

Public Health Data Modernization Assessment

The Centers for Disease Control and Prevention supports jurisdictions to:

- Maintain, improve, and modernize the approach to acquire, manage, share, and use data for public health action
- More effectively detect, respond, prevent, and control diseases and conditions to protect the public health and safety of the American people

This report provides a summary of the results of an annual self-assessment of public health data modernization-related capabilities and needs.

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SECTION 1

Overview of Data Modernization Efforts





✔ Present or implemented ➔ In progress ✖ Absent or not implemented ? Status unknown ● If not applicable leave gray

Identified a Data Modernization Initiative Lead

Developed a Data Modernization Plan with information and data systems modernization objectives

Notes



SECTION 2

Assessment of Health Information Systems

DOMAIN 1





Assessment Activities Conducted

✔ Present or implemented
 ➔ In progress
 ✘ Absent or not implemented
 ? Status unknown
 ● If not applicable leave gray

Conducted an environmental scan and/or facilitated an application rationalization exercise to streamline, simplify, and reduce redundancies across the public health IT department

Identified stand-alone, monolithic legacy systems that would benefit from a modern, configurable, componentized platform to enable data-sharing across the enterprise

Identified stand-alone systems that are not interoperable with other public health information systems

Identified antiquated, inefficient legacy systems that can no longer be updated and/or are difficult to maintain due to custom- or hard-coding and would benefit from modern programming languages and technologies

Identified systems that can only be run on legacy operating systems

Conducted an analysis of alternatives to evaluate migrating health information systems to a cloud-based computing platform

Evaluated open standards or open-source tools as alternative(s) to proprietary technologies

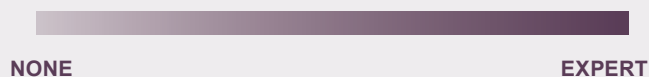
Identified a need for a new, core-critical system for laboratory or other data, (e.g., Laboratory Information Management Systems [LIMS], Syndromic Surveillance System [SyS])

Identified a need for application modernization to improve navigation, features, and functionality that could be improved with modern programming languages

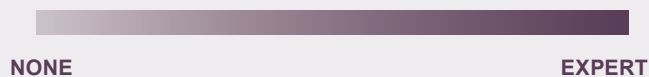
Workforce Capacity for Assessing Health Information Systems

Workforce Proficiency Level

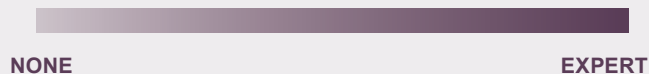
Assessment of Health Information Systems



Information Architecture



Emerging Technology



Number and proficiency level of staff is

sufficient / not sufficient

to meet needs related to assessing health information systems.





Workforce Enhancements

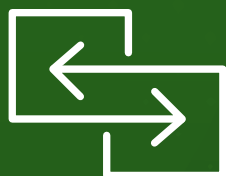
Key Challenges

Opportunities or Plans for Assessing Health Information Systems



SECTION 3

DATA EXCHANGE AND SYSTEMS INTEROPERABILITY DOMAIN 2





Opportunities or Plans for Automation

Patient Immunization Records:

Patient Case Reports:

Patient Laboratory Orders:

Patient Laboratory Results:

Patient Vital Records:

Patient Encounter Data/Syndromic Surveillance Records:





Data Exchange and Systems Activities Implemented

✔ Present or implemented
➔ In progress
✘ Absent or not implemented
⚠ Status unknown
● If not applicable leave gray

Develop APIs to enable rapid and flexible connectivity between applications, data, and devices

Develop microservices to enable shared services between systems-enabling connectivity between applications, data, and devices

Employ an API Gateway or Enterprise Service Bus (ESB) for enterprise message brokerage and integration monitoring

Integrate domains to promote interoperability between disparate systems

Enhance/upgrade infrastructure to support continuous data streaming and scalable storage for high-volume throughput, triage, and data retention

Develop a case/patient matching and record linkage strategy that enables linkage between laboratory, epi, and clinical systems

Develop a universal outbreak ID that links an individual case report with an outbreak event

Use a data lake, a centralized, scalable data storage repository capable of retaining vast amounts of structured, semi-structured, and unstructured data to introduce flexible configuration and agility in surveillance architecture

Employ a semantic layer to allow the mapping of disparate data sources into a single schema or a unified data model for the purposes of integrated surveillance

Develop a cloud strategy that seeks to improve resource utilization and scalability, increase service responsiveness, and accrue meaningful benefits in efficiency, agility, and innovation

Use of cloud computing services to support shared services



DEVELOPING OR ENHANCING AN INTEGRATED SURVEILLANCE SYSTEM:

Key Challenges

Opportunities or Plans for Developing or Enhancing Integrated Surveillance Systems





Electronic Laboratory Reporting (ELR)

✔ Present or implemented
➔ In progress
✘ Absent or not implemented
⚠ Status unknown
● If not applicable leave gray

Receive and Process ELR RECORDS

	Transmission	% processed electronically
Laboratory Orders	HL7 2.3.1 HL7 2.5.1 Web Portal Other	%
Laboratory Results	HL7 2.3.1 HL7 2.5.1 Web Portal Other	%

Key Challenges

Opportunities or Plans to Enhance or Accelerate ELR Reporting Process



Electronic Test Order Reporting (ETOR)

% of Test Orders and Results Processed Through ETOR at the Public Health Laboratory

Orders Received	%
Results Sent	%

Ability to Receive, Process, Analyze, and Transmit ETOR* to Support Outbreaks and Emergency Response or Other Cases[†]

✔ Present or implemented
 ➔ In progress
 ✘ Absent or not implemented
 ? Status unknown
 ● If not applicable leave gray

Standardized data exchange in adherence to HL7 Version 2.5.1 Implementation Guide: S&I Framework Laboratory Orders from EHR, Release 1 - US Realm

Standardized data exchange in adherence to HL7 Version 2.5.1 Implementation Guide: Laboratory Results Interface, Release 1 STU Release 3 - US Realm

Web Portal

Laboratory Information Management System (LIMS)

* Includes demographic variables (e.g., gender, age, race)

[†] e.g., newborn screening, antimicrobial resistance



Challenges to Enhancing or Accelerating ETOR Reporting Process

Opportunities or Plans to Enhance or Accelerate ETOR Reporting Process





Electronic Case Reporting (eCR)

Has **has not** conducted a workflow analysis for reportable conditions to evaluate the feasibility of receiving and processing electronic initial case reports (eICR) and reportability responses (RR).

Opportunities or Plans for Enhanced Workflow for Reportable Conditions

Receiving and Consuming eICR and RR Records From AIMS for Disease Surveillance

✓ Present or implemented
→ In progress
✗ Absent or not implemented
? Status unknown
● If not applicable leave gray

HL7 CDA® R2 Implementation Guide: Public Health Case Report, Release 2: the Electronic Initial Case Report (eICR), Release 1, STU Release 1.1 - US Realm

Electronic Case Reporting (eCR) Version: 0.1.0 FHIR Version: 3.1.1 in adherence to the HL7 FHIR® Implementation Guide: Electronic Case Reporting (eCR) v.1.0.0



Key Challenges to Transmitting Electronic Case Reports Across Systems

Opportunities or Plans for Transmitting Electronic Case Reports Across Systems





Key Challenges to Utilizing eICR Data

Opportunities or Plans to Enhance the eICR and RR Integration Into Data Systems and Utilize Data From eCR





Reportable Conditions Knowledge Management System (RCKMS)

% | Of reporting requirements authored for available conditions in AIMS/RCKMS

Briefly Describe Plans for Authoring and Updating Reporting Requirements for Available Conditions

Needed Services and Tools to Support Data Evaluation and Quality Assurance





Immunization

Present or implemented
 In progress
 Absent or not implemented
 Status unknown
 If not applicable leave gray

Receive and Process Electronic Immunization Records

Standardized data exchange in adherence to HL7 Version 2.5.1 Implementation Guide for Immunization Messaging

Web Portal

Transmit Electronic COVID-19 Immunization Records From a Centralized Immunization System (IIS) to CDC

HL7 Version 2.5.1 Implementation Guide for Immunization Messaging via Vaccine Administration Management System (VAMS)

COVID-19 Vaccination Reporting Specification (CVRS)



Key Challenges Related to Immunization Reporting

Opportunities or Plans to Enhance or Accelerate Immunization Reporting





Syndromic Surveillance

✔ Present or implemented → In progress ✘ Absent or not implemented ? Status unknown ● If not applicable leave gray

Transmit Standardized Admission, Discharge, and Transfer (ADT) Electronic Patient Records in Adherence to

HL7 Version 2.5.1 Implementation Guide: Syndromic Surveillance, Release 1

Using Syndromic Surveillance to Inform Public Health Actions








Challenges to Enhancing or Accelerating Syndromic Surveillance Reporting

Opportunities or Plans to Enhance or Accelerate Syndromic Surveillance Reporting





Case Notifications

 Present or implemented
  Currently being worked on
  Status unknown

National Notifiable Diseases Surveillance System (NNDSS) Status of Message Mapping Guides

Generic v2.0	Tuberculosis (TB) and Latent TB Infection (LTBI)	Lyme and Tickborne Rickettsial Diseases (TBRD)
Hepatitis v1.0	Mumps	Measles
STD v1.0	Pertussis	Rubella
Congenital Syphilis v1.0	Varicella	Congenital Rubella Syndrome
Arboviral v1.3	Malaria	Multidrug-Resistant Organisms (HAI MDRO)
Foodborne and Diarrheal Disease (FDD)	Trichinellosis	Carbon Monoxide Poisoning
Respiratory and Invasive Bacterial Diseases (RIBD)	Babesiosis	COVID-19



Case Notifications: Challenges to Enhancing or Accelerating Data Collection, Surveillance, and/or Reporting

Case Notifications: Opportunities or Plans to Enhance or Accelerate Data Collection, Surveillance, and/or Reporting





Vital Records

✔ Present or implemented ➔ In progress ✖ Absent or not implemented ? Status unknown ● If not applicable leave gray

Data Exchange Mechanism

Steve 2.0 - State and Territorial Exchange of Vital Events System interface, developed by the National Association for Public Health Statistics and Information Systems (NAPHSIS) to securely transfer electronic vital records into the National Vital Statistics System (NVSS) at the National Center for Health Statistics (NCHS)

Vital Records Death Reporting FHIR Implementation Guide v0.1.0

Key Challenges Related to Vital Records Data Sharing and Reporting

Opportunities or Plans to Enhance or Accelerate Vital Records Data Sharing and Reporting



Contact Tracing

Present or implemented
 Absent or not implemented
 Status unknown
 If not applicable leave gray

Contact Tracing Tools

Salesforce

REDCap

Sara Alert

CommCare

Microsoft Arias

DOMO

MTX

Contact Tracing System is Interoperable With

Integrated Disease Surveillance System

Immunization Information System or Registry

Vital Records





Key Challenges to Contact Tracing

Opportunities or Plans to Accelerate Contact Tracing





Shared Services

Present or implemented
 Absent or not implemented
 Status unknown
 If not applicable leave gray

Shared Services Used

Shared Instance of REDCap	Analytics Support Services	RCKMS for eCR Implementation
iConnect Lab Web Portal (LWP)	FHIR Server	ESSENCE and NSSP Platform
Validation Services	File Routing	

Key Challenges Related to Shared Services

Opportunities or Plans to Enhance or Implement Shared Services





Workforce Capacity for Data Exchange and Systems Interoperability:

Workforce Proficiency Level

Data Exchange, Interoperability, and Standards



IT Platforms, Systems, and Software



Number and proficiency level of staff is

sufficient / not sufficient

to meet needs related to data exchange and systems interoperability.

Workforce Enhancements

Key Challenges Related to Data Exchange and Systems Interoperability

Opportunities or Plans for Integration

SECTION 4

DATA AND IT GOVERNANCE

DOMAIN 3





Data and IT Governance Activities Conducted

Present or implemented
 In progress
 Absent or not implemented
 Status unknown
 If not applicable leave gray

Develop an Innovation Management strategy to promote and govern innovation efforts

Adopt an iterative, continuous-delivery development model, (e.g., Lean-Agile [e.g. Scaled Agile Framework (SAFe)])

Adopt a DevOps/DevSecOps continuous integration and continuous delivery (CI/CD) model

Perform a Security Risk Assessment (SRA) to identify vulnerabilities, evaluate threats, and implement key security controls in software applications and/or applied Server Hardening techniques to improve the security and resiliency of infrastructure

Engage in routine Business Continuity Planning (BCP) to plan and execute processes and systems to effectively manage potential threats and keep facilities operational (e.g., disaster recovery and failover)

Employ a Data Quality Management (DQM) governance framework to employ and optimize processes, methods, and technologies

Employ Master Data Management (MDM) (e.g., Master Patient Index [MPI]) to provide governance, processes, and standards for critical data which benefit from a single reference point

Engage in Data Lifecycle Management (DLM) to govern the creation or receipt, management, and usage (e.g., publication, data sharing), archive (e.g., retention policies and system backups), and disposition of records at end of life

Adopt a standard operating procedure (SOP) for establishing and renewing memorandums of understanding (MOU) and data sharing agreements (e.g., DUAs)

Establish policies and procedures to ensure confidentiality and informed consent

Engage in digital IT Asset Inventory Management to dynamically catalog and manage hardware and software assets, licenses, networks/network devices, configuration, processes, documentation, and other HIT resources

Develop an API Strategy/API Management Plan that includes goals and objectives, documentation methods, version control, API policies, API lifecycle (e.g., plan, design, implement, test, publish, operate, maintain, monitor, and retire)



Continuous Monitoring Activities Conducted

✔ Present or implemented
 ➔ In progress
 ✘ Absent or not implemented
 ? Status unknown
 ● If not applicable leave gray

Continuous Discovery

Discovering and maintaining near real-time inventory of all networks and information assets including hardware and software; identifying and tracking confidential and critical data stored on desktops, laptops, and servers

Continuous Assessment

Automatically scanning and comparing information assets against industry and data repositories to determine vulnerabilities, prioritizing findings, and providing detailed reporting by department, platform, network, asset, and vulnerability type

Continuous Audit

Continuously evaluating client, server, and network device configurations and comparing with standards and policies; gaining insight into problematic controls, usage patterns, and access permissions of sensitive data

Continuous Patching

Automatically deploying and updating software to eliminate vulnerabilities and maintain compliance; correcting configuration settings including network access and provision software according to end-user's role and policies

Continuous Reporting

Aggregating disparate scanning results from different departments, scan types, and organizations into one central repository; automatically analyzing and correlating unusual activities in compliance with regulations

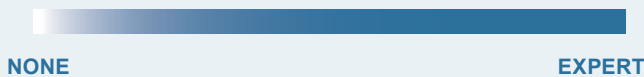
Workforce Capacity for Data and IT Governance

Workforce Proficiency Level

Data Governance



Data Operations



Data Security



Data Policy and Ethics



Number and proficiency level of staff is

sufficient / not sufficient

to meet needs related to data exchange and systems interoperability.





Workforce Enhancements

Key Challenges Related to Data and IT Governance

Opportunities or Plans Related to Data and IT Governance



SECTION 5

DATA ANALYTICS, VISUALIZATION, AND REPORTING DOMAIN 4





Data Analytics, Visualization, and Reporting Activities Conducted

✔ Present or implemented
 ➔ In progress
 ✘ Absent or not implemented
 ? Status unknown
 ● If not applicable leave gray

Employ advanced analytics, visualization, and reporting technologies to effectively enable integrated surveillance to inform public health action in real-time

Use a shared, advanced analytics platform to support data analysis, visualization and data synthesis across domains where data scientists can use their “tool-of-choice”

Publish de-identified datasets, data visualizations, or dashboards on public-facing website(s) and/or other channels to equip communities with diverse, real-time public health data that reflect local realities and enable faster decision-making

Maintain a web portal and/or other mechanisms by which local partners may securely access identifiable data sets, as appropriate, to support public health preparedness and response

Employ predictive analytics and/or other forms of computational modeling technologies to effectively engage in predictive modeling, analytics, and forecasting

Utilize artificial intelligence (e.g., machine learning, natural language processing) methods to link and process data from disparate sources and enable spatial clustering and enhanced temporal predictions

Notes



Workforce Capacity for Data Analytics, Visualization, and Reporting

Workforce Proficiency Level

Research and Evaluation Design



NONE EXPERT

Statistical, Geospatial, and Qualitative Analysis



NONE EXPERT

Programming and Scripting



NONE EXPERT

Artificial Intelligence



NONE EXPERT

Exploratory Analysis



NONE EXPERT

Data Visualization



NONE EXPERT

Data Synthesis and Dissemination



NONE EXPERT

Predictive Analytics



NONE EXPERT

Data Collection and Storage



NONE EXPERT

Data Quality Management



NONE EXPERT

Number and proficiency level of staff is

sufficient / not sufficient

to meet needs related to data analytics, visualization, and reporting.





Workforce Enhancements

Key Challenges

Opportunities or Plans for Data Analytics, Visualization, and Reporting



SECTION 6

CONCLUSION





Other Targeted Enhancements Implemented

Needed Resources



SECTION 7

PRIORITIES





NEXT STEPS

As a result of the annual assessment and stakeholder input on the assessment findings, the following data modernization and workforce development needs, opportunities, and plans have been identified:

Priority Needs or Gaps

Priority Opportunities or Plans to Address Needs or Gaps



Thank You

