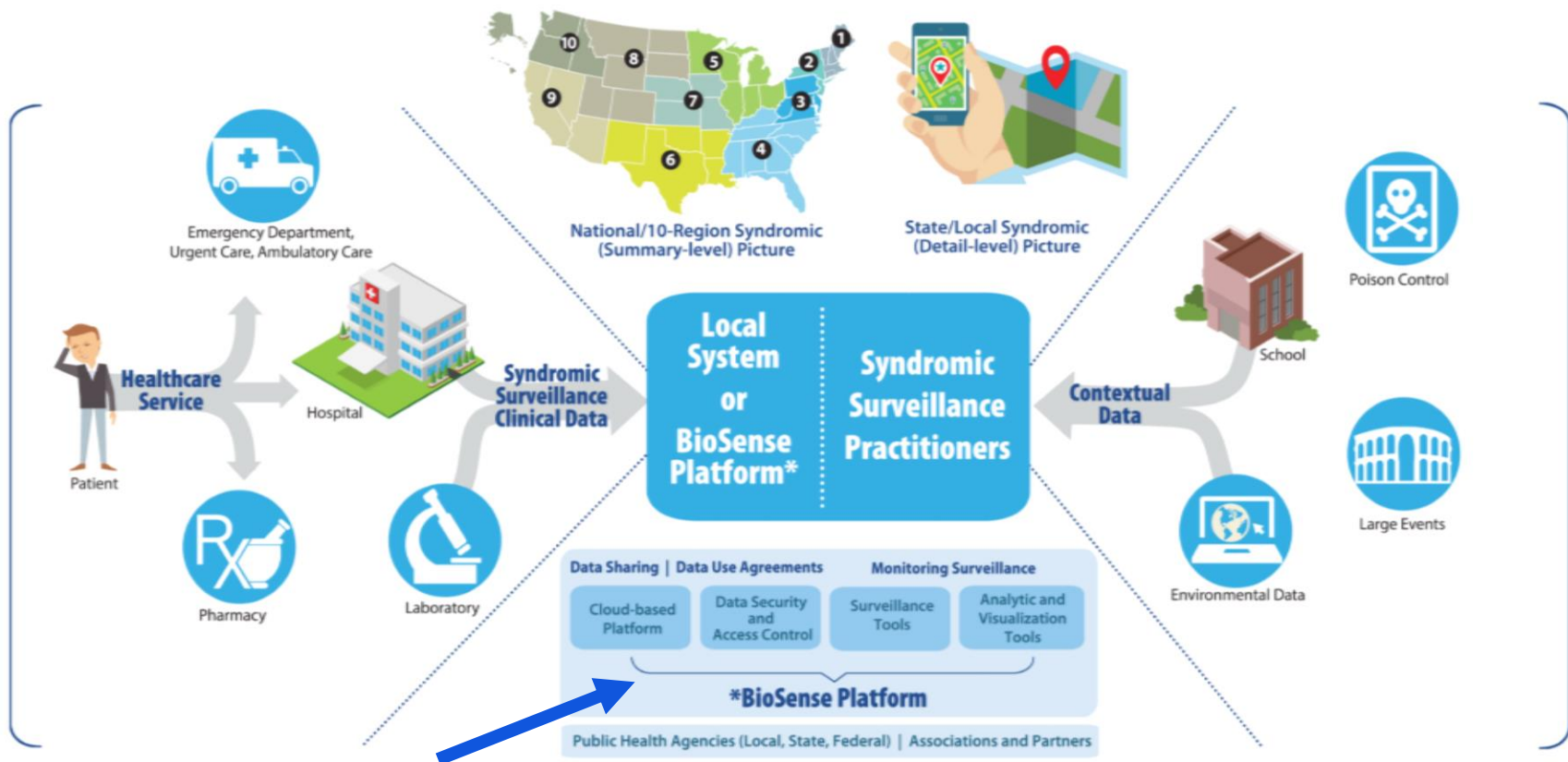# Orientation to
Data Flow and Data Quality

*Data Ingestion into the BioSense Platform and
Data Quality Checks and Reports*

Analytic Data Management Team

Public Health Syndromic Surveillance Data Flow

Emergency Department, Urgent Care, Ambulatory Care

Patient

Healthcare Service

Hospital

Pharmacy

Laboratory

Syndromic Surveillance Clinical Data

National/10-Region Syndromic (Summary-level) Picture

State/Local Syndromic (Detail-level) Picture

Local System or BioSense Platform*

Syndromic Surveillance Practitioners

Contextual Data

Poison Control

School

Large Events

Environmental Data

Data Sharing | Data Use Agreements   Monitoring Surveillance

| Cloud-based Platform | Data Security and Access Control | Surveillance Tools | Analytic and Visualization Tools |

***BioSense Platform**

Public Health Agencies (Local, State, Federal) | Associations and Partners

Overview

- Data Flow

- Data Elements

- Foundational Data Quality (DQ)

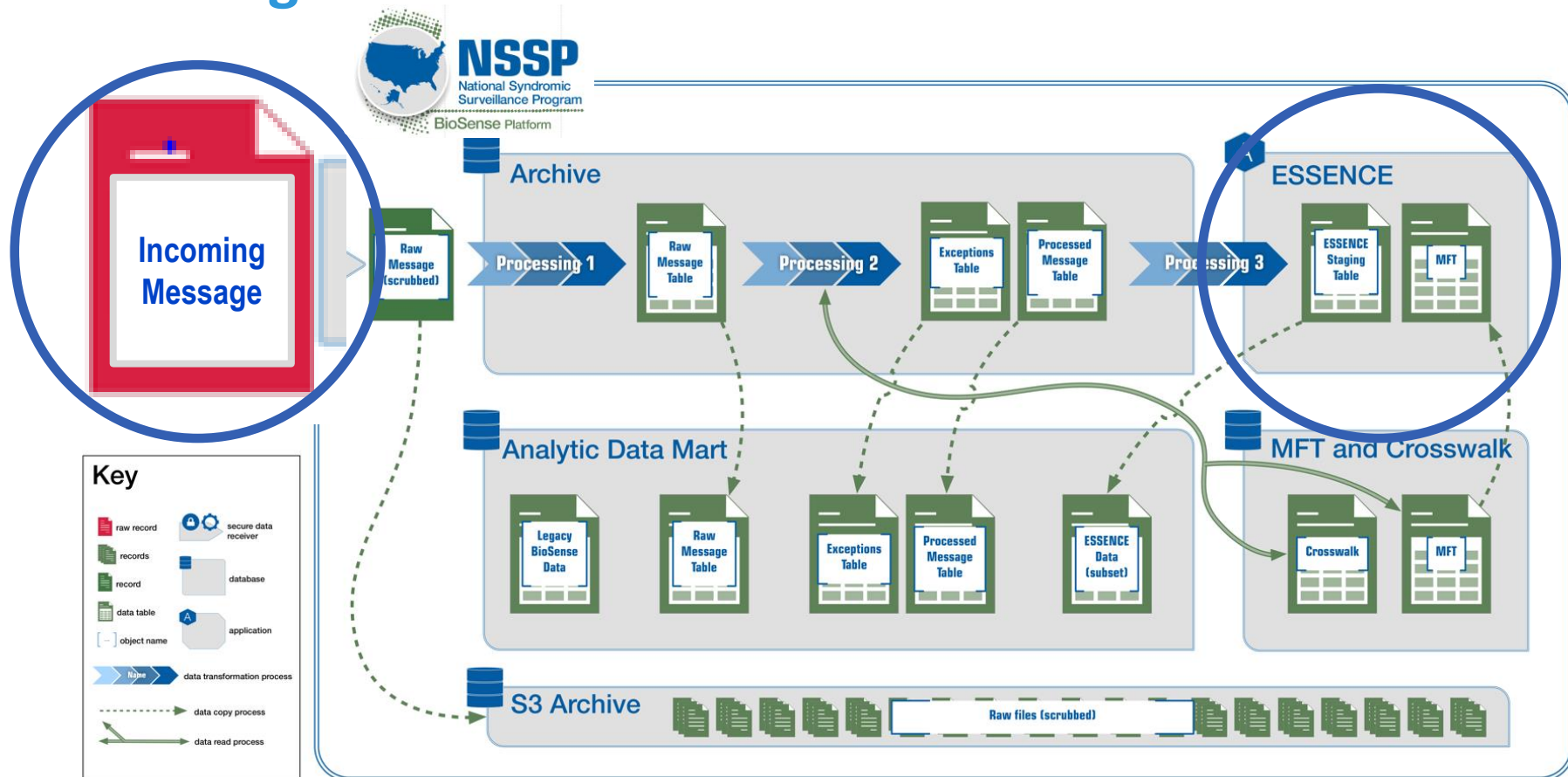- Deeper Dive DQ Review of Data Content

Overview

- Data Flow
- Data Elements
- Foundational Data Quality (DQ)
- Deeper Dive DQ Review of Data Content

BioSense Platform Data Flow Design

- Ingest syndromic surveillance data

- Remove Personally Identifiable Information (PII) from targeted message segments
  - The BioSense Platform will scrub incoming data to remove PII from these segments

- Separate servers for analytic data marts to optimize transactional data processing
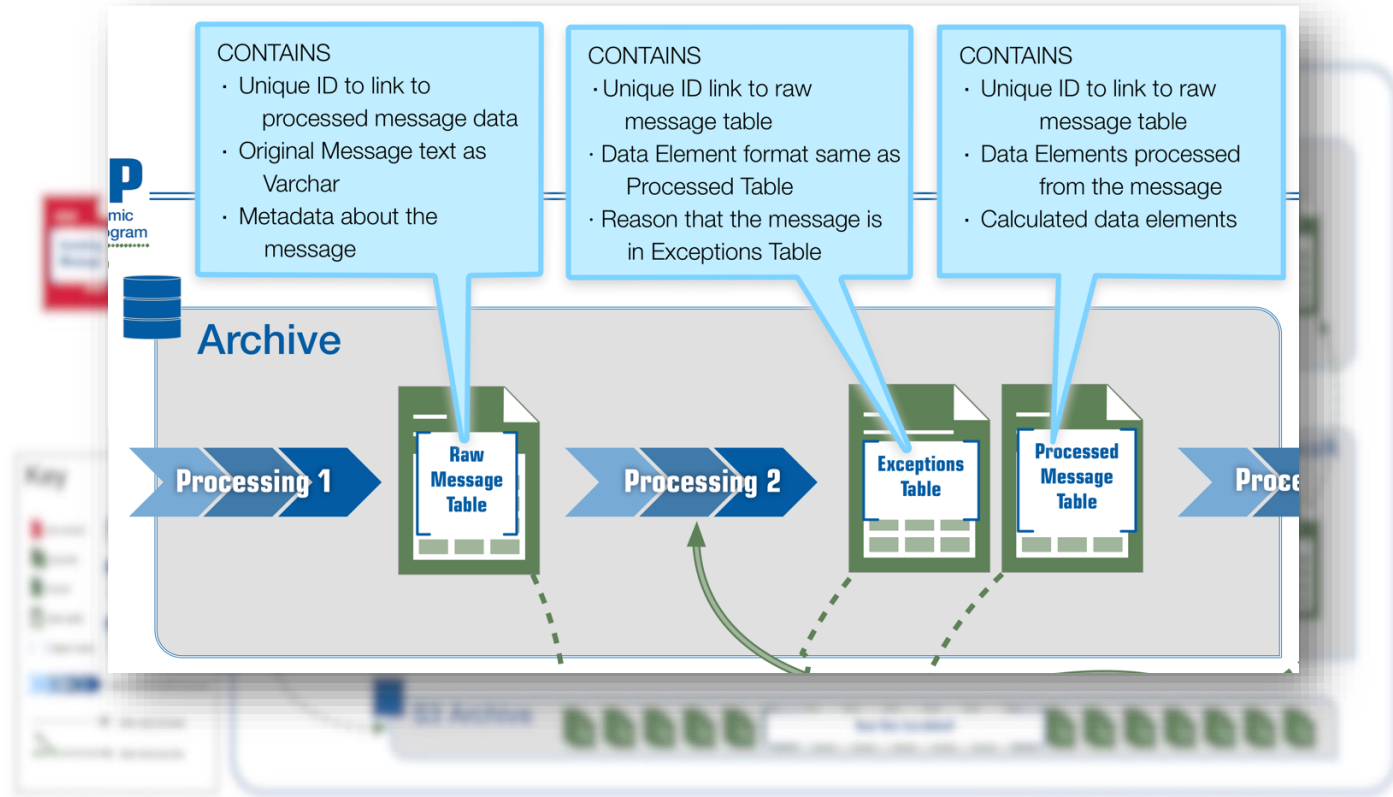
Incoming Data from Jurisdictions

NSSP
National Syndromic
Surveillance Program
BioSense Platform

Archive

Raw Message (scrubbed) → Processing 1 → Raw Message Table → Processing 2 → Exceptions Table → Processed Message Table → Processing 3 → ESSENCE Staging Table → MFT

ESSENCE

Analytic Data Mart

Legacy BioSense Data | Raw Message Table | Exceptions Table | Processed Message Table | ESSENCE Data (subset)

MFT and Crosswalk

Crosswalk | MFT

S3 Archive

Raw files (scrubbed)

Key

- raw record
- records
- record
- data table
- [~] object name
- secure data receiver
- database
- application
- data transformation process
- data copy process
- data read process

Last modified: January 27, 2016

NOTE: CONCEPTUAL DIAGRAM. FOR PLANNING & DISCUSSION USE ONLY.

Processing: Transform Data for Storage in BioSense Platform Archive—*Raw, Processed, and Exceptions Tables*

Design Considerations:

- One database table per site to allow for faster processing
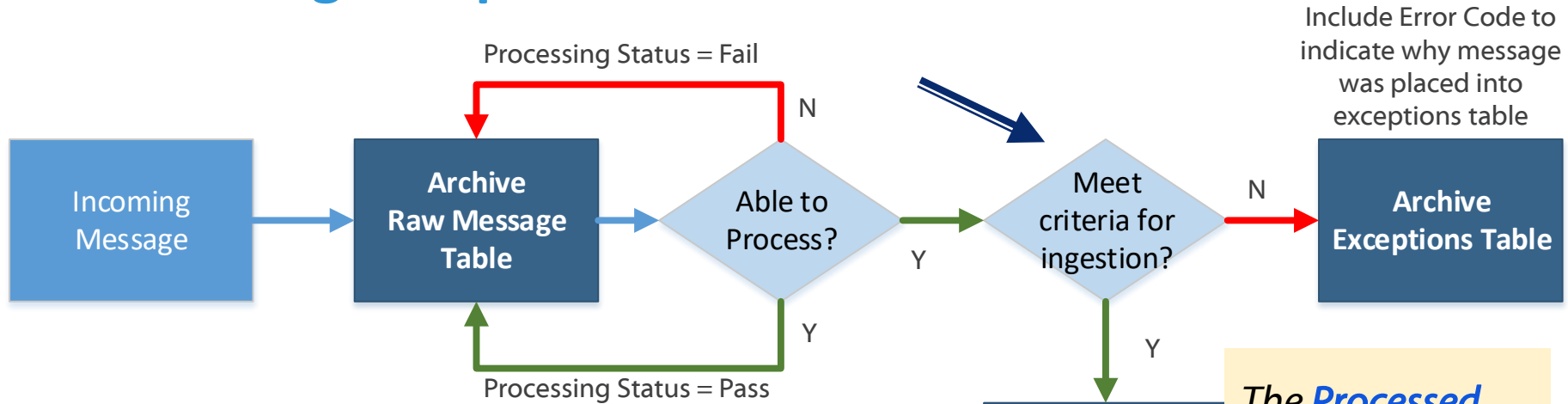- Data indexed to optimize processing

Filtering of Messages – *Raw Message Table*

Processing Status = Fail

Include Error Code to indicate why message was placed into exceptions table

Incoming Message

Archive Raw Message Table

Able to Process?

N

Y

Meet criteria for ingestion?

N

Archive Exceptions Table

Y

Processing Status = Pass

Archive Processed Message Table
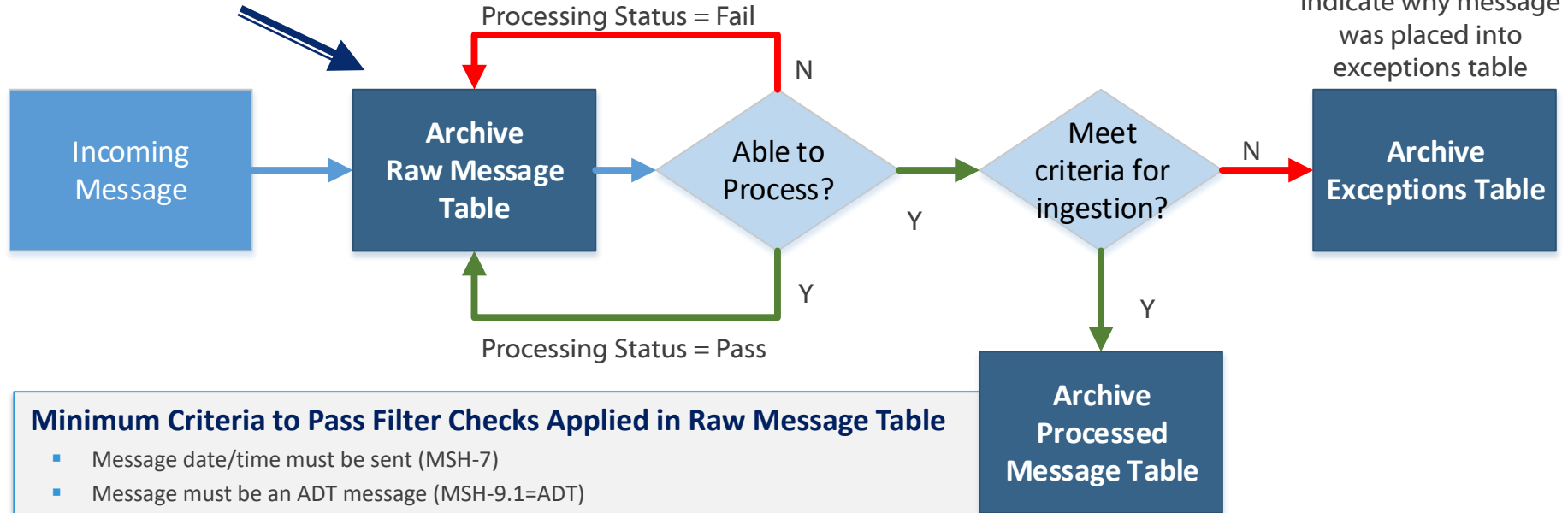
Minimum Criteria to Pass Filter Checks Applied in Raw Message Table

- Message date/time must be sent (MSH-7)
- Message must be an ADT message (MSH-9.1=ADT)
- Sending Facility must be sent (MSH-4.2 or MSH-4.1)

☑ If all criteria "pass," the *message_status* in the raw message table is set to "New," and processing to the Archive Processed Message Table can begin. Once processing is complete, the status is set to "Read."

☒ If one or more criteria "fail," the *message_status* is set to "Filtered," and no further processing takes place.

Processing Exceptions

Processing Status = Fail

N

Include Error Code to indicate why message was placed into exceptions table

Incoming Message → **Archive Raw Message Table** → **Able to Process?**

Y → **Meet criteria for ingestion?**

N → **Archive Exceptions Table**

Processing Status = Pass

Y

Y → **Archive Processed Message Table**

*The **Processed** Table is used in downstream processing to ESSENCE*

Minimum Criteria for Ingestion to Processed Message Table

- Patient ID must exist and be > 2 characters
- Visit Date must exist as valid date and be >= 8 characters
- Facility ID must exist (must contain any value in EVN-7 or MSH-4)
- Facility ID from message must appear as active facility on MFT (Note: As for Staging tests, when facility status is set to Onboarding, data will successfully process to the Staging Archive data)
- ☑ If all criteria "pass," the record is stored in the main Processed table
- ☒ If one or more criteria "fail," the record is triaged to the Exceptions table and no further processing takes place

Tables in ARCHIVE Database (Staging Data)

Use staging tables to review data during onboarding testing:

Table Name	Description
XX_ST_Raw	Contains original message delivered to BioSense Platform and some metadata about that message. If message was filtered and designated invalid for syndromic surveillance, the Filter_Reason column will contain a code explaining why.
XX_ST_ Processed	Contains processed message received and calculated values built from elements. Table contains ONLY messages that meet minimum processing criteria. Incomplete or invalid messages will be sent to XX_ST_Except.
XX_ST_ Except	Contains messages that did NOT meet minimum criteria for processing (incomplete, invalid). (Note. Structure of the XX_ST_Except table is same as XX_ST_Processed table.) To understand why a message appears in XX_ST_Except table, you may want to join to the XX_ST_Except_Reason table.
XX_ST_ Except_Reasons	Contains message_ID and all reasons for placing record in the XX_ST_Exceptions table. To view exception code descriptive values, join to XX_ST_Except_Reason table.

Tables in the ARCHIVE Database (Production Data)

Once verified, your site's data will be available in production:

Table Name	Description
XX_PR_Raw	Table contains original message delivered to the BioSense Platform and some metadata about that message.
XX_PR_Processed	Contains processed message received and calculated values built from the elements.
XX_PR_Except	Contains messages that did NOT meet minimum criteria for processing.
XX_PR_Except_Reasons	Contains message_ID and all reasons for placing record in the XX_PR_Except table.

Reference Tables	Description
Filter_Reasons	Table maps the Filter Reason Code found in the Raw table to its descriptive text.
Except_Reasons	Table maps the Exception Reason Code found in the Except_Reasons table to its descriptive text.

Interactive ESSENCE Application for Surveillance

- Subset of fields from BioSense Platform archive

- Additional business rules applied as data are formatted and transformed for use with ESSENCE
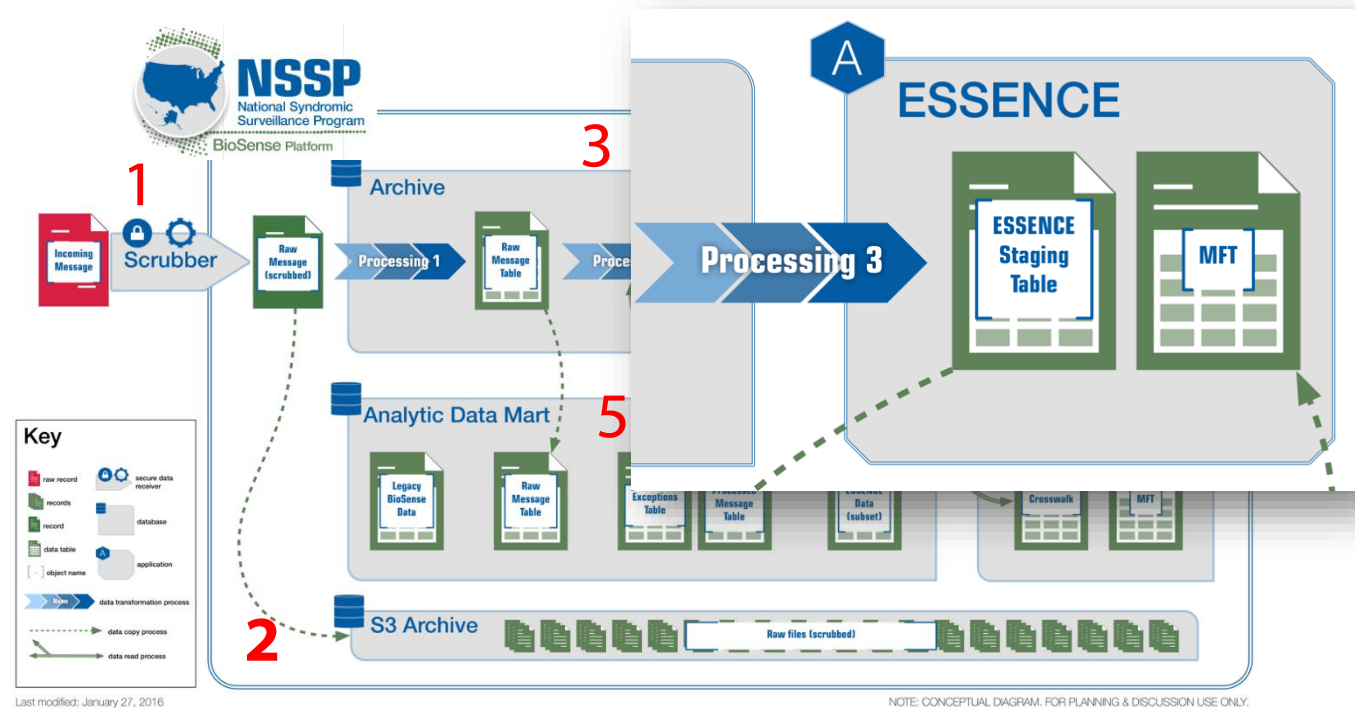
Analytic Data Mart

- Incremental replication of BioSense Platform ARCHIVE database

- DQ Reports based on Data Mart data

- Tools to access analytic data mart
  - ADMINER
  - RStudio Pro
  - SAS Studio
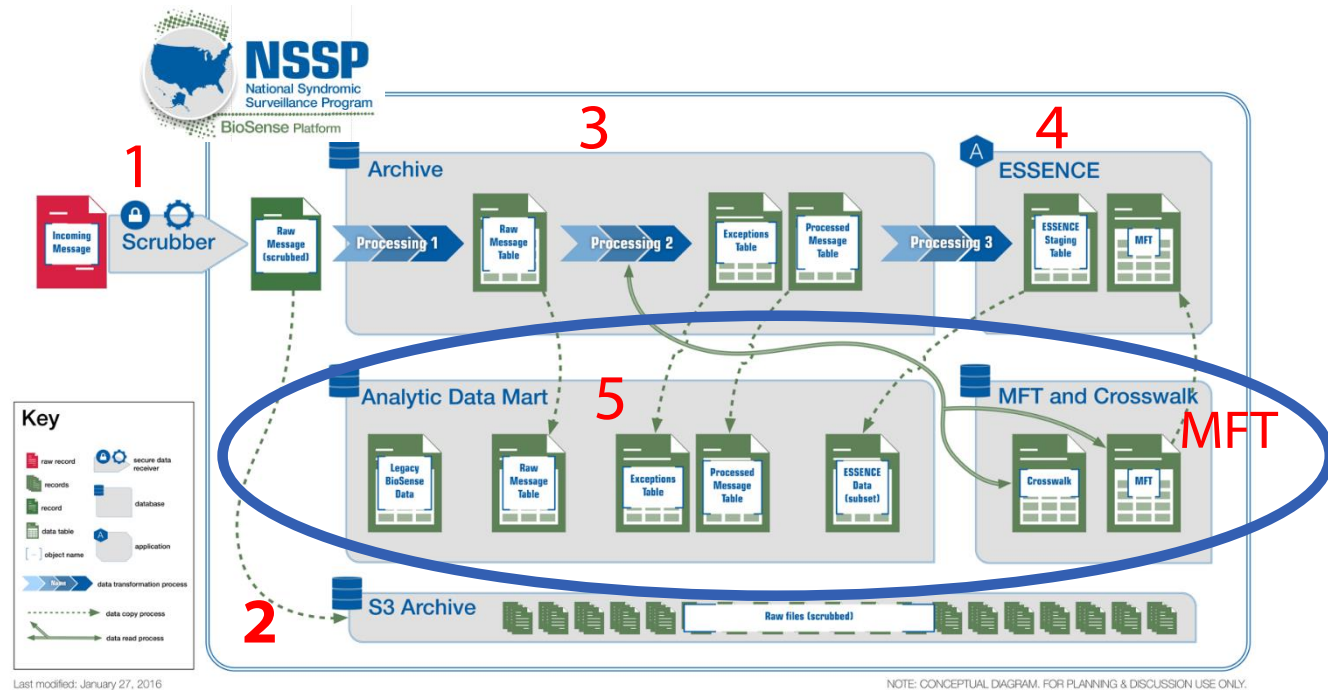
Data Volume

- 2.5 million HL7 messages a day
- Since January 2016
  - 1.1 billion records
  - 214 million visits
  - 104 million patients
- Average daily volume estimates
  - 1.9 million records
  - 328,000 visits
  - 178,000 patients

	2016-2017		2016		2017	
	Total	Avg Daily	Total	Avg Daily	Total	Avg Daily
Days	730		365		365	
Sites	55		55		55	
Facilities	3,960		3,410		3,640	
Patients	103,460,557	141,727	52,196,285	143,004	64,815,996	177,578
Visits	213,553,122	292,539	93,897,594	257,254	119,655,528	327,823
Records	1,146,494,535	1,570,540	465,386,915	1,275,033	681,107,620	1,866,048

Facilities

- 3,960 facilities across 55 sites

- 93% registered under a single facility type
  (e.g., Emergency, Inpatient, Urgent Care, Outpatient)

- 70% registered as Emergency facility type
  - 92% registered as a single facility type
  - 87% of visits reported as an Emergency visit

Overview

- Data Flow
- Data Elements
- Foundational Data Quality (DQ)
- Deeper Dive DQ Review of Data Content

Guiding Principles for Defining Data Elements

- Load all syndromic surveillance core data elements from the *PHIN Messaging Guide for Syndromic Surveillance: Emergency Department, Urgent Care, Inpatient and Ambulatory Care Settings*, Release 2.0 (April 2015)
  - Legacy guides were considered when defining processing and incorporated where appropriate

- Enhance analytic capability
  - Identify new elements from a syndromic surveillance message
  - Define new processed elements (Calculated Fields)

- Ensure data elements follow a consistent naming convention

- Store all instances of repeating data (repeating segments or repeating fields)
  - Separator is a semicolon **;**

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PHIN Messaging Guide (see NSSP Resource Center)

- A collaborative effort is in progress to update the guide.
- The guide standardizes core data elements and messaging specifications for syndromic surveillance.

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Data Dictionary

- Provides details about data elements stored n the NSSP data tables.

- No password required to access!

BioSense Platform Archive Processing Guidelines
Coded Elements

- Processing segments of coded elements:
  - Store codes in column named **X_Code**
  - Store code descriptions in column named **X_Description**
  - Store entire segment in column named **X_Segment**
  - Store combination of code and description in column named
    X_Combo *(concatenate codes with their respective descriptions as sent in a message)*

X refers to data element name

*For example: Admit_Reason_Code , Admit_Reason_Description,
Admit_Reason_Segment, Admit_Reason_Combo*

BioSense Platform Archive Processing Guidelines
Calculated Fields (Prefixed with "C_")

If element is calculated or created during processing:

- Store contributing elements separately
- Store source field(s) contributing to calculated value

Example:

Variable **C_Var** is calculated based on variables **Var1, Var2, Var3**

Archive example:

C_Visit_Date=05/01/2016
C_Visit_Date_Source=Admit

Element	Value	Logic
Var1	Null	Direct Input
Var2	A	Direct Input
Var3	B	Direct Input
C_Var	A	Select first non-null value from Var1, Var2, and Var3
C_Var_Source	Var2	Source of C_Var

BioSense Platform Archive Data Elements

- NSSP Data Dictionary – available at [NSSP Resource Center](#)
  - Contains full list of proposed data elements and processing for HL7 Archive

- Complex Data Element Requirements
  - Chief Complaint
  - Calculated Chief Complaint
  - Calculated Patient Age
  - Calculated Death Indicator
  - Calculated Patient Class
  - Calculated Facility ID (Sending or Treating) and BioSense "agnostic" Facility ID
  - Processed Facility ID
  - Unique Patient ID and Medical Record Number
  - Visit Date/Time and Visit Date
  - Unique Visit ID

Unique Visit ID in NSSP: *C_BIOSENSE_ID*

- Uniquely defines "a visit"

- Copied to **ESSENCEID** column in ESSENCE tables

- Calculated field defined as follows:

  Concatenation of

  - C_Visit_Date (When)
  - C_Biosense_Facility_ID (Where)
  - C_Unique_Patient_ID (Who)

- Each "seed" in this calculation is also a calculated field ("C_")

Processing clarification: If a patient visits a facility twice on the same day, messages for both interactions will be associated with the same C_BioSense_ID.

Calculated Chief Complaint: *C_Chief_Complaint*

- Hierarchically defined as the first non-null value from…
  - Chief_Complaint_Text (reported in TX or CWE data type)
  - Admit_Reason_Description

Information on other calculated columns is available in Data Elements Appendix Slides.

Data Flow from Archive Processed to ESSENCE
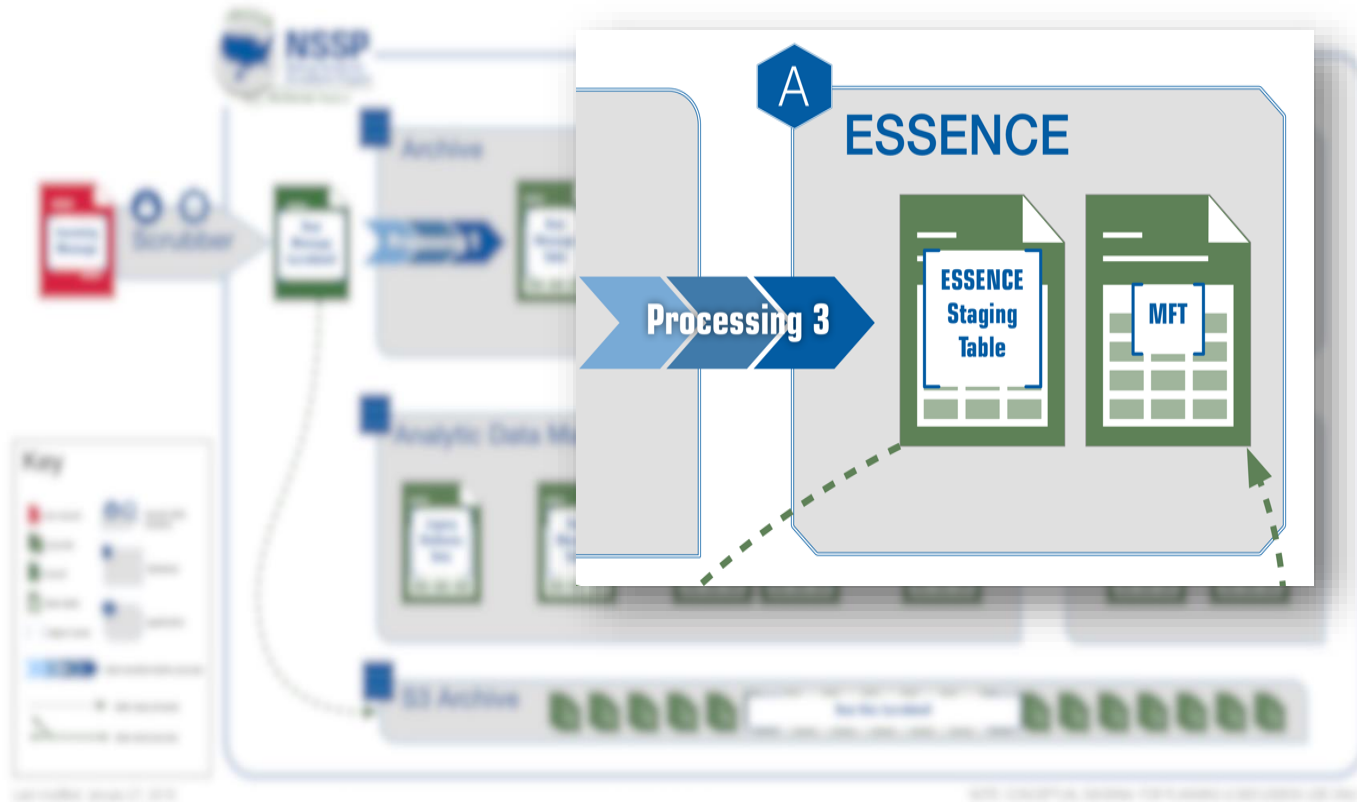
Sending Data to ESSENCE (continued)

- Guiding principles for selecting data to send to ESSENCE
  - Core elements in *PHIN Guide for Syndromic Surveillance*
  - Elements of analytic importance
  - Elements required to support ESSENCE processing
  - Time stamp information

Where possible, column names in the Archive and in ESSENCE are the same

Archive Processed Column	ESSENCE Column
C_Facility_ID	Hospital
C_Chief_Complaint	ChiefcomplaintOrig *(ChiefcomplaintParsed is used in "binning")*
Diagnosis_Code	DischargeDiagnosis
Discharge_Disposition_Code	DischargeDisposition

ESSENCE Ingestion Processing: Staging Table to Base Table

- ESSENCE processes data to…
  - Collapse messages into a single "visit" (using same algorithm to identify a visit as the Archive column C_BioSense_ID)
  - Associate visits with specified syndromes and sub-syndromes via Chief Complaint binning
  - Support web-based queries

- For each visit, ESSENCE populates a column with info present in **last message** processed for that visit, with some **exceptions**: Special rules are applied to *Patient Class, Chief Complaint, Discharge Disposition, and Discharge Diagnosis.*
  - Process uses "First non-NULL value" or "Last non-NULL value"
  - Companion history fields store info across all messages constituting a single visit

ESSENCE Ingestion Processing: Staging Table to Base Table (cont.)

ER_Import_Staging (ESSENCE Staging Table)

MessageDateTime	C_Visit_Date_Time	C_Unique_Patient_ID	Hospital (C_Facility_ID)	Sex	Age	Visit ID facility generated
20160301 08:30:00:000	20160229 02:30:00:000	A12B3	001FACILITYID	F	.	1000
20160301 08:40:00:000	20160229 02:30:00:000	A12B3	001FACILITYID	.	40	1001
20160301 09:30:00:000	20160229 01:30:00:000	123456	001FACILITYID	M	22	2000

Considered as the same visit in NSSP

1

2

Collapse to "Patient Event"

ER_Base (ESSENCE Base Table)

ESSENCEID (NSSP generated C_Biosense_ID)	MessageDateTime	C_Visit_Date_Time	C_Unique_Patient_ID	Hospital (C_Facility_ID)	Sex	Age	Visit ID
20160229001FACILITYIDA12B3	20160301 08:40:00:000	20160229 02:30:00:000	A12B3	001FACILITYID	.	40	1001
20160229001FACILITYID123456	20160301 09:30:00:000	20160229 01:30:00:000	123456	001FACILITYID	M	22	2000

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Reported Patient Class and Calculated Patient Class
Patient_Class_Code and C_Patient_Class

- Reported Patient class—although useful in analyses and data explorations, may <u>not</u> be present in all message submissions or may not adhere to standard

- Calculated Patient class—during processing, BioSense Platform creates Calculated Patient Class by using the following algorithm:

1. Patient Class (PV1-2) if non-NULL and meets standard (e.g., "E" for Emergency)

2. Apply special mapping to standardize specific "non-standard" values (e.g., "Emergency" sent instead of "E")

3. Look up Inferred Patient Class from Facility Type reported in message if it is valid for syndromic surveillance

4. Assign class value based on inferred patient class associated with primary MFT entry

Concept Code	Concept Name	Value
261QE0002X	Emergency Care [Ambulatory Health Care Facilities\Clinic/Center]	E
1021-5	Inpatient practice setting	I
261QM2500X	Medical Specialty [Ambulatory Health Care Facilities\Clinic/Center]	O
261QP2300X	Primary Care [Ambulatory Health Care Facilities\Clinic/Center]	O
261QU0200X	Urgent Care [Ambulatory Health Care Facilities\Clinic/Center]	O

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Example: Patient Class History Field

ER Import StagingTable	
Message Order	**PatientClass**
1	E
2	I
3	E

ESSENCE Stored Data		
PatientClass	**PatientClassUpdates**	**PatientClassList**
E	{1};E;{2};I;{3};E;	EI

ESSENCE Screen Display		
Patient_Class	**PatientClassUpdates**	**PatientClassList**
E	{1};E;{2};I;{3};E;	Emergency, Inpatient

- Note the label for *PatientClass* reads *Patient_Class in ESSENCE*
- *PatientClass* is the same as *Patient_Class_code*

Descriptive "formatted" value of "EI"

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Patient Class and Calculated Patient Class

ESSENCE – Data Details Formatted Display

Patient_Class	PatientClassUpdates	PatientClassList	C_Patient_Class	C_Patient_Class_Updates	C_Patient_Class_List
E	{1};E;	Emergency	E	{1};E;	Emergency
I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient	I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient
I	{1};I;	Inpatient	I	{1};I;	Inpatient
I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient	I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient

Example of underlying unformatted data:

patient_class_code	patientclass	patientclasslist	patientclassupdates	c_patient_class	c_patient_class_list	c_patient_class_updates
I	I	EI	{1};E;{2};I;{3};E;{4};I;{5};E;{6};I;{7};E...	I	EI	{1};E;{2};I;{3};E;{4};I;{5};E;{6};I;{7};E...

Patient Class and Calculated Patient Class
Standard patient class values other than E, I, O

ESSENCE Data Details

Patient_Class_Code	Patient_Class	PatientClassUpdates	PatientClassList	C_Patient_Class	C_Patient_Class_Updates	C_Patient_Class_List
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV

- *Standard Patient Class Code "E" is "Emergency"*
- *Standard Patient Class Code "V" is "Observation*

Formatted patient class (in "list" columns) is based on patient class combinations that include E, I, O . If something other than E, I, O is reported in combination (standard or nonstandard), the formatted "list" column will NOT be formatted. Rather, the raw value is displayed.

Here, although "E" was reported, "V" was also reported. "EV" is NOT a permutation of "E, I, O" combinations and is NOT mapped to a descriptive value.

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Patient Class and Calculated Patient Class
ESSENCE Query Fields

Query Field Label	Field being queried from underlying data
Patient Class	PatientClass - Last non-null Patient Class value *(Note label in data details reads Patient_Class)*
Calculated Patient Class	**C_Patient_Class - Last non-null Calculated Patient Class**
Patient Class History (standard "drop down" option)	PatientClassList
Patient Class History Free Text (free-text option)	PatientClassList
Calculated Patient Class History	**C_Patient_Class_List**
Computed Patient Class History	C_Patient_Class_Updates

Patient Class and Calculated Patient Class
ESSENCE Query Fields

Query Field Labels

Ex: Query is based on c_patient_class_list values of "EI"

- Formatted display of E, I, O combinations are reflected in "drop downs."

- Query for underlying data is based on "raw" values. For example: "Emergency, Input" drop-down selection will pull visits with "EI."

- Data with combinations other than E, I, O will NOT pass query.

- Make use of "HasBeen" flags now in place.

Patient Class and Calculated Patient Class
Impact of Standard Patient Class Values Other Than E, I, O

Query Field Labels

ESSENCE Data Details

Patient_Class_Code	Patient_Class	PatientClassUpdates	PatientClassList	C_Patient_Class	C_Patient_Class_Updates	C_Patient_Class_List
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV
V	V	{1};E; {2};I; {3};V;	EIV	V	{1};E; {2};I; {3};V;	EIV

These visits would NOT pass query selection via "drop-down" selection.

Calculated Patient Class "HasBeen" Binary Flags

- Leverage the "pristine" Calculated Patient Class
  (contains standard values only)

- Scan list of standard values stored in Calculated Patient Class and create "Ever in" columns:

  – If "E" is found, "Ever in Emergency" (*HasBeenE*) is set to 1 (True)

  – If "I" is found, "Ever in Inpatient" (*HasBeenI*) is set to 1 (True)

  – If "O" is found, "Ever in Outpatient" (*HasBeenO*) is set to 1 (True)

- Incorporate "Ever in" flags as part of cubes to enhance query speed

- Result: User may query on "Ever in Emergency" (for example) to hone in on ED visits regardless of various combinations of patient classes reported for visit

Calculated Patient Class "HasBeen" Flags
Combinations of E, I, O

Patient_Class	PatientClassUpdates	PatientClassList	C_Patient_Class	C_Patient_Class_Updates	C_Patient_Class_List
E	{1};E;	Emergency	E	{1};E;	Emergency
I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient	I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient
I	{1};I;	Inpatient	I	{1};I;	Inpatient
I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient	I	{1};E; {2};I; {3};E; {4};I; {5};E; {6};I;	Emergency, Inpatient

Example of underlying unformatted data:

patient_class_code	patientclass	patientclasslist	patientclassupdates	c_patient_class	c_patient_class_list	c_patient_class_updates
I	I	EI	{1};E;|{2};I;|{3};E;|{4};I;|{5};E;|{6};I;|{7};E...	I	EI	{1};E;|{2};I;|{3};E;|{4};I;|{5};E;|{6};I;|{7};E...

HasBeenE	HasBeenI	HasBeenO
1	1	0

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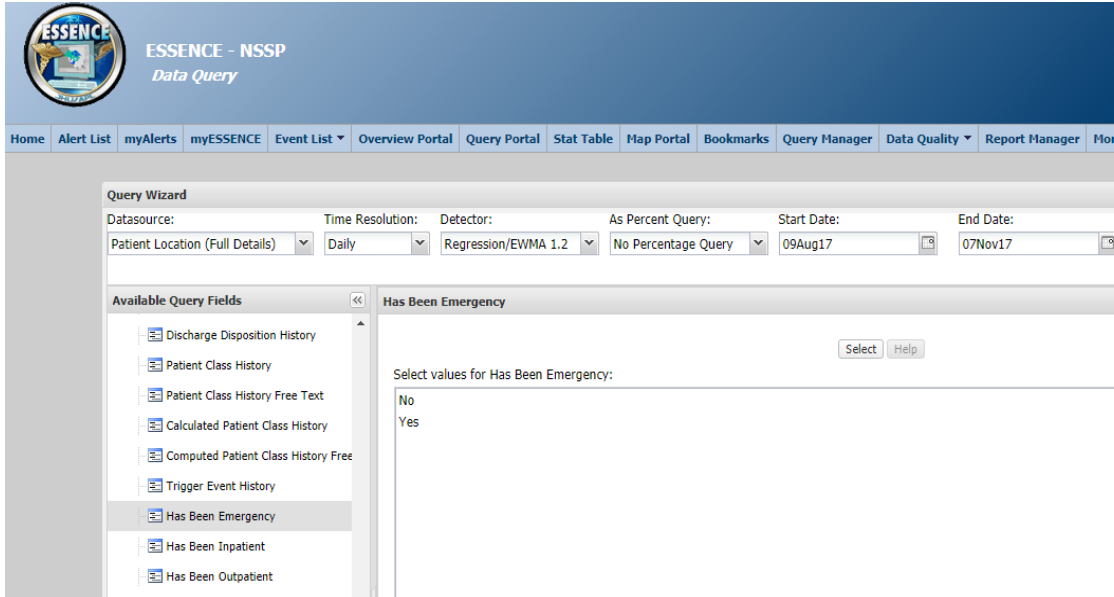
Calculated Patient Class "HasBeen" Flags
Combinations Other Than E, I, O

Patient_Class_Code	Patient_Class	PatientClassUpdates	PatientClassList	C_Patient_Class	C_Patient_Class_Updates	C_Patient_Class_List
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV
V	V	{1};E; {2};V;	EV	V	{1};E; {2};V;	EV

HasBeenE	HasBeenI	HasBeenO
1	0	0

Calculated Patient Class "HasBeen" Flags

Query Field Label	Field being queried from underlying data
Patient Class	PatientClass - Last non-null Patient Class value *(Note label in data details reads Patient_Class)*
Calculated Patient Class	**C_Patient_Class - Last non-null Calculated Patient Class**
Patient Class History (standard "drop down" option)	PatientClassList
Patient Class History Free Text (free text option)	PatientClassList
Calculated Patient Class History	**C_Patient_Class_List**
Computed Patient Class History	C_Patient_Class_Updates
"Ever in" Emergency, Inpatient, Outpatient	**HasBeenE, HasBeenI, HasBeenO**

"HasBeen" selection now available in ESSENCE.

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Special Rule: Chief Complaint

- First reported, non-null value for Chief Complaint

- History fields "retain the history" and provide
  - De-duplicated, ordered list of all Chief Complaint values sent across messages for a single visit
  - Time stamp to document when fields were last updated

Various chief complaint fields in ESSENCE are populated based on the NSSP Calculated Chief Complaint (C_Chief_Complaint)

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Example: Chief Complaint History Field

ER Import Staging Table	
Message Number	**ChiefComplaintOrig**
1	My Original Chief Complaint
2	Brief Chief Complaint

ER Base Table	
ChiefComplaintOrig	**ChiefComplaintUpdates**
My Original Chief Complaint	{1};My Original Chief Complaint; {2};Brief Chief Complaint;

Chief Complaint
ESSENCE Query Fields

Query Field Labels

Underlying Data

	ChiefComplaintOrig	ChiefComplaintParsed	ChiefComplaintUpdates
	heart palp	HEART PALPITATIONS	{1};heart palp; {2};heart palp;Rapid Heart Rate;
	Flank Pain	FLANK PAIN	{1};; {2};Flank Pain;
	Fever	FEVER	{1};; {2};Fever;

Query Field Label	Chief Complaint Columns in ESSENCE	Description
Chief Complaint (Orig) Free Text	ChiefComplaintOrig	First non-null value of the incoming NSSP calculated chief complaint (c_chief_complaint)
ChiefComplaints	ChiefComplaintParsed	Parsed version of the original first non-null chief complaint
Chief Complaint History	ChiefComplaintUpdates	De-duplicated and concatenated list of the original chief complaints reported for a visit

Special Rule: Discharge Diagnosis

- Last reported, non-null value for Discharge Diagnosis

- History fields retain "the history" and provide
  - De-duplicated, ordered list of all Discharge Diagnosis values sent across messages for a single visit
  - Time stamp to document the last time the fields were updated

DischargeDiagnosis in ESSENCE is populated from Diagnosis_Code (DG1) in the NSSP Archive.

Discharge Diagnosis, Chief Complaint, and CCDD

ESSENCE Data Details

ChiefComplaintOrig	ChiefComplaintParsed	ChiefComplaintUpdates	Discharge Diagnosis	DischargeDiagnosisUpdates	CCDD
heart palp	HEART PALPITATIONS	{1};heart palp; {2};heart palp;Rapid Heart Rate;	;R00.2;R94.31;R00.2;R94.31	{1};; {2};;R00.2;R00.2;R94.31; {3};;R00.2;R94.31;R00.2;R94.31;	HEART PALPITATIONS | ;R00.2;R94.31;R00.2;R94.31
Flank Pain	FLANK PAIN	{1};;; {2};Flank Pain;	;N12;A41.9;N12;A41.9	{1};; {2};;N12; {3};;N12;N12;A41.9; {4};;N12;A41.9;N12;A41.9;	FLANK PAIN | ;N12;A41.9;N12;A41.9
				{1};;	

Diagnosis_Combo
R00.2 Palpitations;R94.31 Abnormal electrocardiogram (ECG) (EKG);R00.2 Palpitations;R94.31 Abnormal electrocardiogram (ECG) (EKG)
N12 Tubulo-interstitial nephritis, not specified as acute or chronic;A41.9 Sepsis, unspecified organism;N12 Tubulo-interstitial nephritis, not specified as acute or chronic;A41.9 Sepsis, unspecified organism

DischargeDiagnosis is appended to ChiefComplaintParsed to create analysis variable "CCDD" in ESSENCE. In NSSP, diagnosis code and diagnosis description are "married" and represented in "Diagnosis_Combo."

45

Special Rule: Discharge Disposition

- Last reported, non-null value for Discharge Disposition

- History fields retain "the history" and provide
  - De-duplicated, ordered list of all Discharge Disposition values sent across messages for a single visit
  - Timestamp to document the last time the fields were updated

DischargeDisposition in ESSENCE is populated from Discharge_Disposition (PV1-36) in Archive.

Special Mapping: Discharge Disposition

- [Standard](#) value set support Discharge Disposition

- Data are often not adhering to the standard

- Discharge Disposition Category is populated based on an ESSENCE specific mapping table to map standard and non-standard values to an ESSENCE discharge disposition category

Disposition value of "09" is standard for Admit; however, data may come through with variations.

ESSENCE mappings attempt to address nuances with disposition data.

Disposition	Category
A	ADMIT
ADM IN	ADMIT
Admit	ADMIT
Admit Cardiac Tele	ADMIT
Admit Critical Care	ADMIT
Admit ER Observation	ADMIT
Admit Hold	ADMIT
09	ADMIT
Admit IMCU	ADMIT
Admit M/S	ADMIT

Recap: BioSense Platform Data Flow Goals

- Enable public health officials to conduct syndromic surveillance more systematically and collaboratively

- Provide access to data delivered to BioSense Platform
  - HL7 messages
  - ASCII converted to HL7 messages

- Provide access to stable structured databases reflecting processed HL7 messages

- Prime data with various calculated fields to allow flexibility in analysis approaches regardless of analytic tool being used

- Make data complete, useful, and actionable

Overview

- Data Flow

- Data Elements

- **Foundational Data Quality (DQ)**

- Deeper Dive DQ Review of Data Content

Data Flow/Volume Checks

Are the lights on?

NOTE: CONCEPTUAL DIAGRAM. FOR PLANNING & DISCUSSION USE ONLY.

Last modified: January 27, 2016

Incoming Data to ARCHIVE Data Flow Checks by Site

Automatic Alerts

- Volume discrepancies from one "data stop" to the next
- Processing lag time more than 24 hours from one "data stop" to the next
- High percent of
  - Filtered
  - Excepted

Action

- Generate auto-emails to internal team
- Determine root of the problem
- Alert and engage site as appropriate

"Lights On" Report

Thu 9/14/2017 6:33 AM

BioSense Platform <biosenseplatform@syndromicsurveillance.org>

BioSense Lights On Report - 2017-09-14

Archive   9/14/2019

BioSense "Lights on" Daily Report
2017-09-14

This email consists of the following reports. Please click on the links to navigate to the appropriate information:

- 1.1 Feeds with no recent data
- 1.2 Filtered Records in last 24 hours
- 2.1 Production Data Flow Backlog Record Count - Aggregate
- 2.2 Production Data Flow Backlog Record Count - By Site
- 3.1 Exceptioned Data in the last 24 hours

Overview

- Data Flow

- Data Elements

- Foundational Data Quality (DQ)

- Deeper Dive DQ Review of Data Content

Data Quality Reports: Starting Point

- Beta reports developed for
  - Timeliness
  - Completeness
  - Validity
- Production data reports are run monthly
- Staging data (in test) are run nightly
- Reports are posted to the NSSP shared folder for viewing by CDC users with access permissions from designated site(s)

Data Quality Assurance (QA) Reports: Intent

- Standardize reports across sites for internal operational QA

- Identify potential issues with processing and incoming data and, as needed, investigate further to get to the root of the problem

- Support sites that lack sufficient QA resources

- Work with the community to refine reports

Reports neither supplant QA work being done by
sites that have well-established QA processes nor are intended to be the
only QA work performed on data.

Data Quality Reports

- Timeliness

- Completeness

- Validity

Timeliness

How long does it take the data to arrive on the platform?

- Lag time is measured from "date/time of the visit" to "date/time the first message arrived" on the BioSense Platform
- Subsequent messages for same visit are NOT considered to avoid skewing the results
- Reports include graphs and tables
- Metrics are for 24 hours and 48 hours

Timeliness: Report Set

- Graphs include
  - Visit counts
  - Median number of days from visit to arrival over time

- Summary Tables include Timeliness Performance Categories
  - 0 – <30% of visits arriving within 24 hours; within 48 hours
  - 30 – <80% of visits
  - >80% of visits

- Detail Tables include
  - Timeliness Performance Categories
  - Mean/median number of lag days
  - Lag days associated with >80% of visits

Example: Timeliness Reports Graphs

Site_ID-Site_Name Trends for Median Days and Visits for 2016
(based on Processed data as of 02DEC2016 at 10:29 AM)
ALL Feeds
FeedName: $ALL
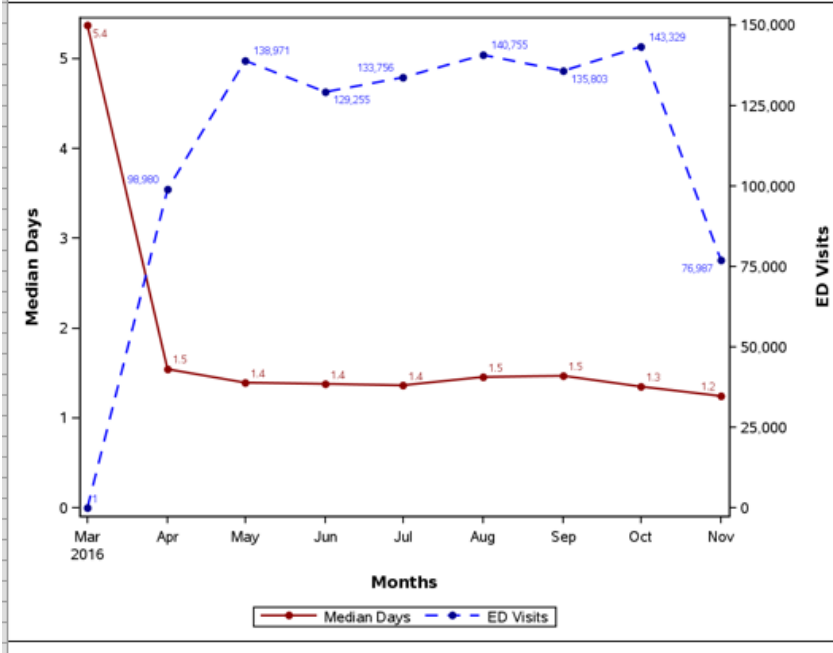
Example of Timeliness Reports Summary Table

Centers for Disease Control and Prevention

Timeliness Report Year: 2016

Based On Processed Data Selected By Arrived_Date from 2016-01-01 to 2017-04-30

Run On 23APR2017 at 2:10 PM

Timeliness Categorization Summary: Site_ID-Site_Name

	Within 1 day				Within 2 days			
Timeliness Performance Categorization (%)	Number of Facilities (N)	Cumulative Number of Facilities (N)	Percentage of Facilities (%)	Cumulative Percentage of Facilities (%)	Number of Facilities (N)	Cumulative Number of Facilities (N)	Percentage of Facilities (%)	Cumulative Percentage of Facilities (%)
00-30	9	9	11.538%	11.538%	0	0	0.0%	0.0%
30-80	38	47	48.718%	60.256%	19	19	24.359%	24.359%
>80	31	78	39.744%	100.0%	59	78	75.641%	100.0%

Basis by which the total percentage of visits for a facility was grouped among three ranges (0%-30%, 30%-80%, >=80%)

A. Red->Low Performance: Percentage of visits received is between 0% and 30%

B. Yellow->Intermediate Performance: Percentage of visits received is between 30% and 80%

C. Green ->High Performance: Percentage of visits received is above 80%

ESSENCE Data Quality Reports
Based on "Collapsed" Visits

Difference in Timeliness Reports

Time Zone Adjusted and Applied to Data Quality Reports

Example: Difference in Timeliness ARCHIVE Data DQ Reports and ESSENCE

DQ Reports

TRIGGER	Biosense Unique ID	Arrived_Date_Time	Visit Date	Lag time	Facility ID	Unique Patient ID	Sex	Age	Patient Class	Chief Complaint	Diagnosis	Disposition
A04	2016.09		60901 06:30:00:000	60 minutes	FacilityID1	PATIENTA01	F			I have a cough and have trouble breathing; My throat is so sore.		
A08	2016.09		60901 06:30:00:000	130 minutes	FacilityID1	PATIENTA01	F	44	E	Flu like symptoms		
A03	2016.09		60901 06:30:00:000	2.5 months	FacilityID1	PATIENTA01				Influenza and Secondary bacterial pneumonia	;J11; J15	02

Timeliness: 60 minutes

Example of the potential utility in applying "use first non-null value" rule for "Arrived Date Time" during ESSENCE ingestion.

ESSE...

TRIGGER	Biosense Unique ID	Arrived_Date_Time	Visit Date	Lag time	Facility ID	Unique Patient ID	Sex	Age	Patient Class	Chief Complaint	Diagnosis	Disposition
A03	2016.09.01.FacilityID1_Patient_A01	20161215 09:30:00:000	20160901 06:30:00:000	2.5 months	FacilityID1	PATIENTA01			E	I have a cough and have trouble breathing; My throat is so sore.	;J11; J15	02

Timeliness: 2.5 months

Data Quality Reports

- Timeliness
- Completeness
- Validity

Completeness

Are data populated?

- Consider all records associated with a unique patient visit (assesses incoming data and <u>not</u> the downstream process)

- Determine if a data element for a unique patient visit is complete based on whether records (for the visit) carried data for that data element

- Mark as complete on basis of findings across records

- Calculate percent complete (for each data element) based on a visit-level denominator

Among all the facility's opportunities to send data for a unique patient visit data element, were those data actually sent for that visit?

Example of Completeness Reports: Data Elements

NSSP Completeness Report->Site: Site_ID-Site_Name Year: 2016 By Arrived_Date
(based on NSSP Site_Name data as of 30NOV2016 at 9:00 AM)

Feed_Name=$ALL

| | | | | | C_Facility_ID, Facility_Name | | | | |
| | | | | | $ALL $ALL | Feed_Name001 $ALL | Feed_Name002 $ALL | Feed_Name003 $ALL | Feed_Name004 $ALL |
Processed Column	PRI	Use Group	Required	HL7	% Visits	% Visits	% Visits	% Visits	% Visits
C_Facility_ID	1	Facility	CR	MSH-4.1	100.0	100.0	100.0	100.0	100.0
C_Biosense_Facility_ID	1	Facility	CR	MSH-4.1	100.0	100.0	100.0	100.0	100.0
C_Processed_Facility_ID	2	Facility	CR	MSH-4.1	100.0	100.0	100.0	100.0	100.0
C_Visit_Date	2	Visitdate	CR		100.0	100.0	100.0	100.0	100.0
C_Visit_Date_Time	1	Visitdate	CR	NA	100.0	100.0	100.0	100.0	100.0
C_FacType_Patient_Class	2	VisitInfo	CR	PV1.2.1	80.741	99.636	89.01	99.628	95.799
C_MFT_Patient_Class	2	VisitInfo	CR	PV1.2.1	100.0	100.0	100.0	100.0	100.0
C_Patient_Class	2	VisitInfo	CR	PV1.2.1	100.0	100.0	100.0	100.0	100.0
C_Death	2	VisitInfo	CRE	PID.30.1	100.0	100.0	100.0	100.0	100.0
C_Patient_Age	1	Demographics	CRE	OBX.5.1	99.951	99.999	99.933	100.0	100.0
C_Patient_Age_Years	2	Demographics	CRE	OBX.5.1	99.951	99.999	99.933	100.0	100.0
C_Patient_County	1	Demographics	CRE	PID-11.9	96.64	94.087	99.785	94.992	0.0
C_Chief_Complaint	2	CC_Diagnostic	CRE	NA	97.966	90.528	99.803	96.479	100.0
Arrived_Date	2	Operations	CR	NA	100.0	100.0	100.0	100.0	100.0
Arrived_Date_Time	1	Operations	CR	NA	100.0	100.0	100.0	100.0	100.0

Drill-down example shows selection of "Required" elements calculated by NSSP (CR, CRE). Did NSSP process successfully yield data based on incoming data in Required type elements?

Example of Visit Data: Visit-level Completeness

- Three records (messages) sent for a unique patient visit (Visit #1)
- Two records (messages) sent for a different unique patient visit (Visit #2)
- Some but not all of the records have data in various data elements

Visit #1

TRIGGER	Biosense Unique ID	Arrived_Date_Time	Visit Date	Facility ID	Unique Patient ID	Sex	Age	Patient Class	Chief Complaint	Diagnosis	Discharge Disposition
A04	2016.09.01.FacilityID1_Patient_A01	20160901 08:30:00:000	20160901 06:30:00:000	FacilityID1	PATIENTA01	efmale		01	I have a cough and have trouble breathing; My throat is so sore.		
A08	2016.09.01.FacilityID1_Patient_A01	20160901 08:40:00:000	20160901 06:30:00:000	FacilityID1	PATIENTA01	F	44	E	Flu like symptoms		
A03	2016.09.01.FacilityID1_Patient_A01	20161215 09:30:00:000	20160901 06:30:00:000	FacilityID1	PATIENTA01				Influenza and Secondary bacterial pneumonia	;J11; J15	02

Visit #2

TRIGGER	Biosense Unique ID	Arrived_Date_Time	Visit Date	Facility ID	Unique Patient ID	Sex	Age	Patient Class	Chief Complaint	Diagnosis	Discharge Disposition
A04	2016.09.01.FacilityID1_Patient_A02	20160901 08:30:00:000	20160901 06:30:00:000	FacilityID1	PATIENTA02			E	Chest Pain		
A08	2016.09.01.FacilityID1_Patient_A02	20160901 08:40:00:000	20160901 06:30:00:000	FacilityID1	PATIENTA02			E	Chest Pain		

ESSENCE Data Quality Reports
Based on "Collapsed" Visits

Difference in Completeness:
ARCHIVE Data and ESSENCE

- Data received in the most recent message is used to ingest into ESSENCE

- Exceptions include
  - Patient Class (last non-NULL)
  - Chief Complaint (first non-NULL)
  - Diagnosis (last non-NULL)
  - Discharge Disposition (last non-NULL)

Example: Difference in Completeness
ARCHIVE Data DQ Reports and ESSENCE

Data used in DQ Reports for Visit #1

Complete:
Sex, Age, Patient Class, CC, Diagnosis, Discharge Diagnosis

(Based on incoming data)

Biosense Unique ID		Arrived_Date_Time	Visit Date	Lag time	Facility ID	Unique Patient ID	Sex	Age	Patient Class	Chief Complaint	Diagnosis	Discharge Disposition
A04	2016.09.01.FacilityID1_Patient_A01	20160901 07:30:00:000	20160901 06:30:00:000	60 minutes	FacilityID1	PATIENTA01	F			I have a cough and have trouble breathing; My throat is so sore.		
A08	2016.09.01.FacilityII							44	E	Flu like symptoms		
A03	2016.09.01.FacilityII									Influenza and Secondary bacterial pneumonia	J11; J15	02

> **Note.** This example shows potential utility in leveraging Chief Complaint History column (all CCs) in ESSENCE binning. RESP syndrome is met, but not ILI.

Complete:
Patient Class, CC, Diagnosis, Discharge Diagnosis
Incomplete:
Sex, Age

(Based on business rules applied in ESSENCE ingestion)

Data in ESSENCE for Visit #1

TRIGGER_Biosense Unique ID	Arrived_Date_Time	Visit Date	Lag time	Facility ID	Unique Patient ID	Sex	Age	Patient Class	Chief Complaint	Diagnosis	Discharge Disposition	ESSENCE Syndrome
2016.09.01.FacilityID1_Patient_A01	20161215 09:30:00:000	20160901 06:30:00:000	2.5 months	FacilityID1	PATIENTA01			E	I have a cough and have trouble breathing; My throat is so sore.	;J11; J15	02	Resp

Data Quality Reports

- Timeliness

- Completeness

- Validity

Validity

Are pertinent data elements adhering to standards?

- Targets data elements of interest that have an associated vocabulary (e.g., Administrative Sex)
- Calculates conformance at
  - "record level" (# and percent of records that conform)
  - "visit level" * (# of visits that conform)
    - Mirrors collapsing rules used in ESSENCE ingestion to yield 1 record per each visit
- Categorizes missing data as nonconforming

*Facilitates assessment of incoming data (and data as appearing in ESSENCE)

Example of Validity Reports: Summary

NSSP Values Report->Site: Site_ID-Site_Name Year: 2016 By Arrived_Date
Values are selected from all records within a visit
(based on NSSP Site_Name data as of 02DEC2016 at 9:21 AM)

| | | | | % Conforming by Feed_Name and Facility | | | | | |
| | | | | $ALL $ALL Facilities | | | Feed_Name001 $ALL Facilities | | |
DQ Column	DQ Standard	Use Group No	Use Group	% Records	% Visits	% Patients	% Records	% Visits	% Patients
Administrative_Sex	PHVS_Gender_SyndromicSurveillance	6	Demographics	99.999%	100.0%	100.0%	100.0%	100.0%	100.0%
Admission_Type	PHVS_AdmissionType_HL7_2x	5	VisitInfo	80.8%	74.21%	79.925%	92.873%	96.673%	92.002%
Admit_Source	PHVS_AdmitSource_HL7_2x	5	VisitInfo	80.847%	87.792%	90.545%	73.398%	95.359%	94.34%
Age_Calculated		6	Demographics	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Age_Reported		6	Demographics	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Age_Units_Calculated	PHVS_AgeUnit_SyndromicSurveillance	6	Demographics	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Age_Units_Reported	PHVS_AgeUnit_SyndromicSurveillance	6	Demographics	98.903%	99.62%	99.634%	95.66%	97.573%	96.809%
Body_Mass_Index		9	Vitals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
C_Chief_Complaint		7	CC_Diagnostic	96.816%	98.027%	97.159%	89.84%	94.857%	88.788%
C_Death		5	VisitInfo	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
C_Factype_Patient_Class		5	VisitInfo	68.697%	73.196%	74...			
C_MFT_Patient_Class	PHVS_PatientClass_SyndromicSurveill	5	VisitInfo	100.0%	100.0%	100.0%			
C_Patient_Age		6	Demographics	99.935%	99.98%	99...			
C_Patient_Age_Units	PHVS_AgeUnit_SyndromicSurveillance	6	Demographics	99.94%	99.982%	99.975%			
C_Patient_Age_Years		6	Demographics	99.935%	99.98%	99...			
C_Patient_Class	PHVS_PatientClass_SyndromicSurveill	5	VisitInfo	100.0%	100.0%				
C_Patient_County	PHVS_County_FIPS_6-4	6	Demographics	47.58%	39.165%	30.299%	88.188%	95.077%	93.938%
Diagnosis_Code	PHVS_AdministrativeDiagnosis_CDC_IC	7	CC_Diagnostic	54.02%	83.211%	76.453%	49.367%	91.2%	89.987%
Diagnosis_Type	PHVS_DiagnosisType_HL7_2x_V1	7	CC_Diagnostic	53.364%	82.874%	78.147%	49.367%	90.968%	90.858%
Diastolic_Blood_Pressure_Units		9	Vitals	52.203%	56.83%	67.721%	0.0%	0.0%	0.0%

Click on DQ Column of interest for details (or select applicable worksheet)

Summary | Administrative_Sex | Admission_Type | Admit_Source | Age_Calculated | Age_Reported | Age_Units_Calculated | ...

Example of Validity Reports: Detail for Data Element

NSSP Values Report->Site: Site_ID-Site_Name Year: 2016 By Arrived_Date
Values are selected from all records within a visit
(based on NSSP Site_Name data as of 02DEC2016 at 9:21 AM)
Standard(Link Below): PHVS_AdmitSource_HL7_2x
http://phinvads.cdc.gov/vads/ViewValueSet.action?oid=2.16.840.1.114222.4.11.918

DQ Column:=Admit_Source

Feed Name	Facility ID	Facility Name	Clas	Value	Facility Cnt	Records	% Records	Visits	% Visits	Patients	% Patients
$ALL	$ALL	Facilities	0	$ALL-Total	28	2,889,420	100.0%	505,052	100.0%	251,723	100.0%
$ALL	$ALL	Facilities	1	$ALL_Conforming	25	2,336,012	80.847%	443,397	87.792%	227,923	90.545%
$ALL	$ALL	Facilities	1	01	1	27,677	0.958%	4,479	0.887%	1,643	0.653%
$ALL	$ALL	Facilities	1	07	1	203	0.007%	46	0.009%	20	0.008%
$ALL	$ALL	Facilities	1	1	20	1,045,332	36.178%	220,194	43.598%	132,113	52.483%
$ALL	$ALL	Facilities	1	2	16	117,304	4.06%	13,446	2.662%	7,100	2.821%
$ALL	$ALL	Facilities	1	4	21	72,871	2.522%	7,147	1.415%	4,601	1.828%
$ALL	$ALL	Facilities	1	5	17	57,629	1.994%	9,952	1.97%	6,011	2.388%
$ALL	$ALL	Facilities	1	6	16	10,353	0.358%	1,008	0.2%	704	0.28%
$ALL	$ALL	Facilities	1	7	4	413,194	14.3%	94,727	18.756%	29,404	11.681%
$ALL	$ALL	Facilities	1	8	9	8,911	0.308%	1,325	0.262%	607	0.241%
$ALL	$ALL	Facilities	1	9	23	582,538	20.161%	91,073	18.032%	45,720	18.163%
$ALL	$ALL	Facilities	2	$ALL_NonConforming	8	553,408	19.153%	61,655	12.208%	23,800	9.455%
$ALL	$ALL	Facilities	2	$Missing	8	542,592	18.779%	59,758	11.832%	22,782	9.05%
$ALL	$ALL	Facilities	2	105	1	10,354	0.358%	1,808	0.358%	952	0.378%
$ALL	$ALL	Facilities	2	106	1	15	0.001%	2	0.0%	1	0.0%
$ALL	$ALL	Facilities	2	D	1	408	0.014%	78	0.015%	61	0.024%
$ALL	$ALL	Facilities	2	E	1	39	0.001%	9	0.002%	4	0.002%

Questions?

CONTACT US:
NSSP Service Desk: http://support.syndromicsurveillance.org

LEARN MORE:
CDC NSSP Website: https://www.cdc.gov/nssp/index.html
Syndromic Surveillance Community of Practice Portal:
https://www.syndromicsurveillance.org/

REGISTER FOR NSSP UPDATE NEWSLETTER:
https://www.cdc.gov/nssp/news.html

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348   www.cdc.gov

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.

Orientation to
Data Flow and Data Quality
Data Elements

Appendix Slides

Calculated Visit Date: *C_Visit_Date_Time*
C_Visit_Date

- Return the earliest date/time from the following segments:

    – Admit Date/Time

    – Discharge Date/Time

    – Procedure Date/Time

    – Patient Death Date/Time

    – Recorded Date/Time of Message

    – Date/Time of Message

Processed Table will store:

- *C_Visit_Date_Time (date & time)*

- *C_Visit_Date (date only)*

Calculated Facility ID: *C_Facility_ID*

- NSSP data processing stores C_Facility_ID as the first non-null and **valid value** from:
  - Treating_Facility_ID
  - Sending_Facility

C_Biosense_Facility_ID is an agnostic ID internally generated by NSSP.

Given Facility ID for same facility could change over time, this agnostic ID remains static despite Facility ID changes.

Calculated Patient ID: *C_Unique_Patient_ID*

- Select first non-null value from
    - Medical Record Number
    - First Patient ID
    - Patient Account Number
    - Visit Number

Inputs into this selection are stored separately, as well.

Chief Complaint: Incoming Data

- Incoming data for Chief Complaint may be
  - Text (TX)
  - Coded With Exceptions (CWE)

- NSSP BioSense Platform will ingest and process both types

Calculated Patient Age: *C_Patient_Age*
C_Patient_Age_Units

- BioSense Platform receives age information inconsistently across messages

- BioSense Platform generates a calculated age (and companion units) by selecting the first non-null option from:
  - Calculated Visit Date – Birth Date (PID-7)
    Default units:
    Years (if >= 2 years)
    Months (if < 2 years)
  - Age Reported, including units (OBX-5, OBX-6)
  - Age Calculated, including units (OBX-5, OBX-6)

Calculated Visit Date:

Returns the earliest date from the following segments:
- *Admit Date/Time (PV1.44.1)*
- *Discharge Date/Time (PV1.45.1)*
- *Procedure Date/Time (PR1.5.1)*
- *Patient Death Date/Time (PID.29.1)*
- *Recorded Date/Time of Message (EVN.7.2)*
- *Date/Time of Message (MSH.7.1)*

Calculated "Combo" Fields

- **Combo Fields (X_Combo)** concatenate codes with their respective descriptions as sent in a message

Diagnosis_Code	Diagnosis_Description	Diagnosis_Combo
488.8;464	Influenza due to novel influenza A;Acute laryngitis and tracheitis	488.8 Influenza due to novel influenza A;464 Acute laryngitis and tracheitis
488;487	;Influenza	488 ;487 Influenza

NSSP Processing Guideline—"repeating segments" (e.g., DG1-3)

Repeating data elements use semicolon (;) as separator when concatenating repeating values.

Patient Class and Calculated Patient Class
Patient_Class_Code and C_Patient_Class

- Reported Patient class (PV1-2)—although useful in analyses and data explorations—may <u>not</u> be present in all message submissions

- During processing, BioSense Platform creates Calculated Patient Class by using the following algorithm:

  1. Patient Class (PV1-2) if non-NULL

  2. Look up Inferred Patient Class from Facility Type reported in message if it is valid for syndromic surveillance

  3. Assign class value based on inferred patient class associated with primary MFT entry

Concept Code	Concept Name	Value
261QE0002X	Emergency Care [Ambulatory Health Care Facilities\Clinic/Center]	E
1021-5	Inpatient practice setting	I
261QM2500X	Medical Specialty [Ambulatory Health Care Facilities\Clinic/Center]	O
261QP2300X	Primary Care [Ambulatory Health Care Facilities\Clinic/Center]	O
261QU0200X	Urgent Care [Ambulatory Health Care Facilities\Clinic/Center]	O

String Fields

- Capture date/numeric type information as a string to enhance processing and Data Quality checks
  - Message info is read into a string type field (Str_XXX)
  - String is then converted to datetime or numeric value
  - If string contains info not valid for that data type, the element is null

Str_Birth_Date_Time	Birth_Date_Time
19860501	1986-05-01 00:00:00:000
Yesterday	.
May 1	.
May 1, 1986	1986-05-01 00:00:00:000