

National Syndromic Surveillance Program (AKA BioSense)

Tools for West Virginia syndromic surveillance

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What is Syndromic Surveillance?

- ❖ **Tool used by federal, state, and local governmental public health agencies to improve the detection and control of outbreaks and characterize other hazardous events or conditions of public health concern in near real-time**
- ❖ **Distinguished from other public health surveillance by the methods employed**
 - Automated collection of health-related data from clinical information systems and other data sources originally captured for different purposes - monitored as potential indicators
- ❖ **Purpose to detect and/or characterize unusual activity for further public health actions to include**
 - Further targeted surveillance
 - Public messaging
 - Public health investigation

What is Syndromic Surveillance?

- ❖ **Traditional public health surveillance methods currently are not as timely or useful in the early stages of an event of public health significance**
- ❖ **Health data are sorted by computer programs into syndromes or into condition specific targeted queries.**
 - Alerts can be triggered when the number of reports for a particular syndrome statistically exceed what is expected in the population
 - When condition specific targeted queries exceed a set threshold as low as one case meeting the definition.
- ❖ **Syndromic surveillance is best used in conjunction with all public health surveillance tools.**
 - This integration of available information from different surveillance sensors will draw the most complete and actionable picture for public health authorities to make decisions and take action.

History of Syndromic Surveillance

- ❖ **Has occurred since PH surveillance has been around**
 - ILI since middle 1900s
 - AIDS – 1980s
 - Toxic Shock Syndrome – 1980s
 - Reye Syndrome – late 1980s
- ❖ **Late 90's testing and thinking about:**
 - Bioterrorism
 - Electronic reporting
- ❖ **Anthrax attacks**
 - Public Health staffing of EDs
 - Received what was available electronically at the time (ADT)
- ❖ **Refining of syndromic**
 - Learning need more specific probes and not all about statistical algorithms (IOM hearing examples)
 - Finding Successes
- ❖ **Future**
 - New context of EHR
 - Big Data Analytics

A Quick Closer Look

❖ Cook County, IL

- ILI, acute GI, other infectious diseases such as sexually transmitted infections, tuberculosis, and meningitis
- follow up of reportable conditions that have not been reported such as meningitis, asthma, other respiratory conditions including cough
- characterize alcohol abuse in the community
- overdoses, including heroin, poisonings
- characterize assaults and violence in the community such as gunshot wounds
- Special Event Surveillance such as NATO 2012
- injuries such as falls and fractures
- Carbon Monoxide
- Climate Change such as Heat Illness from May – September and Cold Related Illness November – February

A Quick Closer Look

❖ Boston, MA

- Mental health syndromes were used after the Marathon bombing to assess the effect of mental health efforts. Information was shared with the Medical Intelligence Center (MIC) for situation reports which was then shared with other agencies.

❖ Florida

- Identified an outbreak of Ciguatera from one case presenting in the ED through reportable condition queries resulting in an official fish recall and investigation.

CDC Surveillance Strategy

(Published Feb 2014)

“A Strategy for improving the Centers for Disease Control and Preventions activities in public health surveillance”

Goals of the Surveillance Strategy

1. Enhance the accountability, resource use, workforce and innovation for surveillance at CDC and in support of STLT agencies.
2. Accelerate the utilization of emerging tools and approaches to improve the availability, quality, and timeliness of surveillance data.
3. Through cross-cutting agency initiatives, improve surveillance by addressing data availability, system usability, redundancies, and incorporation of new information technologies in major systems or activities.

Four Major Initiatives of the CDC Surveillance Strategy

1. National Notifiable Diseases Surveillance System (NNDSS) Modernization Initiative
2. **BioSense Enhancement Initiative**
3. Accelerate Electronic Laboratory Reporting
4. Accelerate Electronic Mortality Reporting

BioSense

The BioSense Program, run by the Centers for Disease Control (CDC), facilitates recognition and tracking of health problems as they evolve, and provides public health officials with the data, information and tools they need to better prepare for and respond, in a coordinated way, to threats to the health of Americans.

- **Mandated in the Public Health Security and Bioterrorism Preparedness and Response Act of 2002**
- **Cloud based information system that enables local, state, and national public health entities to collect, share, and analyze emergency department data along with other public health related data sources.**
 - Enables local jurisdictions to respond quickly to local threats
- **Practitioners can detect and characterize disease outbreaks**
- **Aggregated analyses of disease patterns can be shared across jurisdictions when needed.**
- **BioSense can be a useful tool for local public health to meet their Meaningful Use requirements**

BioSense Enhancement Initiative

The issues:

- ❖ The quality and representativeness of the data being collected through the BioSense application need to be improved,
- ❖ the application and data platform need further development, and
- ❖ the Community of Practice needs to increase collaboration and data sharing.

Evolution of the BioSense program:

- ❖ Continue to support local and state health departments to build their capacity for meaningful use of syndromic surveillance.
- ❖ CDC will renew its focus on quality and representativeness of the data.
- ❖ CDC will seek to strengthen collaboration and data sharing across local, state, and national public health programs as part of the:

National Syndromic Surveillance Program.

National Syndromic Surveillance Program

Vision

A collaboration among local, state, and national public health programs that supports timely exchange of syndromic data and information for nation-wide and regional situational awareness and enhanced response to hazardous events and disease outbreaks.

Some Major Dimensions of the NSSP

1. Syndromic Surveillance Platform (SyS-Platform)
 - Cloud based collaborative workspace where syndromic surveillance tools exist
2. Governance
 - Leadership group representing BioSense users
 - Advise CDC on platform enhancements
3. National Syndromic Surveillance Community of Practice (NSSCoP)
 - Supplement and support a national community focused on the science of syndromic surveillance
4. Future Development
 - Emerging technology, EHRs, Meaningful Use, etc.

Current Status (+)

- ❖ **Approx 44 states and 60% of local health depts perform Syndromic Surveillance (SyS)**
- ❖ **Approx 20 states use BioSense app; others use OTS or homegrown systems**
- ❖ **Approx 75% of jurisdictions managing Syndromic Surveillance data feeds send data to the BioSense platform**

Uses of Syndromic Surveillance

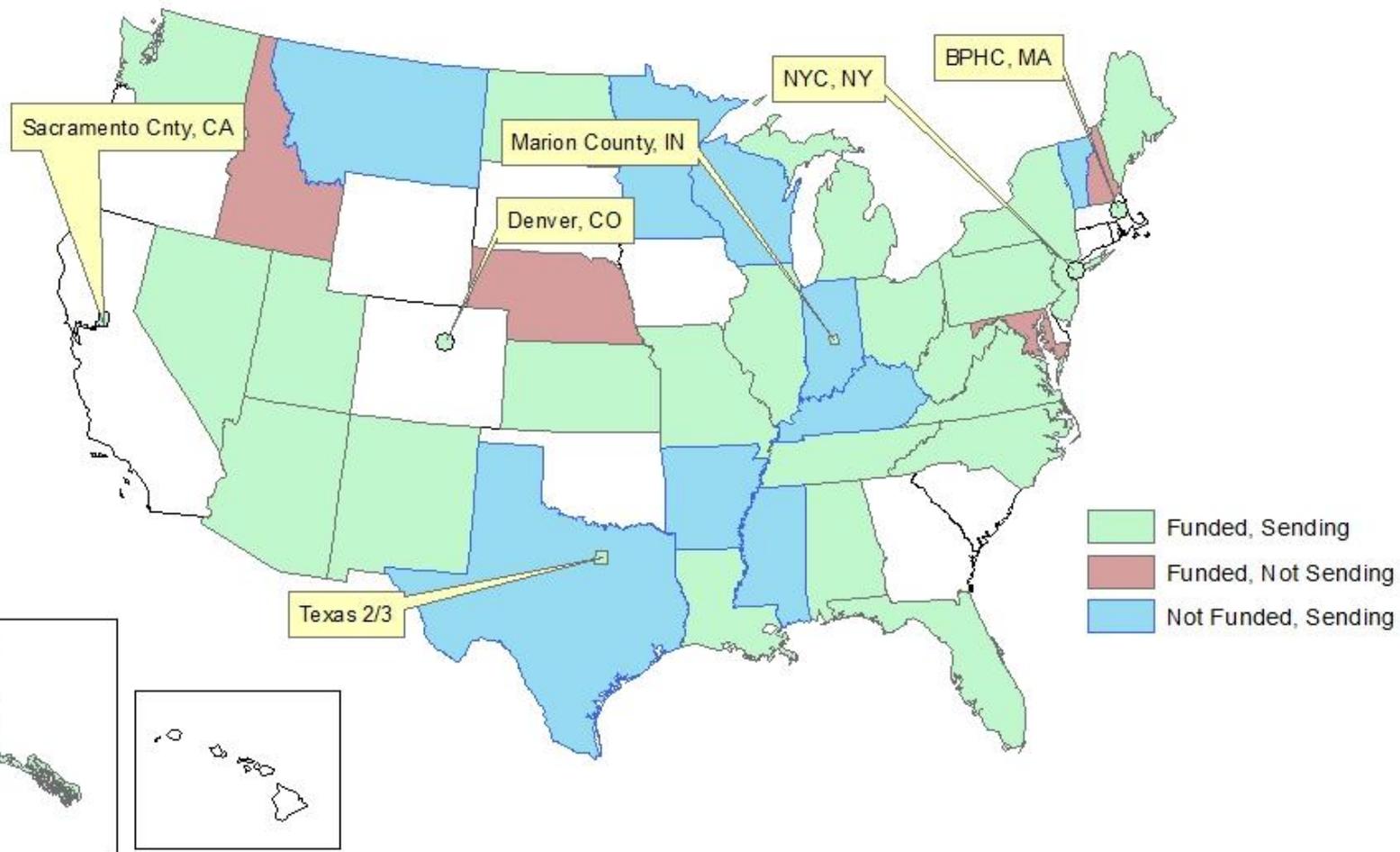
- Infectious disease outbreaks/pandemics (Influenza, H1N1 , Norovirus)
- Identification of reportable conditions not found in other systems
- Mass gatherings (Super Bowl, Conventions, Boston Marathon)
- Natural and man-made disasters (Hurricanes, Fires, Deep Water Horizon)
- Injury (Falls, Bicycle Related Injuries, Drowning, Suicide ideation/attempt, drug overdose)
- Chronic conditions (Asthma)
- Health care utilization (Oral Health, Medication Re-fills, Vaccine monitoring)

Current Status (-)

- ❖ CDC programs are not using BioSense 2 as a national surveillance source or for situational awareness
- ❖ State and local jurisdictions have limited use of BioSense 2 data and there is minimal data sharing
 - Data processing is not transparent and has many defects
 - Data quality and representativeness are unknown
 - Onboarding is challenging and slow
 - Lack of documentation, training, and TA for new users
 - Lack of tools and services for analyzing and using the data
 - Legal barriers and distrust limits data sharing especially with CDC



National Syndromic Surveillance Program Jurisdictional Data Flow and Funding Status September 2014



Recommendations for Improvement

Provided by the BioSense Governance Group and a CDC internal investment review (2013-2014):

- ❖ Develop a consistent mission and vision with specific objectives and timelines for implementation;
- ❖ Improve the representativeness, timeliness, quality, sharing, and usefulness of the syndromic surveillance data;
- ❖ Improve the platform, analytic applications and services;
- ❖ Improve governance, change control and management practices

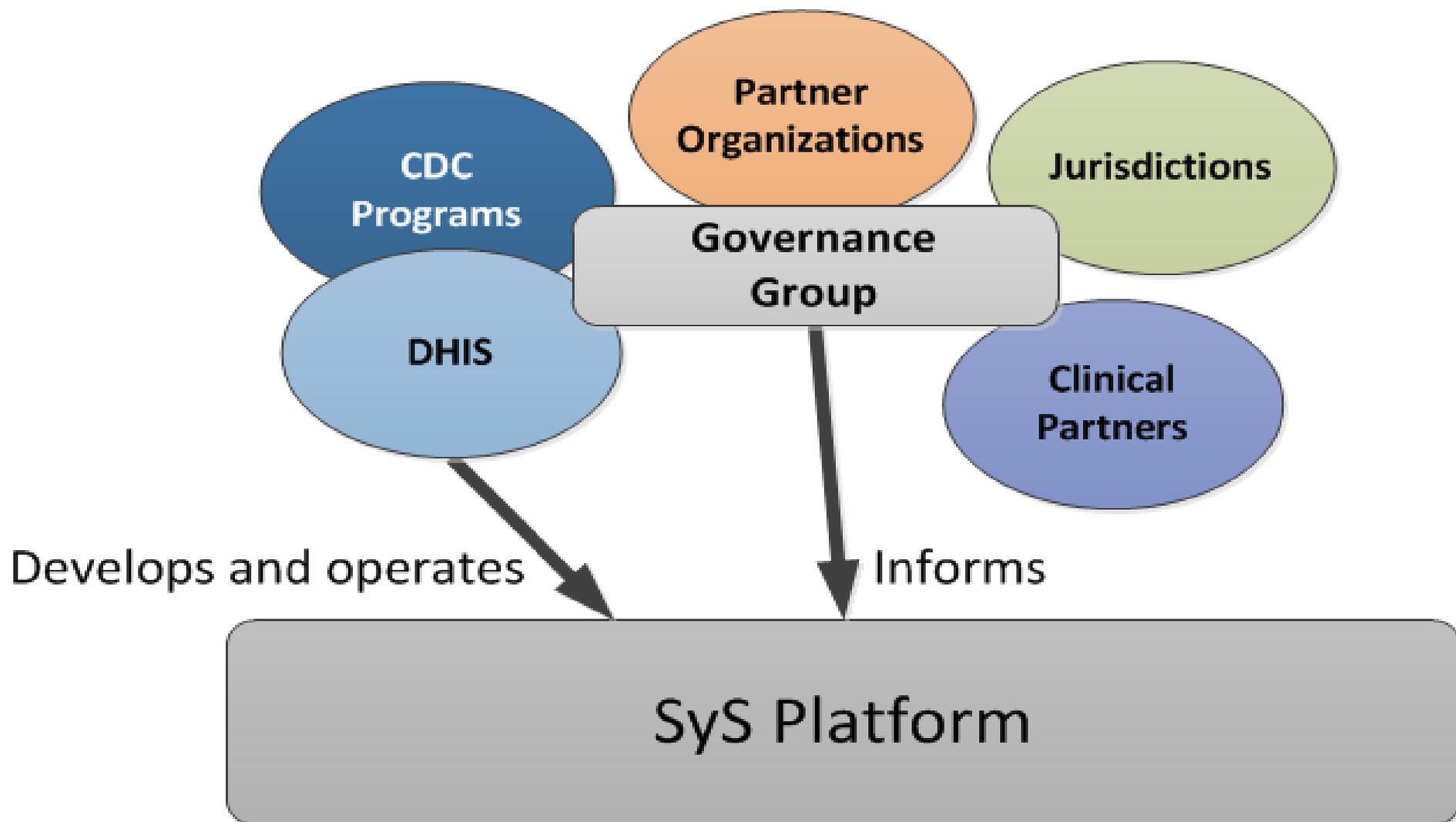
Key components of the Initiative

- ❖ Improving data access, quality, representativeness and timeliness
- ❖ Enhancing the capabilities and technology supporting syndromic surveillance data collection, processing, and provisioning
- ❖ Strengthening the NSSCoP to promote data sharing and further the science and practice of syndromic surveillance.

Stakeholders / Collaborators

- State and local health departments (funded and unfunded)
- Clinical entities
- Veterans Affairs
- Department of Defense
- ASTHO (supports cloud hosting and Governance Group)
- NACCHO (TA for onboarding and informatics)
- CSTE (ICD 9 to 10)
- Public Health Informatics Institute (contracts)
- International Society for Disease Surveillance (community of practice)
- CDC programs (flu, EOC, injury, million hearts, etc)

National Syndromic Surveillance Program



Syndromic Surveillance Platform

Biosense App

ESSENCE

SAS Analytics

Others
EPI-Info, etc)

Data Repository

Data Quality Tools and Dashboard

Data Staging

(Sys Platform)

Integration

May flow through an HD or HIE

Data Flow

Hospitals

VA

DoD

Lab

Pharmacy

Other

Data Quality Activities

- ❖ Evaluate and document data flow and update business rules
- ❖ Establish representativeness (% ED visits)
- ❖ Establish performance metrics for CDC and jurisdictions (FOA)
- ❖ Promote strategic onboarding of hospitals
- ❖ Update Syndromic Surveillance Messaging Guide; include ambulatory care standards (2015 ONC MU interim rule) (Sept)
- ❖ Build CDC/DHIS analytic capacity; develop analytic QA plan; establish routine data analyses and reports
- ❖ Provide TA to jurisdictions to improve data quality from hospitals to health dept. (NACCHO and others involved)

Ongoing Pilot Studies

1. Compare SyS data with ILI-Net data to determine potential for SyS as an additional flu data source for CDC Influenza division
2. Work with CDC Injury program on an opioid overdose study using the SyS data
3. Evaluation of LabCorp data for potential use by CDC's flu and Hepatitis programs
4. Evaluation of prescription drug data from Relay Health

Development of Platform (SyS-P) and BioSense Application

- ❖ Award new development contract (Sept 15th); transition to a platform-oriented delivery model
- ❖ Conduct Enterprise Architecture assessment of the SyS-P
- ❖ Establish a change management process that formalizes jurisdictions' input
- ❖ Identify and prioritize data flow fixes for the new contractor
- ❖ Test and deploy analytic tools on the platform for data management, analysis, and visualization (e.g., ESSENCE, SAS)
- ❖ Create dashboards for data quality & data sharing permissions
- ❖ Create a knowledge repository for programs, templates, methods, and case definitions
- ❖ Management of the AWS cloud environment and services

Operations, Management and Support of NSSCoP

- ❖ Expand the NSSCoP and refine the governance structure
- ❖ Issue 2015 FOA for state/local health departments
- ❖ Test models for data sharing among jurisdictions (MERS, EV D68, Ebola, etc.)
- ❖ Develop communication plan
- ❖ Renew DUAs with DoD and VA
- ❖ Oversee partner Cooperative Agreements
- ❖ Support Data Sharing Workshops and promote data sharing and Sys best practices in collaborations with partners (CoAgs)

BioSense Governance Group

- ❖ Represent the NSSCoP – CDC, partner organizations, and funded and unfunded jurisdictions
- ❖ Inform and provide input on the enhancements and functionality of the SyS-P and BioSense application
- ❖ Provide a forum to promote the science of syndromic surveillance and share use cases
- ❖ Convene workgroups to address issues such as data sharing, and data quality

Timeline

1-2 years

Improve:

- Data flow
- Data quality
- Platform function
- Shared applic's (SAS, ESSENCE)
- Continue:
 - Onboarding
 - Operations

2-3 years

Enhance:

- Data Sources
- Functionality
- Architecture
- Shared services (potentially across platforms)
- Continue:
 - Onboarding
 - Operations

3-5 years

Develop:

- Advanced analytics, data linkage, EHR data use cases, etc.
- More integrated & complete surveillance picture
- Continue:
 - Onboarding
 - Operations

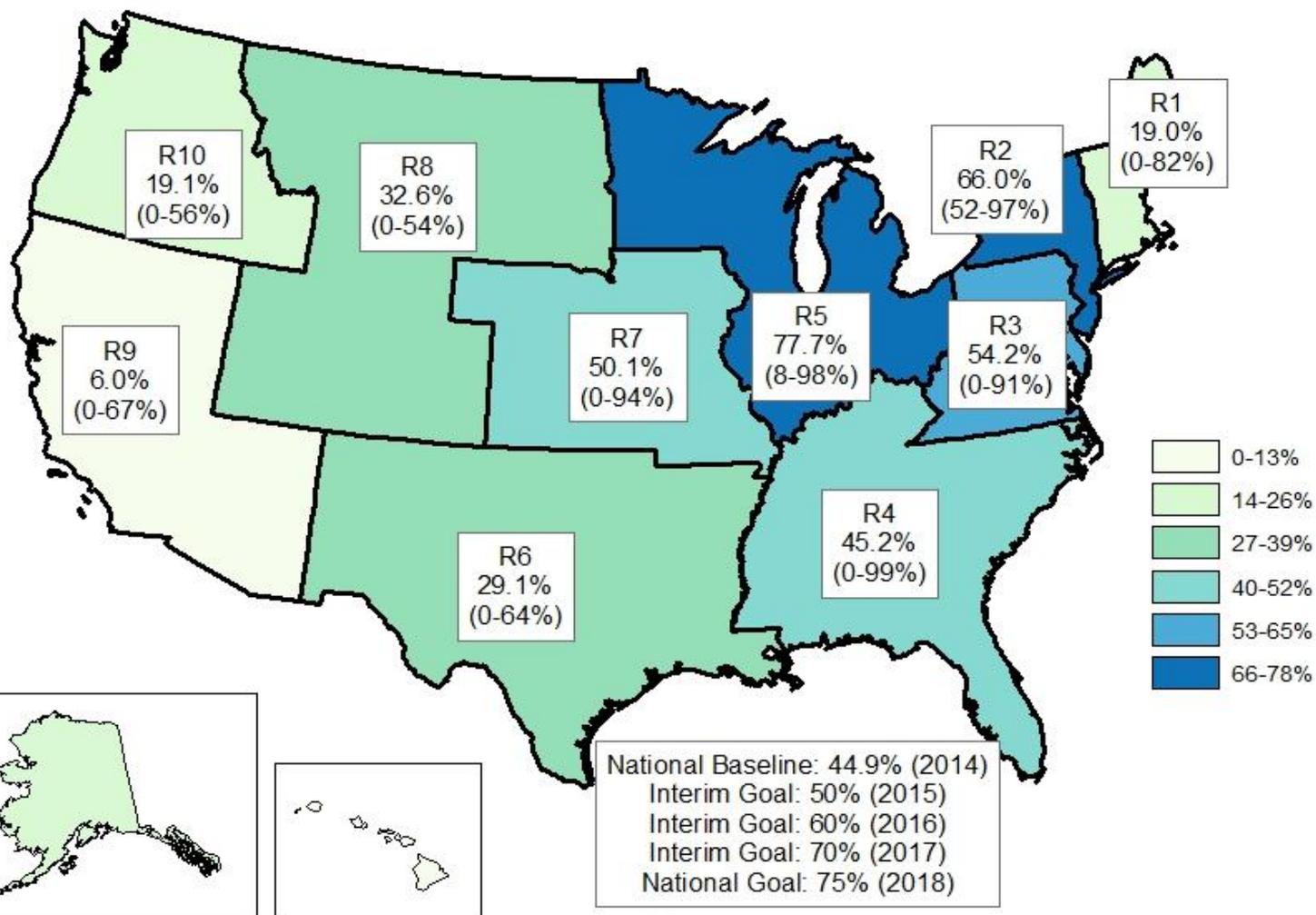


National Syndromic Surveillance Program

% of Emergency Dept visits covered by the BioSense Application

By Department of Health and Human Services Region

October 2014



Current Examples Using BioSense and NSSCoP

- ❖ MERS
- ❖ Chikungunya
- ❖ Ebola
- ❖ EV-D68

MERS

- ❖ **2 cases of Middle East Respiratory Syndrome (MERS) arrived in the US May 2014**
- ❖ **BioSense jurisdictions can directly query raw data in their “locker”**
 - However CDC cannot access these data
 - Critical functions like ad-hoc syndrome definitions not yet capable on the BioSense Platform
- ❖ **Developed a plan to:**
 - Rapidly generate query definitions regardless of locally preferred syndromic surveillance tool
 - Generate aggregate reports to support the Public Health response to MERS

MERS Methods

- ❖ **CDC DHIS worked Collaboratively with members of the community to develop a common set of 5 MERS-like query definitions**
 - 5 definitions provided a range of sensitivity and specificity using chief complaint and ICD codes.
 - Some definitions were very restrictive looking for multiple criteria in a chief complaint, while others were very loose
 - Some focused on mention of travel AND key words, others on travel only, and others on ICD codes only
- ❖ **All definitions were operationalized in SQL, R-Script, SAS, and ESSENCE query languages**
- ❖ **Deployment guidance was provided and a webinar was conducted to elicit participation**
- ❖ **Aggregate weekly reporting came to CDC, was collated, and sent to the CDC Emergency Operations Center (EOC)**

MERS Conclusions

- ❖ **Despite limitations, surveillance reports of MERS-Like visits enhanced the MERS national surveillance picture**
- ❖ **CDC and partner jurisdictions quickly developed a novel, standardized set of definitions that were widely shared**
- ❖ **Though limited by the use of differing systems, the community succeeded in providing CDC MERS-like surveillance data**
- ❖ **This activity can and should be used to drive future requirements for the National Syndromic Surveillance Platform**
- ❖ **Many viewed as a model to expand – offering hope to providing rapid and meaningful syndromic data at a national level**



Chikungunya Syndrome Definition

Posted by [Caleb Wiedeman](#) on June 13, 2014 at 3:58pm in [BioSense User Group \(BUG\)](#)

[← Back to BioSense User Group \(BUG\) Discussions](#)

Has anybody out there developed (or started developing) a syndrome definition for chikungunya? We're looking to try and quickly put something together in Tennessee, but would rather not re-invent the wheel if it's already been done.

Thanks,

Caleb Wiedeman

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Reply by [Becky Zwickl](#) on June 16, 2014 at 2:51pm

For anyone looking for a Chikungunya syndrome definition, Mike Coletta just passed along the following information:

While we haven't begun a formal work to put such a definition into the system, a few jurisdictions (FL and IN) have begun to share. FL developed the following for their ESSENCE system:

```
^chikun^,or,^chikeng^,or,^chickeng^,or,^chickung^,or,^anguil^,or,^antigua^,or,^british
virg^,or,^dominica^,or,^guiana^,or,^guadel^,or,^haiti^,or,^martini^,or,^saint^,or,^barthel^,andnot,^barth
elon^,or,^kitts^,andnot,^burkiits^,or,^lucia^,andnot,^halluc^,or,^stmartin^,or,^grenadine^,or,^sintm^,or,^
sint m^,or,^maartan^,or,^carib^,or,^barbuda^,or,^guyana^,or,^puerto^,or,^nevis^,or,^phillipine^,or,^india
^,or,^ india,or,^ india ^,or,cuba ^,or,^ cuba,or,^ cuba ^
```

If you are not familiar with the syntax, the ^ is a wild card and the operators are separated by a comma. I hope this is helpful to you.

Reply Message



Reply by [Joe Gibson](#) on June 17, 2014 at 1:34pm

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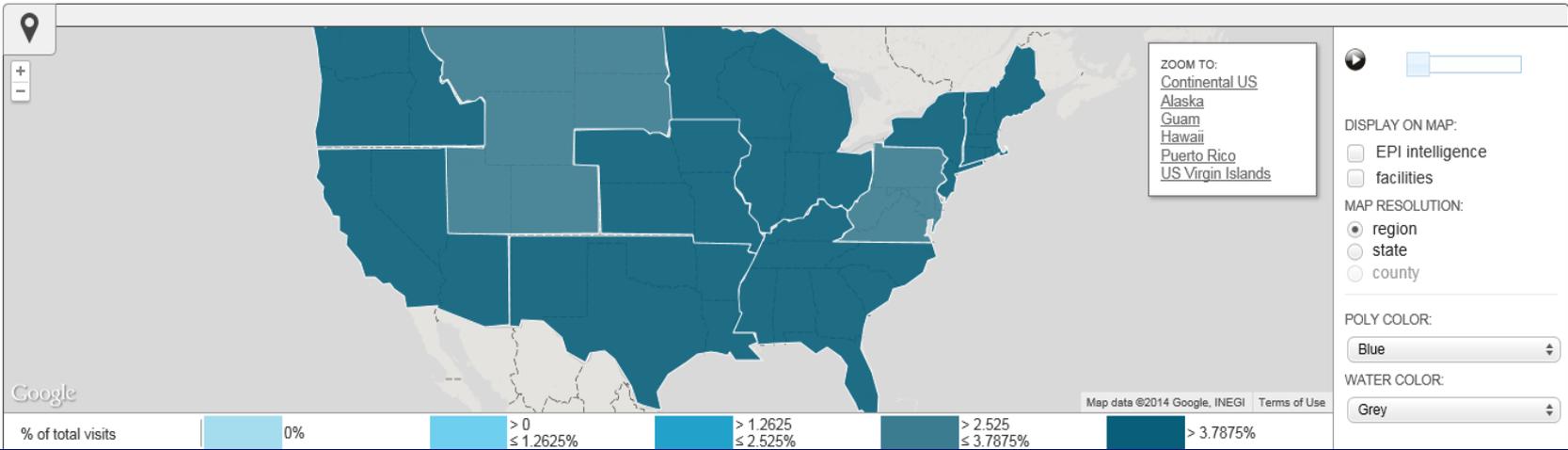
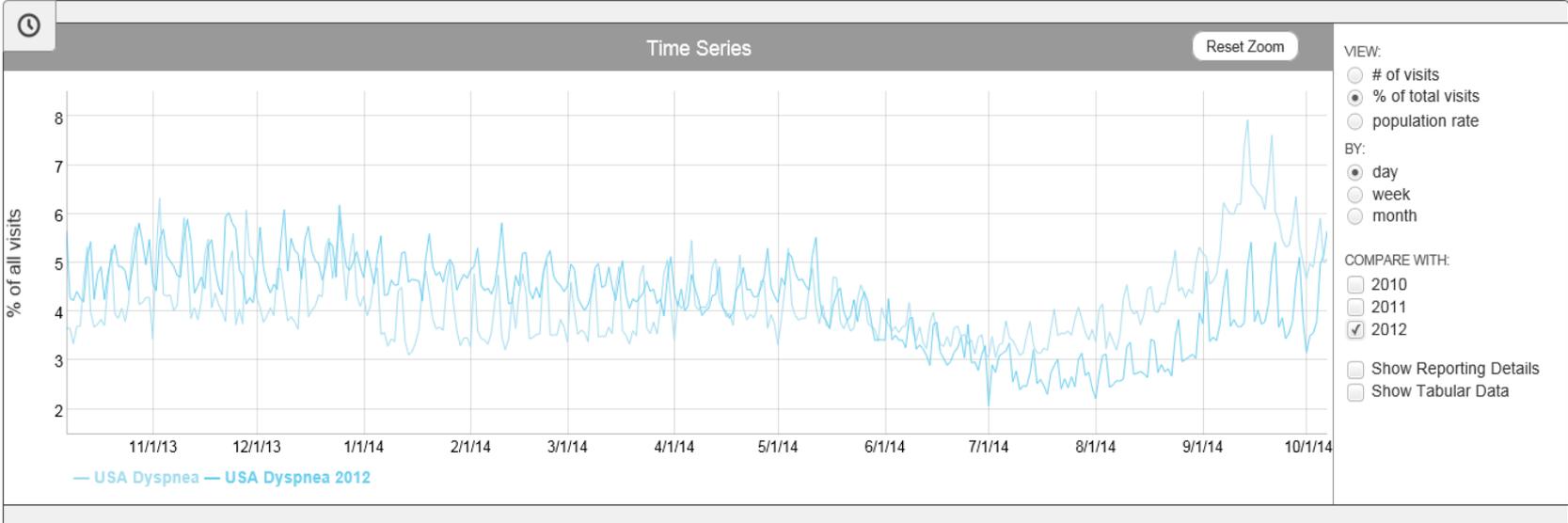
- ❖ **In August, definitions were conceptualized and then operationalized in R-Script**
- ❖ **In September the scripts were tested by 5 states**
- ❖ **When the first case occurred in Dallas, the scripts were adjusted to catch that case**
- ❖ **Posted on the ISDS forum**
- ❖ **Points to a need for more formal processes**

EV-D68

- ❖ **Slightly different – more focused on disease symptoms**
- ❖ **Possible to use the current syndrome categories (specifically Dyspnea)**
- ❖ **Some issues with system created limitations**

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

Viewing 517,500 visits for 1 syndrome in 1 location from 10/7/2013 - 10/7/2014 from 33 sources for Male, Female, and Unknown, ages 0-<2, 2-4, and 5-17.



Recap

The Problems:

- Quality and representativeness of data
- Application and platform development
- Community of Practice increase collaboration and data sharing

National Syndromic Surveillance Program - NSSP (AKA BioSense):

- Continue to support local and state health departments capacity for meaningful use of syndromic surveillance data
- Focus on quality and representativeness of the data
- Strengthen collaboration and data sharing across local, state, and national public health programs

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Questions?



For more information please contact Centers for Disease Control and Prevention

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Visit: <http://www.cdc.gov> | Contact CDC at: 1-800-CDC-INFO or <http://www.cdc.gov/info>

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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