Meaningful Use - HL7 Version 2

HL7 Version 2 and Surveillance
Your Ambassadors Today

- **Anna Orlova, PhD**, Executive Director, Public Health Data Standards Consortium and Johns Hopkins University

- **Lori Reed-Fourquet**, Owner/Consultant, e-HealthSign, LLC
What we will cover

- A public health surveillance “story”
- Pre-Meaningful Use public health surveillance efforts
- Meaningful Use and public health surveillance
- How HL7 is essential to the story
- The end of our story
Public Health Surveillance is the Key Activity of Health Departments to Protect the Public’s Health
Public Health Surveillance Components:

1. Event **detection** based on the laboratory, clinical encounter data and non-clinical data
2. Event **investigation** (case investigation/assessment)
3. Event **monitoring**
4. Event **management** (outbreak management)
5. **Evaluation** of the event management intervention(s)
6. Event **mitigation** (prevention)
Public Health Surveillance Systems

**CDC Environmental Public Health Tracking Network** - health effects data with human exposure data and environmental hazard data.

**CDC National Notifiable Disease Surveillance System** *(NNDSS)* – laboratory and clinical data on nationally defined list of communicable diseases

**State Disease Surveillance Systems** - laboratory and clinical data on jurisdictionally-defined list of reportable diseases (conditions)

**Local and State Syndromic Surveillance Systems** – syndromic data from clinical and non-clinical sources to detect a public health threat event
Pre-Meaningful Use Efforts on Public Health Surveillance

- **HITSP Electronic Lab Reporting Interoperability Specification (IS 01)** specifies HL7 2.5.1 message and CDA R2 for laboratory results reporting to public health agencies.

- **HITSP Biosurveillance Interoperability Specification (IS 02)** specifies HL7 2.5.1 for message-based and HL7 CDA R2 for structured document submission of syndromic data.

- **HITSP Public Health Reporting Interoperability Specification (IS 11)** specifies HL7 2.5.1 for message-based and HL7 CDA R2 for structured document submission of notifiable/reportable diseases data.
Pre-Meaningful Use Efforts on Public Health Surveillance

Public Health Partners:

- Council of State and Territorial Epidemiologists (CSTE)
- Association of Public Health Laboratories (APHL)
- Public Health Data Standards Consortium (PHDSC)
Meaningful Use of HIT and Public Health Surveillance

- Focus is on Syndromic Surveillance

Public Health Stakeholder

- International Society for Disease Surveillance (ISDS)
Meaningful Use of Health IT and Syndromic Surveillance

- Applies to all healthcare providers (inpatient, outpatient and emergency care)
- Focuses on infectious diseases
- Focuses on local and state syndromic surveillance systems not reporting to federal agencies
- Focuses on:
  - Event detection based on the laboratory, clinical encounter data and non-clinical data
  - Event investigation (case investigation/assessment)
  - Event monitoring
  - Event management (outbreak management)
  - Evaluation of the event management intervention(s)
  - Event mitigation (prevention)

Synonym terms used in the past: biosurveillance and situational awareness
Meaningful Use of Health IT and Syndromic Surveillance

**Data Requirements:**
- Facility demographics including contact data for the report and sender data
- Patient demographics
- Laboratory and radiology orders and results
- Vital signs (heart rate, respiratory, blood pressure, height and weight)
- Observation, symptoms and clinical findings
- Triage notes
- Pregnancy status
- Data elements on severity of illness (ventilated/intubated indicators)
- ICU indicators
Meaningful Use of Health IT and Syndromic Surveillance and

- Specifies data submission using HL7 v2.3.1 and HL7 v2.5.1
- Data requirements are mostly the same as specified in the Biosurveillance Minimum dataset with additions of patient-identifiable data:
  - HITSP Encounter Message Component (HITSP C39) – specifies Biosurveillance dataset for message-based data submission
  - HITSP EHR Lab Terminology (HITSP C35, 36, 37) URL – specified vocabularies and terminologies for Lab reports
  - HITSP Transaction Package TP48 - specifies Biosurveillance dataset for document-based data submission
  - HITSP Anonymize Component (HITSP C25) - specifies Biosurveillance identifiers to be anonymized

Biosurveillance Minimum Dataset: C-39 Encounter Message

- Specifies content for patient encounter data (excluding laboratory, radiology) in a message-based functional flow scenario
- HL7 V2.5 ADT data structure
- Key Concepts
  - Patient encounter data are captured as part of the normal process of care performed by healthcare providers such as hospitals, emergency departments and outpatient clinics
  - Anonymized if required by jurisdiction
  - Constrained to AHIC Biosurveillance Minimum Data Set Standards Selection
Biosurveillance Minimum Dataset: C48 Encounter Document

- Specifies content for patient encounter data (excluding laboratory, radiology) in a document sharing functional flow scenario.
- IHE Patient Care Coordination Medical Summary (XDS-MS)
- HL7 CDA R2

Key Concepts:
- Patient encounter data are captured as part of the normal process of care performed by healthcare providers such as hospitals, emergency departments and outpatient clinics.
- Anonymized if required by jurisdiction.
- Constrained to AHIC Biosurveillance Minimum Data Set Standards Selection.
Biosurveillance Minimum Dataset: C35 EHR Lab Terminology

- Specifies vocabulary for Laboratory Results data
- LOINC, SNOMED-CT, HL7 V2.5 Code Sets, HL7 V3.0 Code Sets

Key Concepts
- Constrained to harmonize AHIC Biosurveillance Minimum Data Set Standards Selection
Syndromic Surveillance Systems: Examples

- New York City Department of Health and Mental Hygiene
- Boston Public Health Commission
- City of Milwaukee Health Department
- Indiana State Public Health Electronic Surveillance System (PHESS)
Percent of Children Tested for Lead with BLL>10 µg/dL in the USA

Blood Lead Testing, Volume and Percent Positive (n=1,495,374)

Source: Eileen Koski, Quest Diagnostics. PHIN 2004, May, Atlanta GA
Syndromic Surveillance Basics

Event:

Signal:

Weekly ED Gastrointestinal Syndromes

Source: Shaun Grannis. Lecture in Public Health in NHIN Course  309.860.11Johns Hopkins School of Public Health. 2007
Source: Shaun Grannis. Lecture in Public Health in NHIN Course  309.860.11Johns Hopkins School of Public Health. 2007
Surveillance Information Flow

Hospital ED Registration

Hospital Interface Engine (Routing)

Hospital Firewall (Encryption)

Network Connection

Message Listener

Firewall (Decryption)

Message Processor

Batched, delivered to ISDH every 3 hours

HL7 ADT message

Source: Shaun Grannis. Lecture in Public Health in NHIN Course 309.860.11 Johns Hopkins School of Public Health. 2007
Current PHESS Hospitals (n=72)

> 6,500 visits per day
~ 15 MB data per day

Goal of 78 hospitals by August 2007

Source: Shaun Grannis. Lecture in Public Health in NHIN Course 309.860.11 Johns Hopkins School of Public Health 2007
GI Event

Source: Shaun Grannis. Lecture in Public Health in NHIN Course 309.860.11 Johns Hopkins School for Public Health. 2007
Natural Disaster

Source: Shaun Grannis. Lecture in Public Health in NHIN Course 309.860.11 Johns Hopkins School for Public Health. 2007
Sentiweb
http://www.u444.jussieu.fr/sentiweb
### Interactive Queries

#### Sentiweb

**Map of France**

<table>
<thead>
<tr>
<th>Select</th>
<th>the illness</th>
<th>the year</th>
<th>the time step</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Influenza</td>
<td>1999</td>
<td>Annual</td>
</tr>
<tr>
<td></td>
<td>Diarrheas</td>
<td>1998</td>
<td>1st semester</td>
</tr>
<tr>
<td></td>
<td>Measles</td>
<td>1997</td>
<td>2nd semester</td>
</tr>
<tr>
<td></td>
<td>Mumps</td>
<td>1996</td>
<td>1st quarter</td>
</tr>
<tr>
<td></td>
<td>Chicken-pox</td>
<td>1995</td>
<td>2nd quarter</td>
</tr>
<tr>
<td></td>
<td>Urethritis</td>
<td>1994</td>
<td>3rd quarter</td>
</tr>
<tr>
<td></td>
<td>HIV test</td>
<td>1993</td>
<td>4th quarter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1992</td>
<td>January</td>
</tr>
</tbody>
</table>

Map of France

*iso-incidence with contour of administrative departments*

Send the query

---

25,000 epidemiologic maps and 10,000 incidence curves can be obtained.
The interpretation of each of them requires a statistical analysis. This concerns particularly the interpretation of observed peaks of incidence in the time series and/or the maps.
The danger of misinterpreting increases when queries concern small geographical regions (e.g., departments), or short time steps (e.g., weeks).
In case of any problem, send a message to **Dr Antoine Flahault**.

www.u444.jussieu.fr/sentiweb
Sentiweb

Time >>
Unit = week

and ... space x time

http://www.u444.jussieu.fr/sentiweb

Influenza, France

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Réseau Sentinelles France

Séries hebdomadaires

Série monitrées :

- Acute diarrhea* : Low activity
- Influenza-like illness* : Low activity

Acute diarrhea

In metropolitan France, last week, the incidence of acute diarrhea seen in general practice was 111 cases per 100,000 inhabitants, below the epidemic threshold (188/100,000).

Influenza-like illness

In metropolitan France, last week, the incidence of influenza-like illness seen in general practice was estimated at 4 cases per 100,000 inhabitants.
Public Health Surveillance and Meaningful Use of HIT

- Traditional Public Health Surveillance (Case Reporting)
  - Specific Case Notification Messages
- Syndromic Surveillance (Biosurveillance)
  - Monitor routine clinical data for public health concerns

Where's The Meaning?
How HL7 is Essential to Public Health Surveillance Story

HL7 standards should enable submission of electronic surveillance data to public health agencies according to applicable law and practice.

- HL7 2.3.1 format (no implementation guide specified), or
- HL7 2.5.1 format in conformance with the Public Health Information Network HL7 Version 2.5 Message Structure Specification for National Condition Reporting Final Version 1.0 and Errata and Clarifications National Notification Message Structural Specification

> specifies the use of Case Notification Message Mapping Guides published by the CDC at
http://www.cdc.gov/phin/resources/guides/mmghomepagecasenotification.html
Public Health Surveillance and Meaningful Use of HIT

- What/When/Who/Whom to report (varies by condition and by jurisdiction)
  - Impacts the Provider organization workflow which must be accommodated in the tool used to support fulfillment of reporting requirements
- Reporting tool options
**Jurisdiction Reporting Example**

### REPORTABLE DISEASES - 2010

The commissioner of the Department of Public Health (DPH) is required to declare an annual list of reportable diseases. Each report (by mail, fax, or telephone) should include the full name and address of the person reporting, attending physician, disease being reported, and full name, address, date of birth, race/ethnicity, sex and occupation of the person affected. The PD-23 can be found at on the DPH website. Please see page 4 for a list of persons required to report reportable diseases. The reports should be sent in envelopes marked “CONFIDENTIAL.” Changes for 2010 are noted in bold and with an asterisk (*).

#### Category 1 Diseases:
- Report immediately by telephone on the day of recognition or strong suspicion of disease for those diseases marked with a telephone (📞). Also mail a report within 12 hours.

#### Category 2 Diseases:
- All other diseases not marked with a telephone are Category 2 diseases. Report by mail within 12 hours of recognition or strong suspicion of disease.

<table>
<thead>
<tr>
<th>Category 1 Diseases</th>
<th>Category 2 Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquired Immunodeficiency Syndrome (1,2)</td>
<td>Rocky Mountain spotted fever</td>
</tr>
<tr>
<td>Anthrax</td>
<td>Rubella (including congenital)</td>
</tr>
<tr>
<td>Arboviral disease (California group, EEE, SLE, WNV)</td>
<td>Salmonellosis</td>
</tr>
<tr>
<td>Babesiosis</td>
<td>SARS-CoV</td>
</tr>
<tr>
<td>Botulism</td>
<td>Septicemia or meningitis with growth of gram positive rods within 32 hours of inoculation</td>
</tr>
<tr>
<td>Brucellosis</td>
<td>Shiga toxin-related disease (gastroenteritis)</td>
</tr>
<tr>
<td>Campylobacteriosis</td>
<td>Shigellosis</td>
</tr>
<tr>
<td>Carbon monoxide poisoning (3)</td>
<td>Silicosis</td>
</tr>
<tr>
<td>Central-line associated bloodstream infections (Do not use this form to report) (4)</td>
<td>Smallpox</td>
</tr>
<tr>
<td>Chancroid</td>
<td>Staphylococcal enterotoxin B pulmonary poisoning</td>
</tr>
<tr>
<td>Chickenpox</td>
<td>Staphylococcus aureus disease, reduced or resistant susceptibility to vancomycin (1)</td>
</tr>
<tr>
<td>Chickenpox</td>
<td>Staphylococcus aureus methicillin-resistant disease, invasive, community acquired (6,11)</td>
</tr>
<tr>
<td>• admission to hospital, any age</td>
<td>Staphylococcus epidermidis disease, reduced or resistant susceptibility to vancomycin (1)</td>
</tr>
<tr>
<td>• adults &gt; 18 years, any clinical setting</td>
<td></td>
</tr>
<tr>
<td>Chickenpox-related death</td>
<td></td>
</tr>
<tr>
<td>Chlamydia (C. trachomatis) (all sites)</td>
<td></td>
</tr>
<tr>
<td>Cholera</td>
<td></td>
</tr>
<tr>
<td>Clostridium difficile, community-onset (5)</td>
<td></td>
</tr>
<tr>
<td>Creutzfeldt-Jakob disease (age &lt; 55 years)</td>
<td></td>
</tr>
<tr>
<td>Creutzfeldt-Jakob disease (transmissible)</td>
<td></td>
</tr>
</tbody>
</table>

Jurisdiction Reporting Example

Persons Required to Report Reportable Diseases

1. Every health care provider who treats or examines any person who has or is suspected to have a reportable disease shall report the case to the local director of health or other health authority within whose jurisdiction the patient resides and to the Department of Public Health.

2. If the case or suspected case of reportable disease is in a health care facility, the person in charge of such facility shall ensure that reports are made to the local director of health and Department of Public Health. The person in charge shall designate appropriate infection control or record keeping personnel for this purpose.

3. If the case or suspected case of reportable disease is not in a health care facility, and if a health care provider is not in attendance or is not known to have made a report within the appropriate time, such report of reportable diseases shall be made to the local director of health or other health authority within whose jurisdiction the patient lives and the Department of Public Health by:
   A. the administrator serving a public or private school or day care center attended by any person affected or apparently affected with such disease;
   B. The person in charge of any camp;
   C. The master or any other person in charge of any vessel lying within the jurisdiction of the state;
   D. The master or any other person in charge of any aircraft landing within the jurisdiction of the state;
   E. The owner or person in charge of any establishment producing, handling, or processing dairy products, other food or non-alcoholic beverages for sale or distribution;
   F. Morticians and funeral directors.

## Specialty Forms

In the instance where specialty forms or electronic reporting are available, the PD-23 should not be used. Specialty forms are available for the diseases listed below. Some forms are available as fillable PDF documents. When possible, please use this fillable form.

  - [Adult HIV/AIDS Case Report Form completion instructions](http://www.ct.gov/dph/cwp/view.asp?a=3136&q=453876)

- **Influenza** - Hospitalized and Fatal Cases of Influenza - Case Report Form (860-509-7994 860-509-7994)
  - [Hospitalize and Fatal Flu Cases Form completion instructions](http://www.ct.gov/dph/cwp/view.asp?a=3136&q=453876)

- **Occupational Diseases** - Physician's Report Form (860-509-7740 860-509-7740)
  - [Occupational Diseases Form completion instructions](http://www.ct.gov/dph/cwp/view.asp?a=3136&q=453876)

- **Sexually Transmitted Diseases** - STD-23 (860-509-7920 860-509-7920)
  - [STD-23 Form completion instructions](http://www.ct.gov/dph/cwp/view.asp?a=3136&q=453876)

- **Tuberculosis** - TB-86 (860-509-7722 860-509-7722)
  - [TB-86 Form completion instructions](http://www.ct.gov/dph/cwp/view.asp?a=3136&q=453876)
### Jurisdiction Reporting Example

For information or weekday disease reporting, call 860-509-7994. For reporting on evenings, weekends, and holidays, call 860-509-8000.

<table>
<thead>
<tr>
<th>Patient Name (Last)</th>
<th>(First)</th>
<th>(MI)</th>
<th>Parent or Guardian Name</th>
<th>Age</th>
<th>Birth Date</th>
<th>Patient’s Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address (No. and Street)</td>
<td>(Apt. #)</td>
<td>(City or Town)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Race</td>
<td>Hispanic/Latino</td>
<td>Is patient pregnant?</td>
<td>Did patient die of this illness?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>White</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Black/African American</td>
<td>No</td>
<td>Yes</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>American Indian/Alaska Native</td>
<td>Yes</td>
<td>Unknown</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Name and address of workplace, school or day care

<table>
<thead>
<tr>
<th>Disease Name</th>
<th>Onset Date</th>
<th>Diagnosis Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral Hepatitis</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Jaundice</th>
<th>Flu-like</th>
<th>Discrete Onset</th>
<th>Fatigue</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBsAg:</td>
<td>Positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-HAV:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCV confirmed by:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic/Carrier:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnant sexual partner:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Risk Factors: IDU (present or past) | Blood Transfusion - July 1992 | Hemodialysis

Multiple sex partners | Perinatal (infected mom to baby) |

Contact w/ infected person | Incarcerated (present or past) | MSM (men who have sex with men)

Vaccine: Completed hepatitis A vaccine series | Completed hepatitis B vaccine series |

Lyme Disease surveillance case definition signs and symptoms

<table>
<thead>
<tr>
<th>Physician diagnosed EM rash ≥ 5cm</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesion: Single</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Arthritis (objective joint swelling)</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Bell's palsy or other cranial neuritis</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Radiculoneuropathy</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Lymphocytic meningitis</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Encephalomyelitis</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>If yes, was antibody to B. burgdorferi higher in CSF than serum</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>2nd or 3rd degree atrioventricular block</td>
<td>Yes</td>
<td>No</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Was patient diagnosed with Lyme disease in current year? Yes | No | Unknown |

Lyme disease laboratory results: EIMFA | Culture |

Positive | Negative | Equivocal | ND | Positive | Negative | Equivocal |

Western Blot: IgG | Western Blot: IgM |

Positive | Negative | Equivocal | ND | Positive | Negative | Equivocal | ND

For Local Health Department Use

Physician diagnosed EM rash ≥ 5cm | Yes | No | Unknown |

Lesion: Single | Yes | No | Unknown |

Arthritis (objective joint swelling) | Yes | No | Unknown |

Bell's palsy or other cranial neuritis | Yes | No | Unknown |

Radiculoneuropathy | Yes | No | Unknown |

Lymphocytic meningitis | Yes | No | Unknown |

Encephalomyelitis | Yes | No | Unknown |

If yes, was antibody to B. burgdorferi higher in CSF than serum | Yes | No | Unknown |

2nd or 3rd degree atrioventricular block | Yes | No | Unknown |

Was patient diagnosed with Lyme disease in current year? Yes | No | Unknown |

Lyme disease laboratory results: EIMFA | Culture |

Positive | Negative | Equivocal | ND | Positive | Negative | Equivocal |

Western Blot: IgG | Western Blot: IgM |

Positive | Negative | Equivocal | ND | Positive | Negative | Equivocal | ND

If hospitalized, hospital:

Name | City | State |

Will follow-up be conducted? Yes | No |

Date Admitted | Date Discharged |

Patient ID # |


(please print)

Name of person completing report: ____________

Address: ____________________________ Telephone: ____________

What to report

- Which cases needs to be configurable (varies by jurisdiction)
- Coded Condition (problems, diagnoses, test results)
- Chief Complaint
  - Coded
  - Natural Language Processing
- Content related to the condition
  - Optional in most of the message requirements (unlikely to be sent)
  - Limited availability within the EHR (e.g. travel)
  - Varies by condition (specialized)
- Agree upon a vocabulary for reportable conditions
Public Health Case Reporting Workflow

- Where is the decision to report?
  - Human
  - EHR
  - HIE
  - Auxiliary Decision Support Utility
  - Interface Engine
Public Health Case Reporting Workflow (EHR)

- EHR Collects Case Reporting Data
  - EHR submits Case Report
    - Level of detail not generally in an EHR
    - Will require follow-up with patient for additional data
  - Workflow and products for case reporting
    - Dedicated Personnel
    - Service or specialty product (EHR Module, 3rd Party)
  - EHR Surfacing Public Health Case Report Form
    - Retrieve Form for Data Capture (IHE, HITSP)
    - Allows pre-population of EHR data
    - Allows data entry for non-EHR managed data
    - Point of Care
Public Health Case Reporting Workflow (Health Information Exchange)

- HIE May Support Knowledge to Trigger Reporting on Behalf of EHR
- HIE May Offer Forms Data Capture
- HIE May Supply Subscription to Notifiable Content to Public Health
- HIE May Supply Query Access to Public Health
  - Support for Biosurveillance
  - Support for Anonymizing/Pseudonymizing for Data Mining
Public Health Case Reporting Workflow (Other Reporting Tools)

- Auxiliary Decision Support Utility
  - May support other reporting needs (e.g. Quality Reporting/Analysis)
  - Application
  - Service

- Interface Engine
  - Need to define triggers and content
Reportable Condition Processor

- Inbound HL7
- Potentially Reportable
- Abnormal flag, Organism name in Dwyer II, Value above threshold
- Reportable Condition
- Abnormal flag, Organism name in Dwyer II, Value above threshold
- Reportable Conditions Databases
- Daily Batch
- To Public Health
- Print Reports
- To Infection Control
- Record Count as denominator
- Compare to Dwyer I
- Realtime

The End of Our Story: Enabling Public Health Surveillance via EHR-S

Public Health at HL7
- Re-evaluation of the HL7 EHR-S Functional Model Release 1.1 from Public Health Perspectives
- Development of the Public Health Functional Profile
- Development of the Public Health Domain Analysis Model

Public Health at IHE
- Public Health Reporting Integration Profile
Links To More Information

CDC Public Health Information Network (PHIN) Resources:

URL:
http://www.cdc.gov/phin/resources/guides/mmghomepagecasenotification.html