

## PLUNGED INTO THE FUTURE

Efforts in surveillance data system and reporting modernization in Los Angeles County during COVID-19



## ICS Units in ACDC

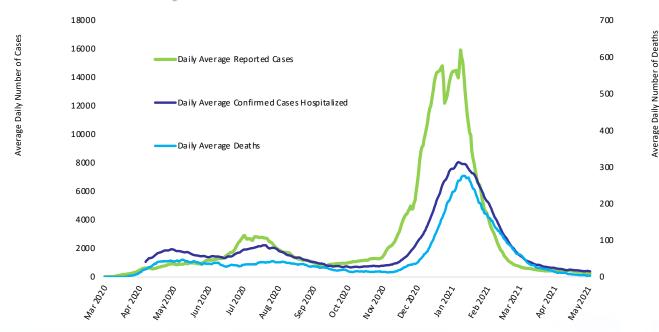
- Healthcare
  - HCW Contact Tracing
  - Hospital Data
  - HAN
  - SNF/LTC Liaison
  - EMS Liaison
- Corrections
- Variant/Genomic Surveillance
- Testing Logisitics
- Worksites
- Pregnancy Surveillance

- Education
- Persons Experiencing Homelessness (PEH)
- Physician Consult
- Coroner Liaison
- Transportation Liaison
- Food Facilities/Agriculture
- Angelinos in Action
- Community Lab Surveillance
- Automated Disease Surveillance
- Epidemiology and Data Unit



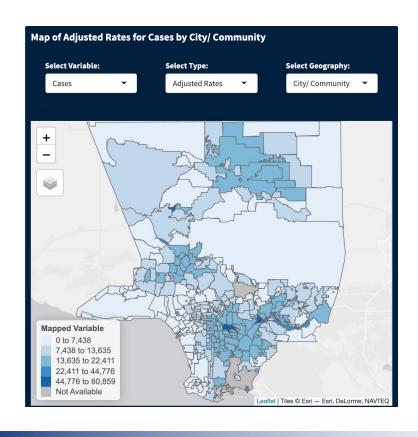
## Setting the Stage

 Daily Number of COVID-19 Cases and Hospitalizations by Episode Date and Deaths by Date of Death





## Some Summary Data



- 1,182,001 Cases
- 23,128 Deaths
- 6,915,864 Persons Tested
- 21,337,727 Tests Resulted



## Setting the Stage

- Communicable Disease Surveillance
  - Laboratory Records for Title 17 + Local Reportable Diseases
  - Health Records
  - Outbreak/Cluster Reports
- Standard Reporting Mechanisms
  - Electronic Laboratory Reporting (HL7) (Electronic Data Feed)
  - Direct Medical Provider Reporting (Processed via Morbidity Unit)
  - Direct Outbreak Reporting (Processed via Morbidity Unit)



## Framing

- Challenges
  - Lack of Data Warehouse
  - Volume of Data
  - Surveillance Data System Age
  - Surveillance Data System Integration Capabilities
  - Proliferation of Laboratories not yet on ELR
  - Expectation of Data Reporting and Interest
    - Agency leadership, media and the public





## **Epidemiology And Data Unit**

- Morning Data and Reporting
- Data Science and Systems
- Cluster Detection
- Outbreak QA
- Death Surveillance
- Data Integration
- REDCap
- Corrections and Law Enforcement Epi

- Vaccine Integration
- eCR
- Case/Contact Interview Data
- Data Standardization
- 5 FTE to a unit that has been upwards of 100 data/epi staff
  - Current size of funded FTE is ~65
     plus ICS



## **Expansion of Data Sources**

- Lab
  - ELR
  - Flat file lab reporting
  - Web-based lab result submission form (direct POCT and faxed entry)
- Medical Provider
  - Faxed individual report form
  - Flat file medical provider reporting
  - Web-based medical provider form

- New Supplemental Sources for Integration
  - Testing appointment data including questionnaire data
  - Case Interview data
  - Hospitalization registry data
  - Vaccination registry data



## Integration of Data Sources

- Ingestion
  - Stage 1: Manual Intake and Processing of Files
    - Direct QA, standardized SAS programs
  - Stage 2: Automation
    - SFTP Ingestion
    - Alteryx work flow
      - Direct connections with labs
      - Automated processes that begin when files are recieved

## Integration

- Standardize matching algorithms across data sources
  - Deterministic
  - Probablistic
  - Using SAS and R
- HL7 Conversion to ELR
- Bot Data Entry
- Limited use of surveillance system import utility
- Development of Import API



## Build out of Data Systems

- Initially, no server based data access
  - Nightly downloads of data dumps from surveillance system application user interface
- Established SQL workflows on vendor side and DPH side to build out SQL-Server base tables for analysis
  - Issues with data transfer from vendor to DPH

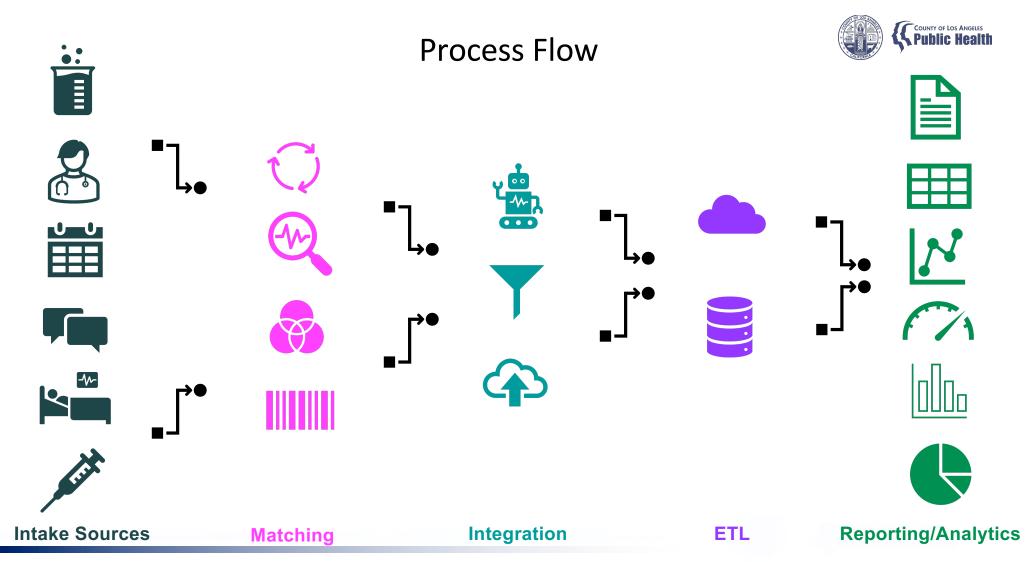
- Established on-premise SQL
   Replication and automated update
   jobs at night
- Currently working on moving data into Hadoop HIVE Data Lake
  - Big Data Architecture
  - Efficient Processing
  - More Automation



## Data Processing and Reporting

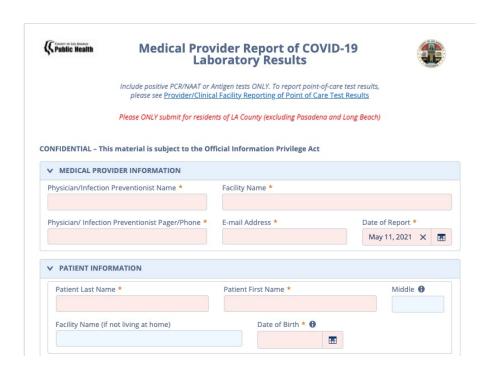
- Daily reporting started day 1
- Daily reports on case surveillance
  - Cases
  - Deaths
  - Hospitalizations
  - Demographics
  - Geography
  - Trends
- counts, crude and age-adjusted rates

- Public Reporting
  - Surveillance Dashboard
    - http://dashboard.publichealth.laco unty.gov/covid19\_surveillance\_das hboard/
  - Media Website
    - http://publichealth.lacounty.gov/m edia/coronavirus/
  - DPH Data Page
    - <a href="http://publichealth.lacounty.gov/m">http://publichealth.lacounty.gov/m</a> edia/coronavirus/data/index.htm
  - And More





## Web-based Reporting (Nintex and REDCap)

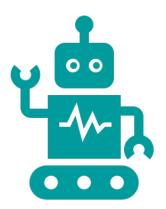


Provider/Clinical Facility COVID-19 Point of Care Test Result			
It is recommended that all SARS CoV-2 POCT test results (e.g. pot to report the positive results.	ositive, negative and indeterminate) be reported, but it is only required		
Complete the form below to report the POCT results of each patient	nt.		
This reporting replaces the requirement to submit a Medical Provide	der Report Form for positive results.		
*NOTE – Before completing form, a one-time registration is require populated in the reporting portal below. Click here to register.	ed so your clinic information can be pre-collected and then pre-		
For questions regarding POCT reporting email POCReportQA@ph	h.lacounty.gov.		
Patient Information			
First Name * must provide value	First		
Last Name * must provide value	Last		
Patient Identifier	This may include the following, medical record number, social security number, account number, etc.		
Date of Birth * must provide value	m M-D-Y		
Gender * must provide value	·		
Race * must provide value	<u> </u>		
Ethnicity * must provide value	·		
Patient Address * must provide value	include house number, direction, and street name. Note - Homeless, if known.		



## **RPA Bots**

 Has processed over 500,000 entries into surveillance system



Process	Interval	Success Rate	# of Transactions
Case Interview	Today: 06.15.2021	0%	0
	Cumulative: 10.13.2020 - 06.15.2021	91%	471,690
Hospitalization	Today: 06.15.2021	100%	124
	Cumulative: 10.13.2020 - 06.15.2021	96%	72,831
Medical Provider Form	Today: 06.15.2021	92%	227
	Cumulative: 03.03.2021 - 06.15.2021	96%	13,038

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## Lab

• Positive and Negative (first time) Lab Results

• Pre-Covid (2019): 1,583,736

• Post-Covid (2020): **11,458,800** 



Lab Ingestion March 2020 to May 2021

ELR Classification	Number of	Number of Records
	Labs	
ELR	474	17,188,544
FLAT FILE HL7 CONVERSION - LAC (LABS)	137	501,193
FLAT FILE HL7 CONVERSION - LAC (MANUAL)	26	10,635
FLAT FILE HL7 CONVERSION - CDPH	217	1,624,979
MANUALLY IMPORTED RECORDS	40	481,936
FLAT FILE HL7 CONVERSION - POCT	62	28,251

## **Tools**







**Intake** 



## Matching, Analysis, Reporting





## ETL







## Integration



**RPA** bot







# LAB TURN-AROUND TIME (TAT) DATA PROJECT



## Turnaround Time (TAT) and Lab Data Quality Reports

- 1. Lab Feedback Report
  - External facing report
  - Sent to high volume Hospital and Reference Labs
- 2. TAT and Missingness Report
  - Internal report
  - Run twice weekly



## 1. Lab Feedback Report

## **Background**

- Improving data quality ensures relevant data, such as case demographics, are collected efficiently.
- Selected 20 highest-volume laboratories (10 hospital and 10 reference) that report lab data via ELR.

## <u>Purpose</u>

- To motivate improvement in TAT and data quality
- To increase transparency of laboratory & DPH performance



### TAT measures

- Labs can compare their own TAT overtime and with other labs from the same lab type (hospital or reference).
- We report two types of TAT measures:
- 1) Performance measure: Average number of days from specimen collection date to lab result date
- 2) Public health measure: Average number of days from result date to date received by local health department



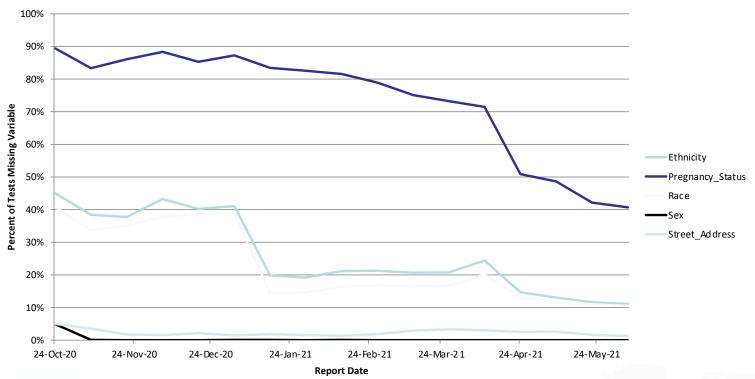
## How Percent Missingness is Measured

- Calculated from de-duplicated ELR records with accession number
- For each variable, percent missing is number of missing values divided by total number of tests submitted during reporting period
  - Rounded to nearest tenth of a percent
- Missing value is defined as blank, or value of "Unknown"
- Key variables were tracked bi-weekly for data completeness:
  - Ethnicity
  - Race
  - Sex
  - Specimen Collection Date
  - Specimen Received date
  - Specimen source
  - Street Address
  - Test Result



## Data quality improvements

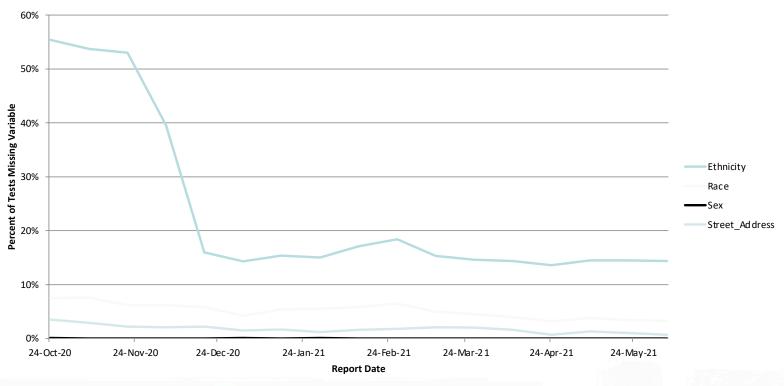
#### **Data Field Missingness Over Time, Reference Labs**





## Data quality improvements

#### **Data Field Missingness Over Time, Hospital Labs**



<sup>\*</sup>Pregnancy status not included due to reporting differences

## Example



#### **COVID-19 Laboratory Performance Report**

Reporting Period: 05/23/2021 to 06/05/2021



Performing facility

Number of tests, reporting period

47,811 Overall\*

2,102 Performing Facility Number of tests, daily average 3,415 150

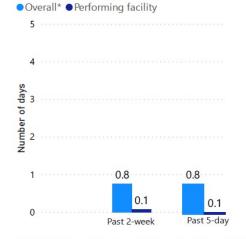
Overall\*

150 Performing Facility

#### **Turnaround Time (TAT)**

#### Performance Measure:

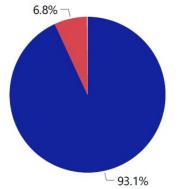
Average number of days from specimen collection date to lab result date.



#### Breakdown by TAT categories:

Proportion of results in each performance measure TAT categories.





#### Public Health Measure:

Average number of days from resulted date to date received by local health department.



\* Overall: includes all results submitted by ten highest volume hospitals to the local health department via electronic lab reporting. Top ten high-volume hospitals:



## Example



#### **COVID-19 Laboratory Performance Report**

Reporting Period: 05/23/2021 to 06/05/2021



#### Percentage of lab results with missing data elements

All lab reports must include all 17 essential data fields and be reported to the local health department within one working day from identification. Listed below are the data elements with missing fields.

E0 /00

#### Overall\*:

Total number of tests

during reporting period:	50,608	47,811
Data Element	Previous Reporting Period**	Current Reporting Period
Ethnicity	14.5%	14.4%
Race	3.4%	3.3%
Sex	0.0%	0.0%
Specimen Collection Date	0.1%	0.1%
Specimen Received Date	0.1%	0.1%
Specimen Source	0.0%	0.0%
Street Address	1.0%	0.7%
Test Result	<0.1%	<0.1%

Performing facility:	~
	$\vee$

Total number of tests during reporting period:	2,155	2,102
Data Element	Previous Reporting Period**	Current Re

Data Element	Previous Reporting Period**	Current Reporting Period
Ethnicity	28.4%	22.9%
Race	18.8%	13.7%
Sex	0.0%	0.0%
Specimen Collection Date	0.0%	0.0%
Specimen Received Date	0.0%	0.0%
Specimen Source	0.0%	0.0%
Street Address	20.4%	14.4%
Test Result	0.0%	0.0%

17011



<sup>\*</sup> Overall: includes all results submitted by ten highest volume hospitals to the local health department via electronic lab reporting. Top ten high-volume hospitals:



## 2. TAT and Missingness Report

- Internal report detailing TAT and data quality, run twice a week
- Reports TAT and missingness both overall, and by individual lab
- Includes Public Health Measure and Performance Measure
- Grouped by lab submission method
  - ELR
  - Flat File Conversion
  - Manual Import
  - Point of Care Tests



## **TAT and Missingness Report**

- Details change in number of days labs take to submit test results to DPH over time
- Includes information about TAT for different test types (positive, negative, import method)
- Also details average time to perform tests (specimen collection to specimen result)
- Details percent missingness of key lab and demographic variables by lab, overall and in the past 30 days



# LOS ANGELES COUNTY COVID HOSPITAL ELECTRONIC SURVEILLANCE SYSTEM (CHESS) OVERVIEW



#### **CHESS overview**

- Solution to individual patient reports and allows for identification, characterization of hospitalized cases
- System build began in April 2020
- Requested data: hospitalized COVID patient demographics, admission,
   ICU, intubation dates, disposition
- Includes all hospitalized persons with positive COVID test (regardless of diagnosis)



## Overview of Data Flow

## Hospital submits file through MFT site (daily):

Method 1: Manual FTP (web)

Method 2: Automated FTP upload (SFTP client)

DPH receives/scans file, and moves files to Staging folder

(automated process)

# Data auto populated in SQL DB

(based on mapping criteria and validation criteria)

## Data imported/ processed in Access

(identifies exclusions, recodes variables, additional validation)

## Data processed/ analyzed in SAS

(QA, recoding, standardization, reports, deterministic matching for integration into IRIS)



# Staging folder file structure for automated processing of hospital files

Name	Date modified
ArchiveFiles	6/12/2021 6:31 PM
DeletedFiles	3/11/2021 11:28 AM
DuplicateFiles	6/12/2021 6:31 PM
EditedFiles_Complete	1/25/2021 10:54 AM
EditedFiles_InProcess	6/9/2021 12:04 PM
ErroredFiles	6/11/2021 6:33 PM
FileData_TobeDeleted_ByService	5/26/2021 7:02 AM
Manual Mapped Hospital Files	3/1/2021 10:57 AM
ProcessedFiles	6/12/2021 6:51 PM
QueuedFiles	6/12/2021 6:48 PM
Reports	6/12/2021 7:00 AM
SourceFiles	5/11/2020 9:27 AM
→ TBDeletedProcessedFiles	6/8/2021 12:45 PM
UnknownSourceFiles	6/7/2021 9:55 AM



## CHESS process measures

- 99,962 hospitalized cases reported to system by 87 hospitals\*
- 90,965 cases matched to LA County resident cases (91%)
- Allows for calculation of length of hospital stay, proportion of cases admitted from nursing homes, hospitalization rates by race/ethnicity and age, in-hospital mortality

\*As of 6/14/2021



## **COVIDWATCH**



mxx014.pdf (page 3 of 18)

## COVIDWATCH (Supplement to Flu Watch)

- Medical Provider and Science Audience
- http://publichealth.lacou nty.gov/acd/ncorona2019 /covidwatch/

# COVID WATCH Summary of Los Angeles County Department of Public Health (LAC DPH) COVID-19 Related Surveillance Updated 6-11-2021 To subscribe to LAC DPH Viral Respiratory

MMWR Week: 22

Ending on: 6-5-2021

To subscribe to LAC DPH Viral Respiratory Illness Surveillance Updates email "Subscribe" to fluwatch@listserv.ph.lacounty.gov

#### **COVID-19 At a Glance**

Virology	Activity	Severity
1.0% of specimens tested at Los Angeles sentinel surveillance laboratories* in week 22 were positive for SARS-CoV-2, which is about the same as in week 21.	In week 22, 3.6% of ED visits were for COVID-19, which is less than week 21.  Visits for influenza-like illness accounted for 1.3% of emergency department visits in week 22, which is about the same as in week 21.	COVID-19 was reported as a cause for 3% of deaths registered in LAC during week 22.  Pneumonia, influenza, and COVID-19 accounted for 8% of all deaths registered in LAC during week 22 which is about the same as in week 21.

<sup>\*</sup> See indicator specific sections for associated methods.

LAC DPH prepares this newsletter to summarize current COVID-19 and respiratory illness surveillance data in Los Angeles County. Because the COVID-19 pandemic is evolving rapidly, our methods, systems, and data are being added and revised constantly.

Weekly surveillance data are preliminary and subject to change.

Daily counts of cases and deaths are available on the LAC DPH website at <a href="http://dashboard.publichealth.lacounty.gov/covid19">http://dashboard.publichealth.lacounty.gov/covid19</a> surveillance dashboard/.

<sup>\*</sup> LAC DPH surveillance data excludes the cities of Long Beach and Pasadena.

<sup>\*\*</sup> The respiratory virus surveillance period starts with MMWR week 40 and runs through week 39 of the following year. The 2019-20 season started on Sept 29, 2019.

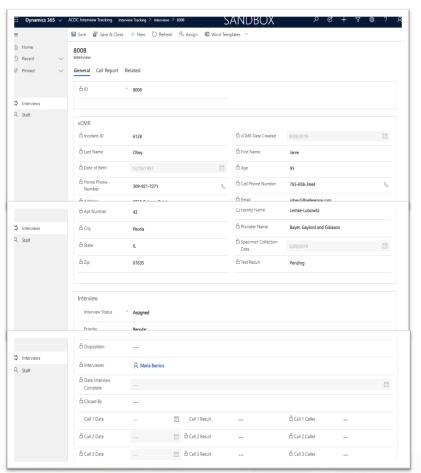


# CASE AND CONTACT INTERVIEW BRANCH (CCIB)

## **CRM**



- CRM ACDC Interview Tracking is a live database used to collect COVID-19 case and close contact interview data in LAC
  - Case interview responses
  - Initial, follow-up, and final contact interview responses
  - Vaccine assistance call responses
  - Administrative information on record statuses
- CCIB produces 5 reports based on CRM data
  - 3 external-facing
    - Monthly CDC and CDPH performance measures
    - Weekly metrics report
    - Daily workload report
  - 2 internal-facing
    - Daily workload report
    - Daily workload by unit report

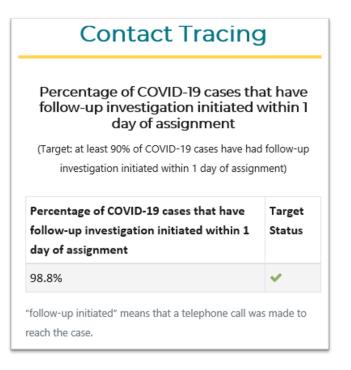


\*Image taken from CRM Sandbox (a play environment that mirrors CRM ACDC Interview Tracking, and is used for testing and training purposes) <sup>36</sup>

## **Workload Reports**



- Contains information on the
  - Number of new case and contact records assigned to staff
  - Number of cases still in progress
  - Record statuses and outcomes
  - Number of referrals to specialized teams handling high-risk cases
  - Percent of new cases with investigation initiated within 1 day of assignment
- Sent to leadership daily, and used to update the Recovery Metrics dashboard on the DPH website <a href="http://ph.lacounty.gov/media/Coronavirus/covid19\_recovery\_dashboard.htm">http://ph.lacounty.gov/media/Coronavirus/covid19\_recovery\_dashboard.htm</a>
- This daily workload report is also stratified by each unit in CCIB for internal workload tracking purposes

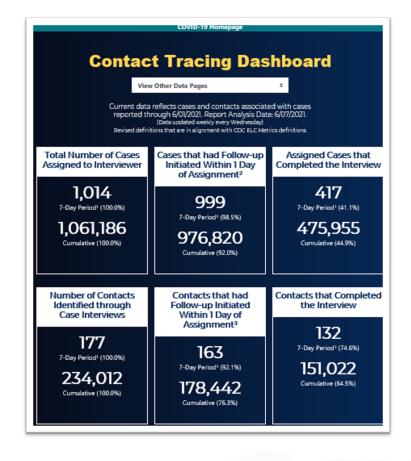


### **Metrics**



- Case investigation and contact tracing performance measures
  - Total cases and contacts
  - Caseload per staff ratios
  - Timeliness and completeness of case and contact interviews
  - Assessment of need and providing of isolation and quarantine support
  - Effectiveness and quality of contact tracing
  - Timeliness of case and contact processing
- Submitted monthly to CDC and CDPH
- Some of these metrics are reported weekly on the Contact Tracing dashboard on the DPH website

http://ph.lacounty.gov/media/Coronavirus/data/contact-tracing.htm





## Aspirations for the Future

- Big Data Infrastructure and Tools for Communicable Disease Surveillance
  - Hadoop Data Lake--Engineering is in progress
- Surveillance System Import API
  - Vendor development in progress for multi-threaded RESTful API
- Data Science
- Extend novel intake processes to other diseases
- Refine standardization and automate matching processes
- New supplemental data source identification and integration
- New Analytic/Reporting Products