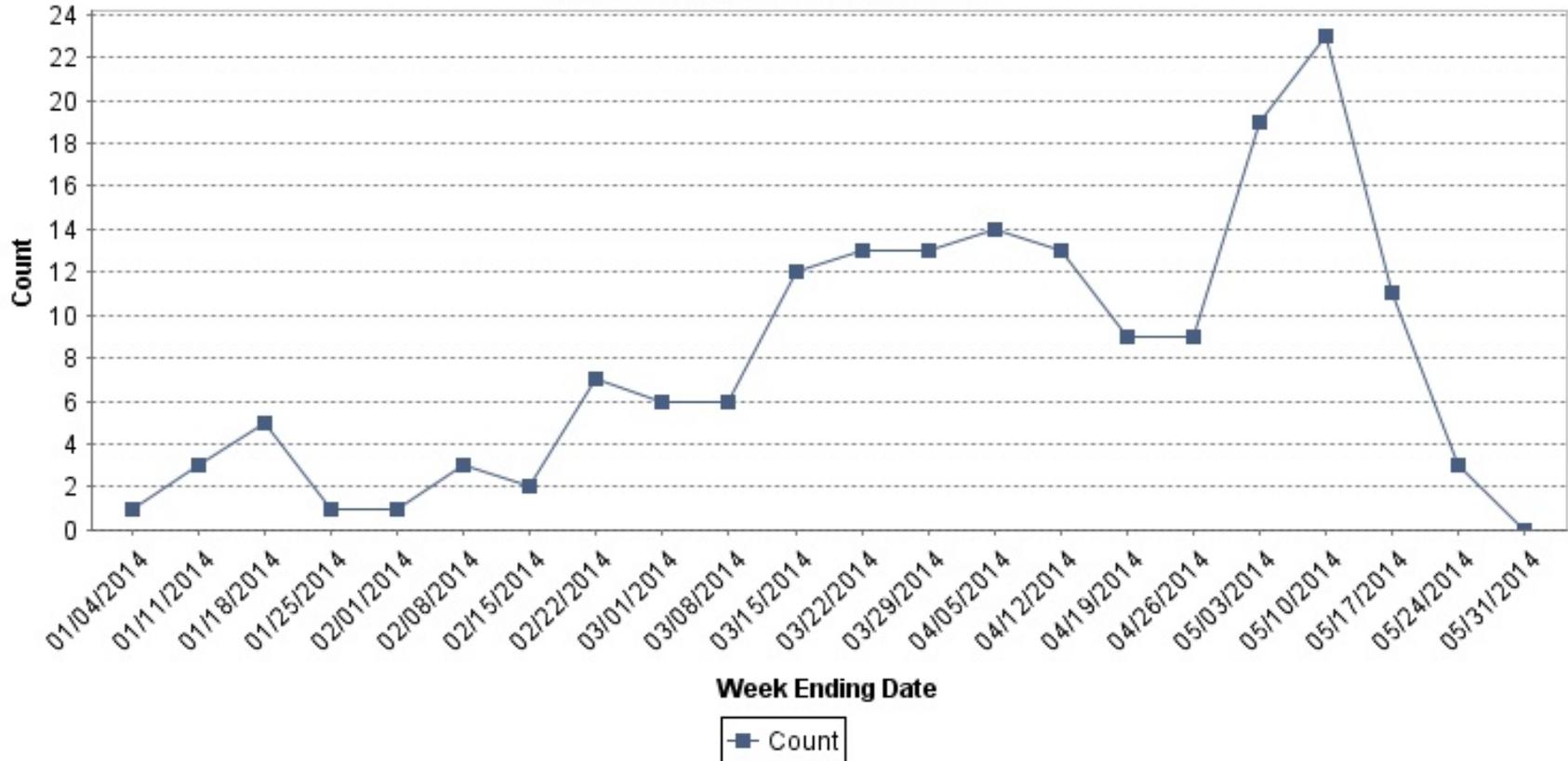
ED: Count of Soccer-related Head Injuries (ICD-9-CM) Grouped by Week

Total Count: 174

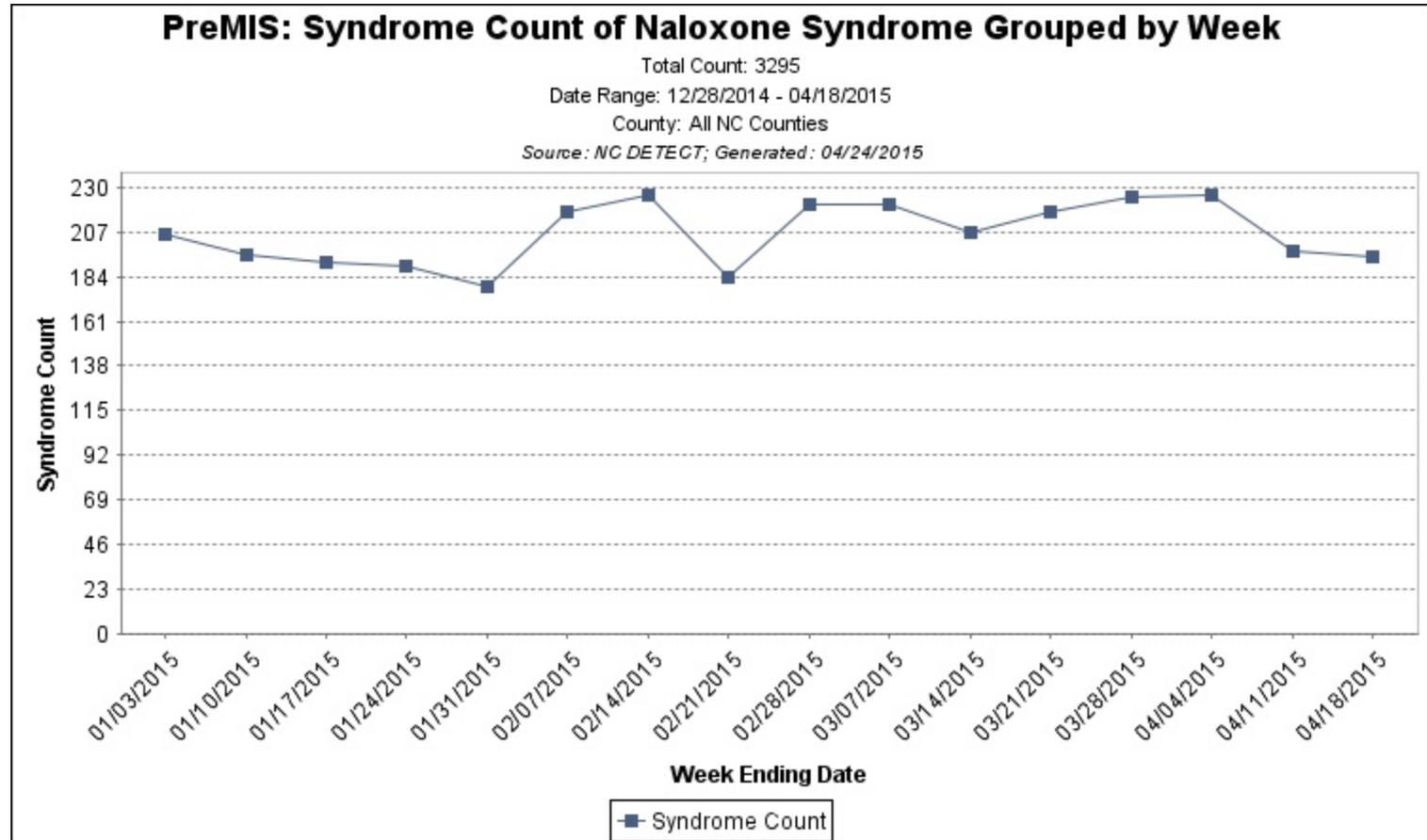
Date Range: 12/29/2013 - 05/31/2014

Hospital: All NC DETECT Hospitals

Source: NC DETECT; Generated: 07/07/2014



EMS Use of Naloxone in NC



Rumor Control

- Syndromic surveillance provides an efficient mechanism to perform surveillance on issues that may or may not be of public health concern
 - Radiation syndromes after Fukushima disaster

Clinical Decision Support

- Monitor syndromes in a clinical setting
- Alert providers when patient may be part of a known disease outbreak
- Include information about additional testing and treatment options

Measles Alert



THE CITY OF NEW YORK
DEPARTMENT OF HEALTH AND MENTAL HYGIENE

Michael R. Bloomberg
Mayor

Thomas R. Frieden, M.D., M.P.H.
Commissioner

nyc.gov/health

February 25, 2008

2008 DOHMH HEALTH ALERT # 5: Measles in Brooklyn

- 1) Two measles cases have been identified in a family in Brooklyn. The cases have not travelled outside of New York, indicating exposure to measles within the City.
- 2) All clinically suspect cases of measles (febrile illness accompanied by generalized maculopapular rash) must be reported immediately (prior to laboratory confirmation) to the New York City Department of Health and Mental Hygiene at (212) 676-2292 or 2313 (weekdays 9 am to 5 pm). For after hours and weekends, please call Poison Control 212-764-7667. Suspect cases of measles must be placed in respiratory isolation immediately.
- 3) Appropriate clinical specimens should be sent to the NYC DOHMH Public Health Laboratories for testing.

Please Distribute to All Primary Care Staff, Including Infectious Disease, Emergency Medicine, Internal Medicine, Pediatrics, Family Medicine, and Laboratory Medicine and All Infection Control Personnel

Dear Colleagues,

On February 13, 2008, the New York City Department of Health and Mental Hygiene (NYC DOHMH) was notified about a confirmed case of measles. The person had onset of rash on February 7, 2008 (contagious period 2/2-2/12/2008). Subsequently, an unvaccinated household contact developed measles on 2/17/2008. The index case denies international travel and had no known contacts with other measles cases. The Bureau is currently conducting an investigation to try to identify contacts, as well as the source of initial infection.

Endemic measles has not been seen in New York City in several years. The confirmation of a case of measles in a resident of the city without a recent travel history indicates exposure within the city. Currently, there are outbreaks of measles in California, United Kingdom, Belgium, and Israel, as well as endemic measles in much of the developing world. Over the last year, we have seen several cases of recent travelers with measles but up to this point no secondary cases have been identified. The confirmation of a case of measles in an individual without a travel history suggests the possibility of ongoing transmission of measles among non-immune individuals within the city.

● HAN alert issued for measles cluster 2/25/08

● Institute for Family Health placed alert next day

● Alert triggers:

● CC of fever and rash

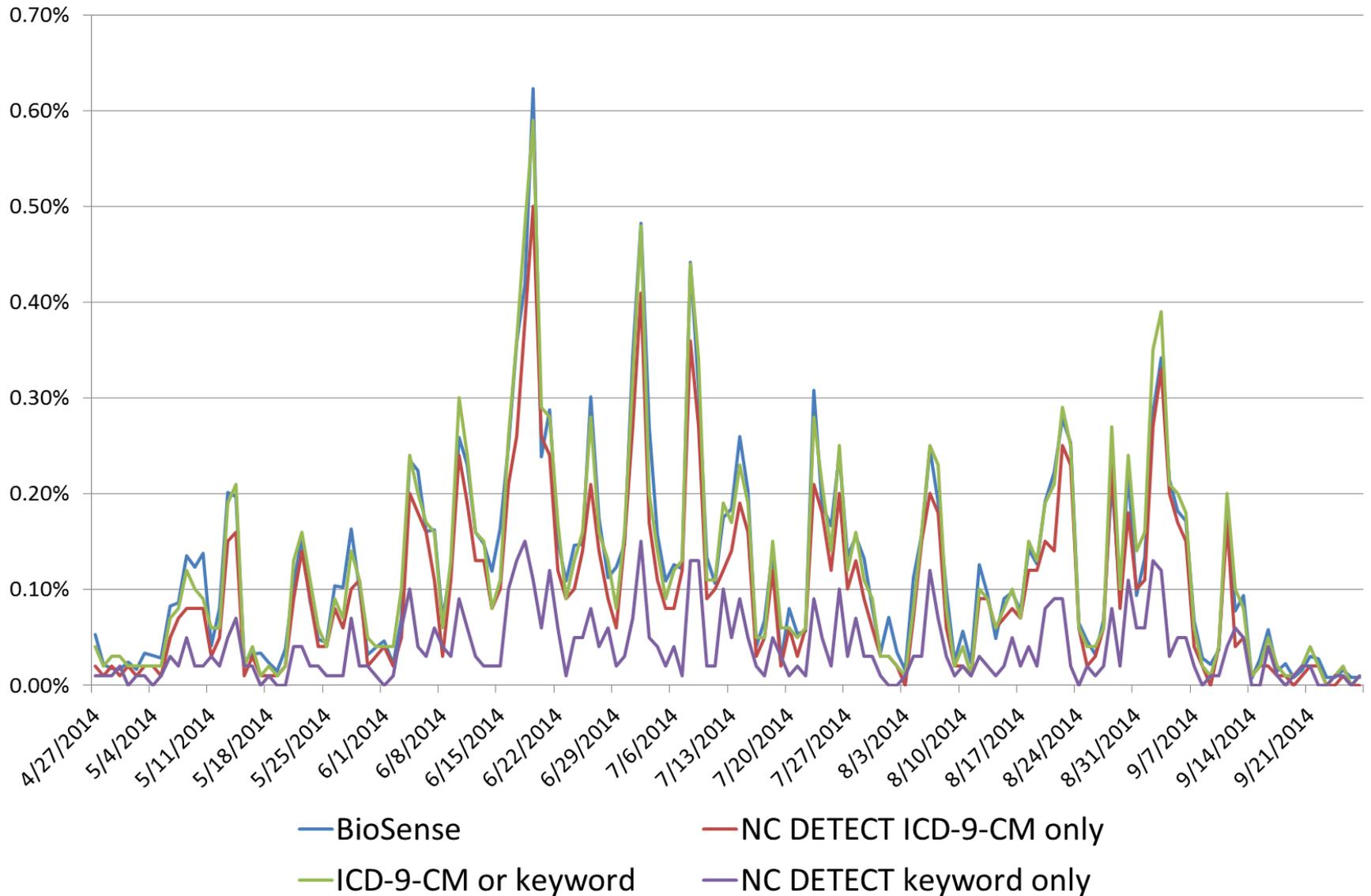
● Alert triggered – 198 pts

● Acknowledged – 4 pts (2%)

Syndromic Surveillance Standards

- PHIN Messaging Guide:
<http://www.cdc.gov/phn/resources/PHINguides.html>
- No national / international standards on free-text based case definitions
 - Standardized definitions can be implemented via widely-used systems, e.g. BioSense, ESSENCE, etc.
 - Most jurisdictions can implement new definitions with minimal burden (and tweak them as needed)

HRI Case Definition Comparison



BioSense: Heat, excessive

Diagnosis Search Terms:

Include: 992, E900

Diagnosis Text Search Terms

Include: demasiado caliente, to hot, too hot, excessive + heat, heat apoplexy, heat collapse, heat cramps, heat edema, heat effects, heat exhaustion, heat fatigue, heat prostration, heat pyrexia, heat stroke, heat syncope, over+heated, sunstroke

Chief Complaint Search Terms

Include: demasiado caliente, to hot, too hot, enlosacion, heat, hypertermia, hyperthermia, insolacion, over+heated, overheated, sobre calentado, sobre caliente

NC DETECT HRI Case Definitions

ICD-9-CM Codes

992.xx or E900.0 or E900.9 or E900

Keywords in chief complaint or triage notes

heat exhaust*, heat cramp*, heat weak*, heat sick*,
Heatstroke, heat stroke, overheat*, over heat*, heat
related*, heat problem*, hypertherm*, to hot, too
hot, sun stroke

ESSENCE Case Definition

HEAT CASUALTY, HEAT CRAMP, HEAT CRAMPING, HEAT EMERGENCY, HEAT EXACERBATION, HEAT EXHAUSTION, HEAT EXPOSURE, HEAT FATIGUE, HEAT ILLNESS, HEAT INJURY, HEAT PROSTRATION, HEAT RASH, HEAT RELATED, HEAT STRESS, HEAT STROKE, HEAT SYNCOPE, HEAT SYNDROME, HEAT TRAUMA, OVER HEAT, OVER HEATED, OVER HEATING, SUN EXPOSURE, SUN POISON, SUN POISONING, SUN RASH, or SUN STROKE

Next steps?

- Increased representativeness of syndromic
- Enterprise integration
 - Sharing / integration of data between syndromic and other systems, e.g. reportable disease systems
- Expanded use of cloud-based systems?
- Continued refinement of detection algorithms
- ...

For More Information

- International Society for Disease Surveillance
 - <http://syndromic.org>
 - Conference Abstracts available in the Online Journal of Public Health Informatics (<http://ojphi.org/>)
 - http://www.syndromic.org/storage/ISDSRecommendation_FINAL.pdf
- Amy Ising: ising@ad.unc.edu