

Public Health Data Modernization in Practice:

# Identification of Core Data Capabilities and Functions

for State, Tribal, Local, and Territorial Health Departments



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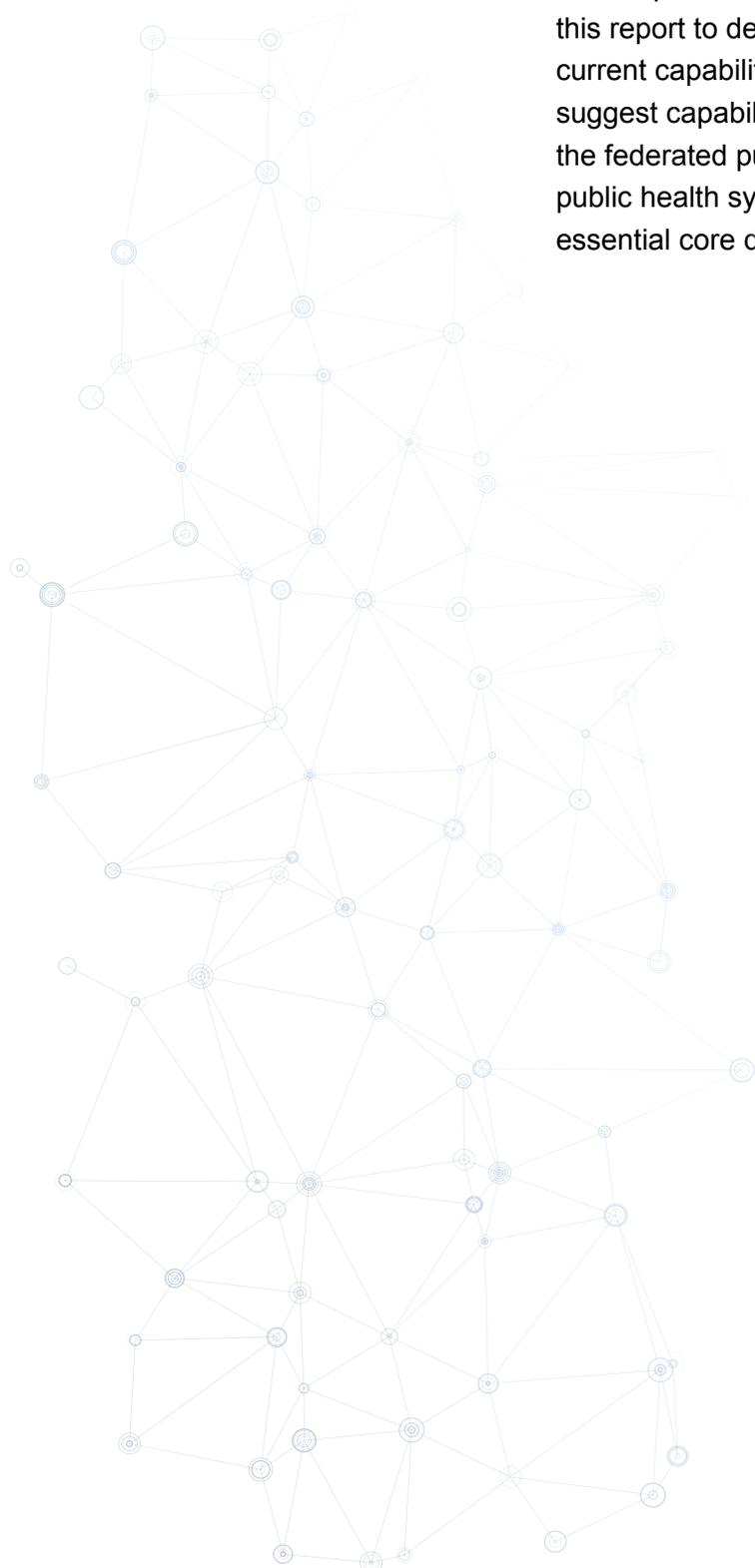
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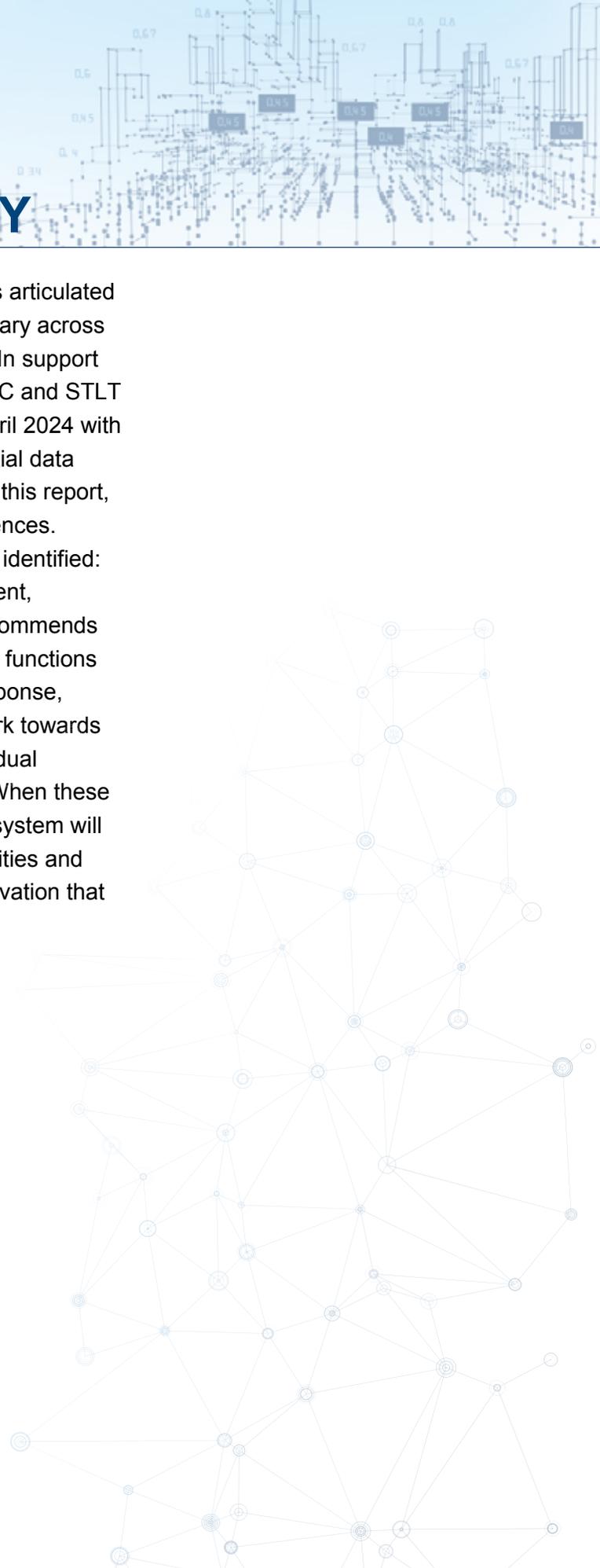
# AUDIENCE: WHO SHOULD USE THIS REPORT

This report is intended for state, Tribal, local, territorial (STLT), and federal public health agencies (PHAs) and their staff. They may use this report to define core data functions at their own agency, assess current capabilities to identify gaps or areas of need, as well as to suggest capabilities they can expect from agencies at other tiers of the federated public health system. This report can also support the public health system to collaborate across agencies and achieve essential core data capabilities.



# EXECUTIVE SUMMARY

During the 2023 Data Modernization Summit, attendees articulated the need to establish the baseline data capacity necessary across levels of public health to support the larger ecosystem. In support of this identified need CSTE, in partnership with the CDC and STL partners, convened a Data Modernization Summit in April 2024 with the purpose of identifying and documenting core essential data functions. The Summit generated the initial concepts of this report, which were then vetted across other public health audiences. Through this process seven data function families were identified: exchange, systems, standards, governance, management, analysis, and information dissemination. This report recommends that public health agencies identify the appropriate data functions most needed according to their role in public health response, leverage partners across tiers for collaboration, and work towards achieving universal core data capabilities both as individual agencies and as a collective public health ecosystem. When these core functions are achieved, the public health data ecosystem will be able to quickly and efficiently support response activities and data-driven decision-making and to support further innovation that ultimately creates a healthier population.



# BACKGROUND

## Report Purpose and Background

This work was initiated as a follow-up action recommended in the CSTE report, *Data Modernization Initiative – Priorities from State, Tribal, Local, and Territorial Public Health*<sup>1</sup>, the product from the prior CSTE Data Modernization Summit held in March 2023 (“2023 Priorities Report”).

This report’s purpose is to advance public health capacity for essential data functions across the many varied STLT PHAs by providing definitions of core capabilities and specific examples of these functions in action across tiers of the public health ecosystem. The content was developed through several rounds of input from the diverse thought leaders who attended the 2024 Data Modernization Summit and was refined via input from broader public health surveillance, informatics, and data modernization experts involved in CSTE’s communities.

The contents of this report represent a subset of the original full Summit purpose and only achieve the first objective that had been defined by the workgroup in preparation for the 2024 Summit. The additional objectives, including the development of strategy and identification of tools, remain opportunities for future work.

## Data Modernization Background

Data Modernization supports public health data systems improvement to “get better, faster, actionable insights for decision-making at all levels of public health”.<sup>2</sup> In late 2019, the CDC launched this effort following the first-ever appropriation of congressional funding. Data modernization activities were then initiated at STLTs immediately prior to the start of the COVID-19 pandemic, which required an unprecedented data-heavy public health response. That response highlighted the importance of timely and accurate data for public health decision-making, as well as the resilience and innovation within public health to leverage the influx of resources and update systems and skills while under immense response-related pressure.

<sup>1</sup> [https://cdn.ymaws.com/www.cste.org/resource/resmgr/pdfs/DML\\_priorities\\_report\\_final\\_1.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/pdfs/DML_priorities_report_final_1.pdf)

<sup>2</sup> <https://www.cdc.gov/data-modernization/php/about/dmi.html>



Challenges across the public health system related to data were an unfortunate and preventable manifestation of decades of underinvestment in public health data systems, which had been proactively documented in 2019 in the CSTE “Driving Public Health in the Fast Lane” report<sup>3</sup> - a major impetus behind the federal funding that launched the Data Modernization Initiative.

## Precursory Activities for This Report

The pandemic funds made available to transform and reinforce public health data infrastructure and resources provided an opportunity to take on essential transformational data modernization work at STLT PHAs. Many PHAs participating in CSTE’s related work expressed interest in a national data modernization strategy that accurately represented their needs and articulated a coordinated overarching blueprint. As a result, CSTE hosted an inaugural DMI Summit in 2023 to identify and publish priorities for modernization from the STLT perspective. The outputs from that DMI Summit resulted in the publication of the *2023 Priorities Report*. The priorities identified in that document informed initiatives undertaken by federal agencies, national non-governmental organizations, and PHAs.

To continue building upon the work initiated through the 2023 DMI Summit, CSTE provided member communities with opportunities to reflect on the stated priorities and identify pivotal next steps to support the forward progress of STLT data modernization. Key content from the *2023 Priorities Report* included the value of better defining core essential data functions. These include: “clearly defining needs at each jurisdictional level and understanding barriers and challenges” and “documentation of baseline expected technical capabilities... to support cohesion and interoperability across the entire public health ecosystem, to ensure needed functionality exists at all jurisdictions.”

CSTE’s members involved in data modernization emphasized the need for focused identification of core data functions as articulated in the *2023 Priorities Report*. In response to this input, CSTE planned and facilitated a second DMI Summit in 2024, which gathered an even broader representation of STLT informatics leaders to develop definitions for these core data functions.

<sup>3</sup> <https://www.cste.org/page/DM-2021>

# METHODS

## Summit Planning

A subset of CSTE Data Modernization Workgroup members volunteered to serve as the planning committee for the April 2024 Data Modernization Summit, held in Atlanta, Georgia.

Invitees for the Summit were identified from the Data Modernization Workgroup, in addition to others identified by CSTE staff members who would increase the diversity and representativeness of STLT agencies in attendance. This 2024 Summit expanded the breadth and depth of participation in comparison to the 2023 Summit, including representation from additional local, Tribal, and territorial public health agencies. The Summit also included several joint sessions with STLT participants attending a separate meeting of the Chronic Disease Modernization Partners' Network. While this meeting was planned separately from the Summit, joint sessions were scheduled to foster more inclusive strategies and solutions across public health domains.

## Summit Purpose

The planning committee defined the overall purpose and objectives of the Summit as follows:

- To define core essential capacity at all levels of the public health system in terms of key data sources, technologies, processes, policies, and staffing needs for achieving universal data exchange and modernized capabilities across the entire public health ecosystem (the “core data functions”).
- Identify tools or strategies that may help PHAs at all levels build capacity, advance their data modernization efforts, and monitor/track progress.



## Summit Objectives

- Describe core data functions at each level of the public health ecosystem needed to meet basic needs in all jurisdictions.
- Identify successful strategies and develop recommendations to support the achievement of essential core capacity and to work toward universal data exchange and systems/infrastructure functionality across the public health ecosystem to promote its agility and efficiency as a whole system as well as ability to exchange data with partners, especially health care.
- Discuss implementation and integration of leading-edge innovation, and how to scale adoption across all PHAs.
- Understand and apply existing maturity models and related tools and resources.

Input into the core data functions was ultimately sought through multiple engagements over time and can be categorized into work done in pre-summit preparatory sessions, at the summit itself, while crafting the summit outputs, and during post-summit input sessions.

## Pre-Summit Work

Pre-Summit virtual preparatory meetings convened the registered attendees and asked them to brainstorm data functions within the following domains:

- Data Receipt / Collection
- Data Management
- Data Exchange
- Other Data-Related Capabilities

As a group activity, individual participants identified new core data functions to add to the list, or “up voted” functions that had been identified by other participants. This process resulted in a large list of public health data functions that served as the foundation for Summit work (see [Table 1](#) in the appendices).

## Summit Work

The functions initially identified at the pre-Summit meetings were leveraged as raw source material for small-group prioritization activities during the Summit. Participants were grouped by jurisdiction features and were asked to indicate the importance of each of the listed core public health data functions using a numerical rating scale from 1-10, with higher numbers indicating greater importance. Table 1 summarizes Summit outputs identifying core STLT data functions and the relative priorities of each function for different tiers of public health (see Appendices).



## Summit Output Writing

CSTE contracted with a technical writing team to produce a written report summarizing the Core Essential Data Functions. This group distilled the raw core functions list and Summit output material into an initial categorized list of core data function families, functions, and examples and initiated multiple rounds of feedback and input from Data Modernization Workgroup members and Summit participants.

## Post-Summit Input

Following the Summit, additional input was gathered through the following methods:

- CSTE hosted a small in-person roundtable discussion during the CSTE Annual Conference in June 2024, during which participants reviewed the working version of the Core Data Functions and provided input into further development.
- CSTE also offered working products to the Chronic Disease Modernization Partners' Network and welcomed their input.
- CSTE hosted a discussion during the Surveillance Practice Implementation Subcommittee call on November 1, 2024, with approximately 200 attendees representing varied agency types and professional roles. This conversation provided insight into attendees' perceptions around the ability to use this work as a tool, measures of progress and success, and necessary resources.

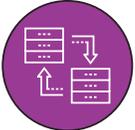
# RESULTS

The content developed during the Summit was grouped into the following seven larger data function families: exchange, systems, standards, governance, management, analysis, and information dissemination. The matrix below presents each of these function families and their core data functions. Some specific examples of the functions are presented below in the corresponding sections as well as in the full [Table 2](#) matrix provided in the appendix. All specific

examples presented are a selected subset and not intended to represent all possible examples of a given core data function. While developing the matrix, those providing input decided to write and include definitions as an appendix rather than embed these within the matrix itself (see Appendices for complete list of “Definitions”). All terms in italic font within [Table 2](#) have definitions and examples within the appendices.

## Matrix of Core Data Function Families

Note: Words in italic font have definitions and examples in the [appendices](#). Specific examples of the functions are listed in subsequent sections.



### Exchange

- Receipt of electronic *public health data* transmitted to PHAs
- Support outbound and inbound queries for *clinical data* and *public health data*
- Actively collect *public health data* (e.g., portals for environmental health file uploads, disease registries)
- Transmit data



### Systems

- Evaluate, update, and maintain existing systems and software, and develop or procure and implement new technology solutions and software that support public health use cases
- Leverage an *electronic disease surveillance system(s) (EDSS)* or integrated disease surveillance system (IDSS) for data ingestion, management, and reporting of conditions



## Standards

- Adopt, implement, and utilize standards
- Contribute towards development and adoption of standards



## Governance

- Establish enterprise data governance
- Organize jurisdictional data for access and provisioning in public health
- Plan, implement, and maintain data sharing policies and practices across tiers of STLT PHAs to engage in collective data governance with partners
- Develop and maintain data-related policies and procedures



## Management

- Maintain storage and management of *public health data*
- Perform system architecture management
- Perform deduplication and create unique person data matching, and establish linkages between data sources
- Maintain access to data on social determinants of health for analysis and public health decision making
- Ensure data quality
- Ensure data privacy, confidentiality, and security



## Analysis

- Perform analysis of *public health data*
- Develop analytics and forecasting capabilities
- Ensure analysis management, transparency, and review



## Information Dissemination

- Ensure data dissemination to the public, the people and communities those data represent, and public health leaders / decision makers and programs
- Interpret data and tell stories with data

## Tiers of Public Health Agencies

Contributors to this work acknowledged that the core data functions will vary across types and levels of the diverse federated public health system; certain agencies will need to possess core data functions that others may not need due to the agency's public health role, resources, and activities. **This report refers to the variation in size, role, agency type, and governmental level as “tiers” and henceforth specifically considers the roles that encompass data**

**functions as needed at the frontline, state, Tribal, and federal areas of responsibility.** Any given public health agency exists in the complicated federated public health structure and may possess specific roles described in multiple tiers below. Public health agencies are encouraged to read the roles below and find themselves in one or more tiers that best align with their work.



Local, Tribal, Territorial, or at times Smaller Centralized State Public Health Agencies

The **Frontline Tier** is intended to represent activities related to direct response to single instances or clustered disease events through individual, person-level, or community interventions, and is most often performed by local, Tribal, territorial, or at times smaller centralized state public health agencies. Importantly, the frontline is often responsible for the generation of key data that are supplied to and inform other tiers. These are the public health professionals and agencies who field reportable conditions reports and initiate corresponding response activities within their jurisdictions (e.g., case investigations), according to their own policies, regulations, and procedures. The frontline tier is often the source of public health data (including case-level data), requires higher granularity and presence of identifiers, and provides some of these data to other tiers to contribute to national surveillance and to enable the state and federal tiers to fulfill their roles.



States, Territories and some Large Local Health Departments

The **State Tier** is intended to represent specific activities performed not only by states, but also territories and some large local health departments. Responsibilities include maintaining systems and processes that support the frontline tier and acting as a conduit to exchange information with public health agencies at other tiers, such as reporting to the federal tier, sending interjurisdictional notifications to other states, and either routing or providing access to centrally received public health data to localities. The state tier can serve as a strong enabler of or obstacle to data capabilities because it serves as a conduit and connection point between other tiers. States also lead policy work regarding data and oversee exchange of information with partners in other sectors (e.g., healthcare, agriculture, environmental regulators, etc.). They also lead and participate in public health response activities for larger disease investigations, especially multistate outbreaks.



### Tribes and Tribal-Serving Institutions

The **Tribal Tier** is broad, as the landscape of Tribes and Tribal-serving institutions is both complex and diverse, and within the context of this document, it is anticipated that not all members of those Tribes and Tribal-serving institutions will see all their specific needs identified. This limitation is acknowledged, and it is hoped that Tribes and Tribal-serving institutions can identify with the higher-level core functions and use this tool to further their progress towards achieving self-determined core essential data functions best suited to Tribal needs.



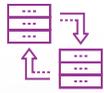
### US Centers for Disease Control and Prevention

The **Federal Tier** refers mainly to the US Centers for Disease Control and Prevention (CDC), whose responsibilities include, but are not limited to, oversight of nationally notifiable conditions surveillance, sharing national data with the public, scientific community and decision-makers, leveraging national data to build a body of condition-specific knowledge and subject matter expertise, developing data-driven public health guidance, and connecting disparate data from jurisdictional contributors into an informed and cohesive national picture. The CDC has also been the major source of funding for public health at state, local, and territorial agencies, including leveraging grants and cooperative agreements to provide resources for data systems, technology infrastructure, and related workforce.

Given the stated need to articulate differences between core essential data functions across these tiers, contributors developed operational definitions of each tier's role and purpose across the seven data function families.

The next sections define the core data functions, organized by each data function family and inclusive of select specific examples. Following each function family matrix and description, the PHA capabilities and roles subsections

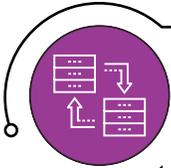
describe the differences across tiers based on the unique role and function at each tier. PHAs should seek to evaluate both their individual agency capacity as well as the collective capacity across the public health landscape achieved through partnership across the tiers. The core data functions are basic essential capacities that public health must achieve; they are not intended to restrict individual PHAs from pursuing even more advanced functioning.



## Data Function Family 1: Data Exchange

Core Data Functions	Specific Examples*
<p><b>Receipt of electronic public health data transmitted to PHAs</b></p>	<p>(Selected subset, not intended to be an exhaustive list)</p> <p>Act as endpoint to receive <i>public health personally identifiable information (PII)</i> data through public health reporting feeds (e.g., ELR, eCR, syndromic surveillance)</p> <p>CDC receives individual case notification messages from state and territorial PHAs via Message Mapping Guides</p> <p>Maintain portals for electronic <i>clinical data</i> or <i>public health data</i> uploads from partners (CSV uploads, etc.)</p>
<p><b>Support outbound and inbound queries for clinical data and public health data</b></p>	<p>Leverage modern technologies and infrastructures to actively look up additional needed <i>clinical data</i> or <i>public health data</i> (e.g., FHIR, TEFCA, etc.)</p> <p>Manual lookup of electronic <i>clinical data</i> in healthcare data systems, data portals, health information exchanges, or electronic health records systems.</p> <p>Respond to received queries for <i>public health data</i></p>
<p><b>Actively collect public health data (e.g., portals for environmental health file uploads, disease registries)</b></p>	<p>Collect data on population health through community-level surveys (e.g., BRFSS, NHANES)</p> <p>Maintain systems or tools that collect data through public health investigations or interviews (e.g., REDCap)</p>
<p><b>Transmit data</b></p>	<p>Share interjurisdictional <i>public health PII</i> data between PHAs</p> <p>Send investigation data between STLT and federal partners to support shared public health response activities, potentially including exchange of data analytics and datasets</p> <p>Bidirectional <i>public health PII</i> data (e.g., Immunization information between providers and registries)</p> <p>Respond to individuals' requests for access to their own data as needed (e.g. individual immunization records)</p>

\* Some selected examples, not intended to be an exhaustive list. Italics indicate terms further defined in the appendix.



## Data Exchange

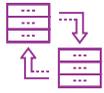
Data exchange is an essential and foundational data function for public health. Public health's ability to exchange information, both identifiable and not, across different tiers of government and with partners like healthcare, laboratories, other jurisdictions, and community leaders is critical to public health practice. This information allows for early detection and rapid response to changing trends in diseases and potential threats, leveraging appropriately tailored interventions. These data inform policy decisions and resource management at the jurisdictional level. Additionally, this exchange can be bidirectional, ensuring that data contained in public health systems support public health activities in the healthcare setting. Data exchange inefficiencies can lead to data gaps and delay response activities.

Electronic data exchange across public health and healthcare is a complex challenge. Technical solutions require compliance with public health agency policies and security requirements. Upgrades to the systems and processes supporting data exchange often have substantial costs. Therefore, exchange methods have changed slowly over time from paper-based, manual processes to more efficient modern technology. Exchange between partners retrogresses to the technical capabilities of the lowest common denominator, meaning that all entities are reliant on collective capacity to leverage efficient, modern methods.

Public health has made significant strides in modernizing data infrastructure as the use of electronic laboratory reporting (ELR), syndromic surveillance, and electronic case reporting (eCR) have been introduced and adopted by PHAs across the country. Many PHAs now receive nearly all their laboratory reports via ELR<sup>4</sup> as compared to receipt by fax or mail that was the norm when data modernization began. However, there remains continued use of faxing and manual data entry as an exchange method across public health, even including data delivery from STLTs to the federal tier. Momentum and progress in this area is continuing as public health navigates the legal, policy, and technological needs to support further modernized exchange with essential partners.

Within this Exchange function family, the listed core data functions demonstrate the need to address data exchange with varied but strategic approaches based on both the sender and receiver, and whether the public health action requires individual line-level identified data versus other formats. Data exchange strategies should ensure that the appropriate public health authority can access high-quality, timely, necessary data that support their direct public health role and actions to protect and promote health.

<sup>4</sup> <https://www.pewtrusts.org/en/research-and-analysis/reports/2024/12/state-public-health-data-reporting-policies-and-practices-vary-widely>



## Data Exchange PHA Capabilities and Roles



### Frontline Tier

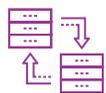
Data exchange can support frontline PHAs by ensuring provision and access to essential data that drive the activities and interventions performed. For the purposes of data exchange, frontline local and Tribal PHAs often rely on their partnering state-level agency which typically receives data from reporting partners first and must, in turn, identify the frontline jurisdiction and either provide direct access to data or route them appropriately. Frontline PHAs are highly varied in size and level of resources, as this category encompasses both small rural county health agencies as well as the largest urban areas. Therefore, the individual capacity to establish modern electronic data exchange may vary at the frontline level; some agencies may have robust capacity for development. Ideally data exchange for the frontline level would have the benefit of both collaborative relationships with partner PHAs as well as sufficient technical and financial resources to equip them as a ready partner. To best meet frontline public health response needs, data exchange processes should be efficient and informed by how the PHAs use the data.

Additionally, frontline public health generates public health data through response activities, such as case patient interviews or contact investigations, and must have efficient methods to exchange relevant data with other tiers of STLT PHAs or with other jurisdictions.



### State Tier

State and territorial PHAs either perform frontline activities themselves or readily exchange information electronically with local or Tribal PHAs who perform this work; they act as a conduit and data adjudicator for partners at other tiers. Data exchange at the state / territorial tier is focused on the ability to leverage current technology and standards to both receive and send data from healthcare and other PHAs using well-defined and standardized public health data exchange technologies. This ensures timely and informed public health action by frontline staff and accurate situational awareness across levels. State- and territorial-level agencies also are charged with federal reporting and perform related data exchange tasks for national situational awareness, such as case notification.



## Data Exchange PHA Capabilities and Roles



### Tribal Tier

Tribal public health agencies who perform frontline response activities require timely and accurate data regarding the conditions and individuals impacted. Their response activities are best facilitated through access to electronic report data and related surveillance system(s) and require efficient methods for data exchange with other levels (local, other Tribal, state, and / or federal). When operating in a centralized structure, Tribal PHAs' data exchange core functions include the ability to utilize current technology to send and receive data with reporting entities and other STLT levels (state / federal) and make data available to frontline staff for public health action.



### Federal Tier

Data exchange at the federal level involves receiving and ingesting crucial public health data from STLTs; it may also engage in direct data exchange with healthcare. Data exchange for public health at the federal level supports both high-level national situational awareness for detection of threats and trends not visible in smaller datasets, as well as building understanding and subject matter expertise as a national resource for coordinated public health response. Federal organizations' core data functions for the Exchange family focus on their ability to provide efficient and reasonable data exchange technologies, establish requirements for public health agencies that achieve national surveillance goals without undue burden on reporting partners and compliance with policies related to access and use of the minimum data necessary, and provision the data within their agencies for all necessary surveillance purposes.



## Data Function Family 2: Data Systems

### Core Data Functions

### Specific Examples\*

(Selected subset, not intended to be an exhaustive list)

**Evaluate, update, and maintain existing systems and software, and develop or procure and implement new technology solutions and software that support public health use cases**

Evaluate, test, and implement data integration building blocks<sup>5</sup> and / or microservices

Identify, evaluate, and invest in shared services (e.g., master person index (MPI), cloud, dashboards, etc.)

Procurement and maintenance of *systems*

Participate in requirements gathering and procurement, development, and implementation of systems at partner PHAs when related to shared work

Conduct data systems assessments (e.g., environmental scan and inventory)

Utilize and maintain nationally-provided, homegrown, commercial or open-source additional public health registries and data systems

**Leverage an *electronic disease surveillance system(s) (EDSS)* or *integrated disease surveillance system (IDSS)* for data ingestion, management, and reporting of conditions**

Utilize, modernize, and maintain a nationally provided, homegrown, commercial or open-source EDSS / IDSS

Capability to capture and store essential data elements, including those obtained through public health interviews and investigations and not present in clinical records

Integrate other types of data through connections to other systems or databases, such as through record linkages (e.g., immunization or death registries) or API interfaces

\* Some selected examples, not intended to be an exhaustive list. Italics indicate terms further defined in the appendix.

<sup>5</sup> <https://cdc.gov.github.io/dibbs-site/>



## Data Systems

Public health agencies at all tiers require modern, efficient, and powerful software systems that can deliver timely and accurate data. These systems provide public health practitioners with the ability to identify single consequential diagnoses, detect aberrations and patterns of disease distribution, add supplemental information, and share detailed or summary information with other tiers of the public health ecosystem as appropriate. These systems are often called electronic disease surveillance systems (EDSS) or integrated disease surveillance systems (IDSS) within the communicable disease workspace, or the disease registries or health information systems (HIS) utilized across other public health program areas. They can be costly to own and operate, have not benefited from stable or sufficient funding resources to keep pace with technology, and have been developed and maintained from historically siloed programmatic funding approaches that have not allowed broader disease-agnostic technology solutions. These realities further increase the need for sustained funding and a skilled workforce capable of ensuring alignment with evolving data standards. These systems must operate as the end point of inbound data exchange and the source of outgoing data.

Many STLT PHAs are recognizing gaps in their existing HIS and EDSS / IDSS systems and are considering solutions including additional modernization investment in existing systems or acquisition and implementation of new systems. Most critical in this endeavor is ensuring that comprehensive and detailed requirements for system capabilities and functions are developed to effectively categorize those existing gaps and serve as the vetting mechanism for any possible replacements. Tools to facilitate this work are available freely for public health<sup>6</sup>. Additionally, STLTs should ensure routine evaluation of all systems in their enterprise to avoid redundancy and to identify the opportunity for cost savings; in many cases, federal funding supporting these systems requires this level of system catalogue. Such inventories and evaluations will also help to identify if a newly requested capability or system could be integrated into an existing system, benefiting more than one program and potentially presenting cost and resource savings. Further, consideration should be made to newly available microservices or building blocks that could address limitations with existing systems. Modernization pilots conducted by the CDC and select STLTs have begun developing tools that may allow existing systems to perform with renewed capabilities<sup>7</sup>.

<sup>6</sup> <https://phii.org/crdm/>

<sup>7</sup> <https://cdc.gov.github.io/dibbs-site/>



## Data Systems

### PHA Capabilities and Roles



#### Frontline Tier

Modern and functional data systems are essential to the effectiveness of frontline public health work. Acknowledging that most of the public health generated data occurs at this tier, it is critical that the systems utilized both provide clear and timely information on new health events so that investigations or follow-up can occur, and that they provide simple interfaces that allow data to be entered into the system. While the individual systems in use may be different, they should be able to seamlessly integrate towards exchange points without requiring redundancy in data entry.

Whether the frontline PHA hosts their own systems or utilizes systems managed by another tier of the public health ecosystem, the frontline contributes to assessments of health information system(s) that aim to identify and document gaps in key data or functionality for public health response. In addition, they contribute to and maintain processes that support and ensure the collection and use of high-quality data.



#### State Tier

PHAs in the state tier conduct assessments of health information system(s) to prioritize those needing enhancement or replacement in order to meet current and future data collection needs. They provide individual, modular, and reusable public health information systems as well as strategically connected infrastructure that meets public health response and intervention needs; systems should be modern, customizable, interoperable, and secure. These PHAs consider access to systems and provision to partner PHAs at the local or Tribal tier as needed.



## Data Systems

### PHA Capabilities and Roles



#### Tribal Tier

In a frontline capacity, Tribal PHAs contribute to assessment(s) and / or provide feedback on health information system(s) to identify gaps to key data or functionality to meet public health response needs and alignment with unique Tribal structure. As a centralized structure, Tribal PHAs conduct assessments of health information system(s) and provide systems as well as strategically connected infrastructure that meet response and intervention needs; systems should be modern, customizable, interoperable, and secure. Consider access to partner PHAs at the state, local, or other Tribal tiers as needed.



#### Federal Tier

Federal public health organizations promote the use of modern and interoperable health information systems. As needed, they may develop, host, offer, fund, implement, or provide ongoing maintenance / technical assistance for systems that equip jurisdictions to fulfill crucial functions.



## Data Function Family 3: Data Standards

Core Data Functions	Specific Examples*
<b>Adopt, implement, and utilize standards</b>	<p>(Selected subset, not intended to be an exhaustive list)</p> <p>Pilot, test, and implement data standards</p> <p>Build systems and exchange methods that receive, process, and use standardized data</p> <p>Programs use standardized data in PH data analysis, data presentation, and decision making (e.g., age, language, race / ethnicity, etc.)</p>
<b>Contribute towards development and adoption of standards</b>	<p>Comment on <i>standards</i>, help develop or improve <i>standards</i></p> <p>Participate in pilots that test, scale or leverage new standards (e.g., Helios, etc.)</p>

\* Some selected examples, not intended to be an exhaustive list. Italics indicate terms further defined in the appendix.



### Data Standards

Standards are essential to the interoperability of data and the comparability of those data across populations. Within public health, the use of standards developed initially for healthcare has become foundational. Organizations such as the Assistant Secretary for Technology and Policy (ASTP)/ Office of the National Coordinator (ONC), curator of the United States Core Data for Interoperability (USCDI) and USCDI+ that incorporates public health and other use cases, and Health Level Seven International (HL7), which provides a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information<sup>8</sup>, are integral to efficient and effective data exchange and utilization.

Involving PHAs in the standards development and implementation process is essential to ensure that those standards incorporate unique public health needs. While there is a strong correlation between healthcare and public health, differences exist, and they must be recognized and reflected in standards to ensure data interoperability. For many years, a few public health voices have endeavored to speak for the entire community, but this must change.

<sup>8</sup> <https://www.hl7.org/about/index.cfm?ref=nav>



## Data Standards

The larger body of applied public health professionals has had limited participation in standards bodies and commenting processes in large part due to the real or perceived time commitments and / or technical expertise required. Public health participation in standards bodies and processes can increase with explicit support from public health agencies, which can take actions like building these activities into position descriptions and dedicating personnel time to related efforts. STLTs should consider incorporating involvement in the standards process into specific roles so that those practitioners become not only familiar with the process but members of that community. Federal funding that supports existing technical positions can include language that encourages standards-related work. This action can help ensure the continuity of public health voices in that space.

To ensure that standards fit the needs of public health, jurisdictions and practitioners should participate in pilot efforts to test standards that are new to public health. Fast healthcare interoperability resources (FHIR)<sup>9</sup> are examples of this. FHIR, a data structure, terminology, and transport standard from HL7, was designed for healthcare and offers potential for data exchange with public health, using modern technology to share data more quickly and efficiently. To validate this, the Helios project<sup>10</sup> was created to gather public health early adopters and identify, develop, and test use cases. This project continues today and has evolved from theoretical conversations with a small handful of public health participants to robustly attended connect-a-thons where those use cases are tested and enhanced in real time. Participation in these early phases of a new initiative can be challenging due to ongoing demands; however, that participation helps to ensure that proposed solutions are vetted or that enhancements are identified early in the process, thereby shortening the ultimate process for the public health community.

Standards are of benefit when fully leveraged, meaning the systems and exchange processes utilize standards-based data elements and exchange formats as defined in implementation guides and other guidance documents. The entire public health landscape should take data standards into consideration when building, updating, or maintaining systems and work towards maximum adherence to standards to the extent possible. National adoption of standards can reduce the onboarding burden on both clinical healthcare and public health by minimizing the need to re-validate during each new connection.

<sup>9</sup> <https://www.hl7.org/fhir/>

<sup>10</sup> <https://confluence.hl7.org/display/PH/Helios+FHIR+Accelerator+for+Public+Health+Home>



## Data Standards

### PHA Capabilities and Roles



#### Frontline Tier

Frontline PHAs should ensure that local data collection utilizes standards-based values and value sets, and that systems are informed by standards and can process data received in accordance with those standards. They should identify and communicate when existing value sets do not meet the needs of public health activities and are able to do so because they maintain awareness of national standards conversations, and when possible, provide input. When local response needs are so highly customized that they require data elements unlikely to be incorporated into national standards, they can maintain data dictionaries and potentially conversion mappings to best meet both local and national needs.



#### State Tier

PHAs in the state tier should also ensure that local data collection utilizes standards-based values and value sets, that systems and value sets within systems are aligned with national standards, and that systems can process data received in accordance with those standards. These jurisdictions should identify and communicate when existing value sets do not meet the needs of public health activities and participate in national standards conversations when possible. State tier PHAs can also rely on standards-based exchange and leverage feed onboarding and validation requirements that vet incoming data against national standards.



## Data Standards

### PHA Capabilities and Roles

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#### Tribal Tier

Tribal PHAs' roles, capacity, and priorities related to data standards may vary widely. When involved in system design, development, or maintenance, they can ensure that local data collection utilizes standards-based values and value sets, that systems and value sets within systems are informed by standards, and that systems can process data received in accordance with standards. They can also participate in the standards development and commenting processes by identifying and communicating when existing value sets do not meet the needs of public health activities and/or Tribal sovereignty. They may also participate in national standards conversations when possible and as necessary to ensure that Tribal data needs, values, and sovereignty are represented.



#### Federal Tier

Federal public health organizations must develop, maintain, and promulgate, in collaboration with STLT representatives, end-to-end use of standards for coordinated national surveillance. This includes using standards-based exchange methods and technology for data coming into and out of CDC data systems, leveraging data standards for surveillance questions on case report forms, and ensuring that CDC systems (internal and external) can leverage standardized data elements. Such organizations also support STLT engagement in standards development, for example by providing open comment periods during standards development and explicitly encouraging federally funded STLT positions to dedicate a proportion of time to these activities.



## Data Function Family 4: Data Governance

Core Data Functions	Specific Examples*
<b>Establish enterprise data governance</b>	<p>Define and maintain data retention policy</p> <p>Develop and maintain a data inventory or data catalogs</p>
<b>Organize jurisdictional data for access and provisioning in public health</b>	<p>Enterprise data warehouse / lake</p> <p>Create and leverage data catalogs or other metadata resources</p>
<b>Plan, implement, and maintain data sharing policies and practices across tiers of STLT PHAs to engage in collective data governance with partners</b>	<p>Identify and establish relationships with all jurisdictional Tribal entities</p> <p>Document mutually agreed upon procedures for the use and publication of Tribal-specific data, per Tribal direction</p> <p>Promote awareness and active inclusion of partners in shared data governance</p> <p>Develop standardized data sharing/use agreements</p>
<b>Develop and maintain data-related policies and procedures</b>	<p>Execute data sharing / use agreements (DSA / DUA) with partners, and develop data sharing protocols and data release procedures within the PHA</p> <p>Develop and maintain policies that ensure the anonymity of individuals and confidentiality of personally identifiable information</p> <p>Establish and publish reporting/reportability requirements</p>

\* Some selected examples, not intended to be an exhaustive list. Italics indicate terms further defined in the appendix.



## Data Governance

Data governance refers to the capacities, capabilities, and processes of an organization to ensure that data are secure, private, accurate, available, and usable. While data governance has existed within the public health space for decades, with recent advancements it is critical to modernize data governance principles along with technology. Clear data governance frameworks in an increasingly interconnected technical environment assure data security, minimum necessary access, tracking of data assets, and individual privacy regarding sensitive diagnoses and behavioral risk factors. The modern data governance approach involves not only information technology professionals but also programmatic staff and others who may previously not have been involved but may possess intimate knowledge of the data, leading organizations to pursue a larger “enterprise” approach to data governance.

Core to the governance process is the establishment and maintenance of agreements that define how data can be shared and used. This process is confounded (real and perceived) by the variations in the STLT and federal rules and regulations that define data privacy. Efforts must be made to develop and execute data sharing agreements (DSAs) and / or data use agreements (DUAs) that place the correct data in the hands of individuals and organizations to communicate with and impact the health of specific populations. Historically, gaps have existed between some STLT PHAs as it relates to data access for Tribes and Tribal organizations. This has been influenced by perception and confusion of the laws and treaties related to Tribal sovereignty (i.e., the inherent right of Tribes to govern themselves). The 2024 CSTE policy brief *Enhancing Data Access to Improve American Indian and Alaska Native Health: A Framework for State and Local Public Health Officials*<sup>11</sup> provides guidance on steps that can be taken to enhance data access for Tribes and Tribal organizations. PHAs make critical decisions regarding data governance given the many sources of data in hand, and they are essential parties to ensure that data governance approaches carefully balance crucial data access for partners with intentional limitations to protect patient confidentiality and adhere to best practices of minimum necessary access.

<sup>11</sup> [https://cdn.ymaws.com/www.cste.org/resource/resmgr/briefs/24-PB-TE-01\\_Final.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/briefs/24-PB-TE-01_Final.pdf)



## Data Governance

### PHA Capabilities and Roles



#### Frontline Tier

Frontline PHAs have the greatest engagement with the people and organizations in the communities they serve and should have visibility to the data available to them to inform communication, policy, and priorities, and should seek agreements with upstream data providers for access to those data. Locally, they should have awareness of and participate in data governance through compliance and use of established rules, policies, and procedures. They identify internal and external parties with data needs and utilize the appropriate tools, (i.e., DSAs), to document and fulfill those needs. They ensure that Tribal sovereignty is observed, that DSAs are executed, and that data are made available to Tribes and Tribal organizations.



#### State Tier

State PHAs play an essential role in providing data access to their partners in other tiers, in accordance with the roles the others play in public health activities. This means ensuring that those STLT tiers most connected to frontline response, such as locals and Tribes, have the data they need to perform their functions. Data governance in the state tier involves implementing and / or participating in enterprise-level approaches, meaning consideration of data access and use across an agency in a consistent manner. These jurisdictions develop and share rules, policies, and procedures to enable the standardized use and sharing of data. They identify internal and external parties with data needs and utilize the appropriate tools to document and fulfill those needs. They are also aware of and ensure that Tribal sovereignty is respected and recognized, that DSAs are developed and executed with the engagement of Tribes and Tribal organizations, and that feedback is incorporated into agency data governance practice.



## Data Governance

### PHA Capabilities and Roles



#### Tribal Tier

Tribal PHAs develop and / or use governance policies, procedures, and tools that ensure the optimized utilization of data. They should seek to establish DSAs with both upstream and downstream partners and share knowledge of resources available to aid in the development of DSAs.



#### Federal Tier

Federal public health organizations implement and / or participate in internal agency-level data governance and support other tiers in collaboratively developing enterprise approaches across the whole public health landscape. They identify internal and external parties with data needs and leverage DUA language for data presentation, access, and release that ensures the anonymity of case patients. They also promote and support the development of STLT data governance through funding and development of standardized tools.



## Data Function Family 5: Data Management

Core Data Functions	Specific Examples*
<b>Maintain storage and management of public health data</b>	<p>(Selected subset, not intended to be an exhaustive list)</p> <p>Ensure availability and disseminate data to state, Tribal, local, and territorial (STLT) professionals for data analysis and interpretation - common infrastructure to access data and automate analyses</p> <p>Enterprise resources for data management, like data warehouse / lake and data processing tools</p>
<b>Perform system architecture management</b>	Employ Enterprise Architecture
<b>Perform deduplication and create unique person data matching, and establish linkages between data sources</b>	Master person index (MPI); privacy-preserving record linkages (PPRL)
<b>Maintain access to data on social determinants of health for analysis and public health decision making</b>	Gravity Project, Community Information Exchanges
<b>Ensure data quality</b>	<p>Evaluate, measure, and monitor data quality</p> <p>Ensure and continuously work to improve data quality - including onboarding, testing, evaluating and iterating with reporters on data quality, along with instituting processes to standardize, filter and extract meaningful data from incoming electronic feeds</p>
<b>Ensure data privacy, confidentiality, and security</b>	<p>Ensure that data are shared as needed for PH action, while maintaining privacy / confidentiality and data integrity</p> <p>Establish information security officer review and engage industry standards, third-party audits, Privacy Officer, Attorney General</p>

\* Some selected examples, not intended to be an exhaustive list. Italics indicate terms further defined in the appendix.



## Data Management

Data management represents a broad range of activities related to the storage, quality, availability, and security of data. Data governance may set the policies and procedures for data access and release, whereas data management leverages technology and subject matter expertise to enable implementation that allows for productive, secure, and efficient data use.

Historically separate programmatically focused funding sources have led to the creation of numerous, disparate data repositories for many STLT PHAs. This data landscape creates barriers to the accessibility and utilization of data. Transitioning to an agency-wide, or enterprise, approach for the management of data is not typically a quick and easy process; however, the investment can result in greater access, utilization, trust, security, and potential sustainability of public health data. These management practices ensure timely access to high quality data which is crucial during public health responses. Undertaking the establishment of enterprise data management requires executive endorsement, prioritization, and support, in addition to extensive outreach to and buy-in from data owners and users. Efforts should be made to develop a robust change management and communications plan.



## Data Management PHA Capabilities and Roles



### Frontline Tier

Frontline PHAs are aware of and utilize enterprise systems and data resources as available from other STLT tiers for public health action or develop and securely maintain local data in accordance with enterprise guidance and policy. They also identify when frontline needs are not addressed by existing resources and contribute to defining solutions.



### State Tier

In the state tier, PHAs develop and / or utilize an enterprise approach to systems and data management that leverages automated pipelines to ensure that high-quality data are available for public health action and are securely maintained.



### Tribal Tier

Tribal PHAs develop and / or utilize an enterprise approach to systems and data management that ensures high-quality data are available for public health action and are securely maintained.



### Federal Tier

Federal public health organizations develop and / or utilize an enterprise approach to systems and data management that ensures high-quality data are available for public health action and are securely maintained. They also ensure that STLTs have the resources needed for effective data management. They must also provision data assets to meet internal programmatic needs while minimizing silos and reducing redundancies.



## Data Function Family 6: Data Analysis

### Core Data Functions

### Specific Examples\*

(Selected subset, not intended to be an exhaustive list)

#### Perform analysis of public health data

Perform *data analysis*, including statistical analyses and modeling

Perform visualization and reporting

#### Develop analytics and forecasting capabilities

Ensure training is available, and time dedicated to developing a skilled workforce

#### Ensure analysis management, transparency, and review

Develop *analytic policies and tools* to enable the development of high-quality analytic products

\* Some selected examples, not intended to be an exhaustive list. Italics indicate terms further defined in the appendix.



## Data Analysis

Proficiency in data analysis is essential for STLT PHAs to identify the populations and conditions within their communities that require prioritized actions, identify emerging issues, identify factors that exacerbate illness or impact outcomes, and measure the success of their work. The expected capabilities within and across STLT PHAs have increased over time, including interest in building more robust disease modeling across the scope of the public health system. STLT PHAs should understand their data analysis needs and assess capabilities to identify gaps and create workforce recruitment and training plans that will ensure the necessary skills are developed. It may not be possible for a true depth of data analysis capabilities to exist at all tiers of the system, but efforts should be made to ensure that relationships are in place to fulfill those capabilities through agreements or collaboration



## Data Analysis

### PHA Capabilities and Roles

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#### Frontline Tier

Frontline PHAs should ensure that their staff have the necessary training and skills to perform basic descriptive data analysis, visualization, and reporting. They should also ensure access to tools and software to support the creation of high-quality, culturally informed products. This also requires that policies supportive of this work are in place. Alternatively, PHAs should have agreements in place to give staff access to analytic products produced on their behalf by partners or other STLT PHAs that allow the same outcome.



#### State Tier

Data analysis in the state tier involves the provision of software and / or enterprise platforms and reusable building blocks for analytics. State tier PHAs should ensure that staff have the skills, or provide access to training, to be able to perform descriptive and statistical data analysis, visualization, and reporting, and develop tools and policies to support the creation of high-quality culturally informed products. This tier may provide support to other PHAs within their jurisdiction to ensure analytic needs are met. State tier PHAs have the unique role of contributing to and subsequently leveraging federally produced national data analytics outputs while also considering unique needs based on their jurisdiction's population.



## Data Analysis PHA Capabilities and Roles



### Tribal Tier

Tribal PHAs should ensure that staff have the skills, or provide access to training, to be able to perform descriptive and statistical data analysis, visualization, and reporting, and develop tools and policies to support the creation of high-quality products. Additionally, these PHAs may have collaborative consultation processes and data use agreements in place to leverage partnerships with other public health agencies, Tribal epidemiology centers, or academic partners who can contribute data analytics and presentation resources that meet Tribal public health authority needs.



### Federal Tier

Federal public health organizations provide support to STLTs to be able to perform analytics and visualization, including funding, software, and training. They also support national-level analytics and ensure STLTs have access to the methodologies utilized. The core functions for data analytics within the federal public health authority include seeking input from contributors across other tiers to ensure that products are accurate, relevant, appropriate, informative, and consistent.



## Data Function Family 7: Information Dissemination

### Core Data Functions

### Specific Examples\*

(Selected subset, not intended to be an exhaustive list)

**Ensure data dissemination to the public, the people and communities those data represent, and public health leaders / decision makers and programs**

Develop and publish dashboards and datasets containing *public health data* that provide information, interpretation, and recommendations tailored to audiences (e.g., individuals and communities, elected decision-makers, academic partners, etc.)

Dissemination of *public health data* for specific use cases according to response and intervention needs

Provide data to partners tailored to audiences

Develop community health assessments (CHA)

**Interpret data and tell stories with data**

Develop and publish descriptive and statistical reports addressing specific populations

Provide data visualizations

\* Some selected examples, not intended to be an exhaustive list. Italics indicate terms further defined in the appendix.



## Information Dissemination

Information dissemination is a core data function family of public health practice, and directly supports one of the ten essential public health services, “communicate effectively to inform and educate”<sup>12</sup>. Dissemination of information is a public health intervention; when done well, it leverages all prior data functions to produce impactful guidance that can assist the public in participating in public health interventions and reducing personal risk. The creation and dissemination of timely and accurate public health information is critical to the development and maintenance of public trust. Public health routinely shares data with healthcare providers, policymakers, and other community leaders to support the prioritization of public health actions.

It is essential to engage populations and partners within each STLT jurisdiction, governmental and public, to ensure that data relevant to them are available in the format they need to the extent permitted by law.

<sup>12</sup> <https://www.cdc.gov/public-health-gateway/php/about/index.html>



## Information Dissemination PHA Capabilities and Roles



### Frontline Tier

Frontline PHAs typically have the strongest relationships with individuals, communities, local capacity building organizations, and local public and private partners given their active presence and ongoing relationships. They should have the ability to create and provide public health information to these audiences, make intentional data dissemination decisions, have policies / processes that support data dissemination, and interpret data for local impact. They partner with other STLTs or other non-STLT organizations to ensure their partners' work incorporates their needs and leverage these agencies' additional capabilities as needed.



### State Tier

PHAs in the state tier leverage data collected / provided by local and Tribal partner public health agencies as available to compile a cohesive jurisdictional picture. They maintain and frequently update dashboards and websites and ensure understandable, comparable, and accessible data dissemination. These jurisdictions should make intentional decisions and have policies / processes that acknowledge the sovereignty and uniqueness of Tribes as well as support data dissemination and interpretation for local impact. Information disseminated at this tier tells a story that is unique and specific to the populations served, but remains connected to the national surveillance standard practices and ensures comparability and inclusion into the national picture.



## Information Dissemination PHA Capabilities and Roles



### Tribal Tier

Tribal PHAs may provide public health information to Tribal members, partners, capacity building organizations, local healthcare organizations, and local research / educational organizations. They are well poised to possess deep cultural understanding and context, which can enrich data presentations and complement data dissemination approaches from other PHA tiers. They have crucial input for other tiers regarding appropriate dissemination of Tribal data.



### Federal Tier

Federal public health organizations develop and disseminate information resources that can leverage the uniquely broad national perspective, including comparison to like areas or prevalence of rare outcomes; connection to state tier data dissemination tools and platforms; and developing data presentation principles in partnership with STLTs to facilitate alignment in public data presentation.



# DISCUSSION

The core data functions identified in this report result from the input of applied public health professionals representing the breadth of the STLT PHA landscape. These functions are intended to provide a foundational level of capability that every STLT should be able to perform either independently or in collaboration with other members of the STLT ecosystem. In addition, this report provides insight into the duties and responsibilities of STLTs at each tier regarding public health data. This insight is beneficial for those outside of the public health community to appreciate how data are used, manipulated, and exchanged, thereby communicating the value of the public health informatics field and at the same time opening a window for other professionals to see where they might contribute their expertise to improve public health data functions.

STLT jurisdictions are encouraged to evaluate their current data capabilities against those identified within this report and incorporate the findings into existing plans, i.e., data modernization or workforce development, or develop new plans to address any identified function gaps and their associated resources. It is acknowledged that substantial investment has been made since 2020 in the modernization of the public health data system; however, sustained funding, including funding for staff support and training, is not assured. As such, any plans developed should place a strong emphasis on long-term sustainability and diversification of funding sources.

This work also provides a reference for public health agencies at all tiers to consider what core data functions require collaboration across the ecosystem. As noted, it may not be possible or desired to fulfill a given data function in every STLT PHA, and conversations should take place to identify opportunities for collaboration and fulfillment of functions by partner STLT tiers. These core functions are ideally met with intentional self-determination from each PHA, which can decide to pursue independent capability for any given function or rely on the larger public health ecosystem to achieve collective capacity.



Building strong relationships internally within a PHA, e.g., between data users and leadership, in addition to upstream and downstream external data partners can result in improved data quality and provides the greatest value to the frontline staff working directly with communities to protect their health. These relationships take time to develop, but the value they provide to all parties offsets the time investment. As has been identified throughout this document, ensuring that Tribal organizations, a core component of the STLT structure, have their needs understood and data sharing established is essential to strengthening of the nation's public health system. All PHAs should consider and implement the guidance and recommendations of the CSTE Policy Brief, *Enhancing Data Access to Improve American Indian and Alaska Native Health: A Framework for State and Local Public Health Officials*<sup>13</sup>.

The scope of this product has focused on articulating the core data functions, but STLT contributors provided some brief suggestions and considerations for how to achieve universal core data functions capacity. This product intends only to describe the core data functions. A next step would be to craft recommendations on how to achieve universal core data functions, including defining necessary resources and strategies, and measurements of progress and success. Discussions identified that the development of those resources would have positive impacts

on STLT PHAs and the public health ecosystem through the ability to have common and agreed upon capability and resource definitions and descriptions to incorporate into planning and funding work. The success of accomplishing this work would mean that STLT PHAs and the public health ecosystem have sufficient staff capacity and systems to exchange data completely and respond to public health events / emergencies nimbly and proactively. To accomplish this, time and sufficient funding are necessary, in addition to agency prioritization and support for the work.

As the public health system continues its modernization journey to develop greater interoperability and leverage new technology and data sources in meaningful processes that inform public health activities, change will be a constant. These changes will likely involve funding, technology, workforce, policies, and data access, all of which impact day-to-day public health practice. Ensuring that robust, yet flexible plans are developed and that all members of the STLT community can achieve and maintain these foundational core data functions will enable the public health system to better adapt to those changes. Although technology innovations and emerging data sources offer tremendous potential, intentional efforts to articulate and achieve the core essential data functions across the STLT landscape will ensure that public health has the collective capacity to support meaningful and effective work.

<sup>13</sup> [https://cdn.ymaws.com/www.cste.org/resource/resmgr/briefs/24-PB-TE-01\\_Final.pdf](https://cdn.ymaws.com/www.cste.org/resource/resmgr/briefs/24-PB-TE-01_Final.pdf)

# CONCLUSION

The objective of this work was to create a tool that defines core essential data functions to allow for the evaluation of capacity and capabilities within and across the separate tiers of the public health system. This work is intended to ultimately identify critical gaps and establish progress towards universal capacity to perform essential data functions both within individual public health agencies as well as through collective capacity across the ecosystem. Contributors frequently emphasized that core data functions vary at each tier of the STLT and federal public health landscape, and that this work should tie core data functions to essential public health activities and interventions that connect data to action. Each tier does not have the same core data functions, just as they do not perform the same public health activities. The results therefore also articulate the similarities and differences of core data function across tiers of STLT and federal agencies.

When these core data functions are achieved across STLTs, public health will be equipped with a robust data exchange ecosystem that is efficient, nimble, and ready to support coordinated, real-time, data-driven response activities and decision-making. However, attaining this foundational level of functionality requires significant support. STLTs will need adequate funding to obtain and enhance resources such as data systems and staff. Additionally, leaders within public health and in other government positions must engage, listen, learn, and advocate to ensure progress towards a common vision. Creation of this solid foundation sets public health up for success and further enables modernization and innovation that contributes to thriving and healthy people and communities everywhere.

# APPENDICES

## Definitions

### **Analytic Policies and Tools**

Include but not limited to branding guidelines, peer review processes, publication guidelines, etc.

### **Case Notification**

The transmission of standardized variables from a case investigation meeting a nationally notifiable case definition to the CDC from a STLT. May also include the transmission of standardized variables from a case investigation from one STLT jurisdiction to another STLT jurisdiction.

### **Clinical Data**

Includes but is not limited to the following from electronic health records (EHR): diagnoses, treatments, test orders, test results, etc. That are formatted to clinical standards that include but are not limited to: fast healthcare interoperability resources (FHIR), HL7 ADT, claims, etc.

### **Data Analysis**

The process of systematically applying statistical and / or logical techniques to describe and illustrate, condense and recap, and evaluate data. Includes descriptive and statistical analysis the incorporate the identification of trends, measures of association, etc.

### **Data Governance**

The policies implemented and actions taken to ensure data are secure, private, accurate, available, and usable. It includes the actions people must take, the processes they must follow, and the technology that supports them throughout the data life cycle.

### **Data Management**

The process of validating, organizing, protecting, maintaining, and processing data to ensure the accessibility, reliability, and quality of the data for its users.

### **Data Systems**

Represents the entirety of data storage, management, and applications utilized to perform public health work. Examples include but are not limited to health information systems (HIS), electronic disease surveillance systems (EDSS), laboratory information management systems (LIMS), immunization information systems (IIS), vital records (birth & death), Multi-State EHR-Based Network for Disease Surveillance (MENDS), etc.



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## Definitions

### **Electronic Disease Surveillance System (EDSS)**

Software that supports disease data entry directly through an Internet browser-based system, thereby creating a database accessible by public health professionals. Supports electronic laboratory reporting and electronic case reporting that enables labs and healthcare to report cases to health departments, integration of multiple health information databases into a single repository, and has electronic messaging capabilities, enabling STLTs to share information efficiently with CDC and other health agencies.

Examples of an EDSS include but are not limited to:

- National – NEDSS Base System (NBS)
- Commercial - MAVEN, RSM
- Homegrown
- Open Source – EpiTrax

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### **Exchange**

The sending and receipt of structured electronic data, bi- and / or unidirectionally. Inclusive of all or some of the following actions dependent on the use case: Transmission, Query, Receipt, Validation, Parsing, and Filtering

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### **External Data Sources**

Data utilized by public health that are compiled by sources other than public health, including but not limited to environmental data (air quality, water quality, temperature), census data, etc.

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### **Interjurisdictional**

The exchange of data between different tiers of the public health system, including state to federal, state to state, state to local, state to Tribal, state to territorial, local to local, local to Tribal, Tribal to local, Tribal to state, Tribal to Tribal, etc.

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### **Additional public health registries and data systems**

Includes but is not limited to registries and other types of public health data systems (syndromic, vitals, immunization registries, injury databases, environmental data repositories, birth defects registries, etc.)

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### **Public Health Data**

Inclusive of public health PII data and public health non-PII data. Includes any data of interest to public health authorities and related to their activities, data reported to public health under laws or regulations, or data collected or created by public health.



## Definitions

### Public Health Non-PII Data

Registries; survey (Behavioral Risk Factor Surveillance System (BRFSS), Youth Risk Behavior Surveillance System (YBRSS), etc.); environmental (air quality, water, restaurant inspections, etc.); hospital discharge; syndromic. These sources do not include personally identifiable data.

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### Public Health PII Data

Includes but is not limited to the following that are formatted to public health standards: electronic laboratory reports (ELR); electronic case reports (eCR); vital records (births & deaths); survey; case notifications; vaccine administrations (VXU); syndromic surveillance ADT messages; electronic test orders and results (ETOR); registries (birth defects, cancer, chronic disease, immunization, traumatic injury, etc.); emergency medical services (EMS); newborn screening (NBS)

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### Standards

Data standards, data exchange standards, secure transport standards, and terminology / vocabulary standards

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## Table 1: Key Data Functions and Priority by Public Health Tier

During the Summit, participants were grouped into tables to consider different types of jurisdictions as listed in the column headers. They were asked to use a numerical rating scale from 1-10, with higher numbers representing higher priority activities. Table 1 represents their raw response data, including use of special characters. Some tables used a range to approximate their priority across the participating jurisdictions, for example a response of “7-10” for Tribal jurisdictions in “Receiving case/ clinical data via eCR.” Some tables used a slash to represent a strong difference in priority between multiple discrete functions listed within the same row.

	<b>Data Function</b>	<b>Federal</b>	<b>Centralized States</b>	<b>Decentralized States</b>	<b>Mixed States</b>	<b>Large Local</b>	<b>Small Local</b>	<b>Tribal</b>	<b>Territorial</b>
1	Receiving case/clinical data via eCR	-	5	6	7	8	4	7-10	10
2	ECR ingestion (e.g., mapping messages to surveillance database)	5	5	8	10	8	1	7-10	10
3	Case notification receipt	10	-	5	7	-	-	-	10
4	Case notification sending	-	8	3	7	-	-	-	10
5	Receiving case information via ADT	10	8	6	7	9	9	5-6	10
6	Receiving electronic lab reports and orders	7	10	10	10	10	2	10	10
7	Sending electronic lab reports and orders	7	7	10	10	10	-	3	10
8	Capture real time all hazard health care utilization and capacity	10	7	2	5	2	1	4	10
9	Collecting data from EHRs, HIEs, QHINs	10	9	9	6	10	10	6	10
10	Standardized notification / data flows for emergent conditions	10	10	10	10	?	?	-	10
11	Receipt of environmental health data	7	6	6	7	10	10	8	7
12	Utilization of environmental health data	7	8	8	7	10	10	8	7
13	Exchange of environmental health data	-	-	6	7	5	5	8	7
14	Dissemination of environmental health data	7	9	8	7	10	10	8	7



**Table 1: Key Data Functions and Priority by Public Health Tier**

	<b>Data Function</b>	<b>Federal</b>	<b>Centralized States</b>	<b>Decentralized States</b>	<b>Mixed States</b>	<b>Large Local</b>	<b>Small Local</b>	<b>Tribal</b>	<b>Territorial</b>
15	Collect traditional surveillance system data	-	10	4	7	1	1	10	7
16	Analyze traditional surveillance system data	8	9	4	7	7	1	8	7
17	Integrate traditional surveillance system data	8	8	4	7	5	3	8	7
18	Disseminate traditional surveillance system data	8	9	4	7	8	8	8	7
19	Receipt of registry data	-	10	8	10	-	1	9	7
20	Analysis of registry data	-	10	8	10	5	-	9	7
21	Exchange of registry data	-	7	8	10	-	-	-	7
22	Dissemination of registry data	10	10	8	10	10	-	9	7
23	Storage and management of vital records data	-	10	9	10	-	-	10	10
24	Analysis of vital records data	-	9	9	10	10	3	10	10
25	Exchange of vital records data	-	10	9	10	-	-	-	10
26	Dissemination of vital records data	-	10	9	10	10	8	10	10
27	Creating data linkages between data sources	-	10	8	8	8	1	10	10
28	Deduplication of patient data and creating unique patient data matching, master patient indexes	-	10 / 5	8	8	10	2	6	10
29	Data retention	10	10	5	10	10	10	6	10
30	Data inventory	-	8	10	10	10	10	7-8	10

Table 1: Key Data Functions and Priority by Public Health Tier

	<b>Data Function</b>	<b>Federal</b>	<b>Centralized States</b>	<b>Decentralized States</b>	<b>Mixed States</b>	<b>Large Local</b>	<b>Small Local</b>	<b>Tribal</b>	<b>Territorial</b>
31	Data privacy, confidentiality, and security	10	10	10	10	10	10	10	10
32	Utilize surveillance system data for public health action	10	10	10	10	10	10	10	10
33	Organize jurisdictional data for access and provisioning in public health (e.g., data warehouses)	8	8	9	5	9	1	10	10
34	Define racial classifications for use in public health analysis and decision making	10	10 / 6	-	10	6	6	10	10
35	Maintain access to data on social determinates of health for analysis and public health decision making	9	10 / 6	9	10	10	8	8	10
36	Data exchange across jurisdictions (i.e., states and tribes, state and federal, county and state)	9	3 / 10	10	9	10	10	10	10
37	Data exchange with CDC, other federal agencies, to ensure federal govt has the data they need	10	8	8	9	-	1	10	10
38	Data dissemination for public use	10	10	8	9	10	10	9	*
39	Availability and dissemination of data for STLT professionals for data analysis and interpretation	10	10	10	10	?	3	10	10
40	System architecture management	10	8	10	5	9	1	8	10

\*Participants at the territorial table elected not to use the tool to rate this function, as it did not align with their perspective.



Table 2. Core Data Function Families, Core Data Functions, and Specific Examples

Data Function Family	Core Data Functions	Specific Examples (Selected subset, not intended to be an exhaustive list)
Exchange	Receipt of electronic public health data transmitted to PHAs	<p>Act as endpoint to receive <i>public health personally identifiable information (PII) data</i> through public health reporting feeds (e.g., ELR, eCR, syndromic surveillance)</p> <p>CDC receives individual case notification messages from state and territorial PHAs via Message Mapping Guides</p> <p>Maintain portals for electronic <i>clinical data</i> or <i>public health data</i> uploads from partners (CSV uploads, etc.)</p>
	Support outbound and inbound queries for <i>clinical data</i> and <i>public health data</i>	<p>Leverage modern technologies and infrastructures to actively look up additional needed <i>clinical data</i> or <i>public health data</i> (e.g., FHIR, TEFCA, etc.)</p> <p>Manual lookup of electronic <i>clinical data</i> in healthcare data systems, data portals, health information exchanges, or electronic health records systems.</p> <p>Respond to received queries for <i>public health data</i></p>
	Actively collect <i>public health data</i> (e.g., portals for environmental health file uploads, disease registries)	<p>Collect data on population health through community-level surveys (e.g., BRFSS, NHANES)</p> <p>Maintain systems or tools that collect data through public health investigations or interviews (e.g., REDCap)</p>
	Transmit data	<p>Share interjurisdictional <i>public health PII data</i> between PHAs</p> <p>Send investigation data between STLT and federal partners to support shared public health response activities, potentially including exchange of data analytics and datasets</p> <p>Bidirectional <i>public health PII data</i> (e.g., Immunization information between providers and registries)</p> <p>Respond to individuals' requests for access to their own data as needed (e.g. individual immunization records)</p>

Table 2. Core Data Function Families, Core Data Functions, and Specific Examples

Data Function Family	Core Data Functions	Specific Examples (Selected subset, not intended to be an exhaustive list)
Systems	Evaluate, update, and maintain existing systems and software, and develop or procure and implement new technology solutions and software that support public health use cases	Evaluate, test, and implement data integration building blocks and / or microservices
		Identify, evaluate, and invest in shared services (e.g., master person index (MPI), cloud, dashboards, etc.)
		Procurement and maintenance of <i>systems</i>
		Participate in requirements gathering and procurement, development, and implementation of systems at partner PHAs when related to shared work
		Conduct data systems assessments (e.g., environmental scan and inventory)
		Utilize and maintain nationally-provided, homegrown, commercial or open-source <i>additional public health registries and data systems</i>
Standards	Adopt, implement, and utilize standards	Pilot, test, and implement data standards
		Build systems and exchange methods that receive, process, and use standardized data
	Contribute towards development and adoption of standards	Programs use standardized data in PH data analysis, data presentation, and decision making (e.g., age, language, race / ethnicity, etc.)
		Comment on <i>standards</i> , help develop or improve <i>standards</i>
Governance	Establish enterprise data governance	Define and maintain data retention policy
		Develop and maintain a data inventory or data catalogs
	Organize jurisdictional data for access and provisioning in public health	Enterprise data warehouse / lake
		Create and leverage data catalogs or other metadata resources
	Plan, implement, and maintain data sharing policies and practices across tiers of STLT PHAs to engage in collective data governance with partners	Identify and establish relationships with all jurisdictional Tribal entities
		Document mutually agreed upon procedures for the use and publication of Tribal-specific data, per Tribal direction
Promote awareness and active inclusion of partners in shared data governance		



Table 2. Core Data Function Families, Core Data Functions, and Specific Examples

Data Function Family	Core Data Functions	Specific Examples (Selected subset, not intended to be an exhaustive list)
Governance	Develop and maintain data-related policies and procedures	Develop standardized data sharing / use agreements
		Execute data sharing / use agreements (DSA / DUA) with partners, and develop data sharing protocols and data release procedures within the PHA
		Develop and maintain policies that ensure the anonymity of individuals and confidentiality of personally identifiable information
		Establish and publish reporting/reportability requirements
Management	Maintain storage and management of public health data	Ensure availability and disseminate data to state, Tribal, local, and territorial (STLT) professionals for data analysis and interpretation - common infrastructure to access data and automate analyses
	Enterprise resources for data management, like data warehouse / lake and data processing tools	
	Perform system architecture management	Employ Enterprise Architecture
	Perform deduplication and create unique person data matching, and establish linkages between data sources	Master person index (MPI); privacy-preserving record linkages (PPRL)
	Maintain access to data on social determinants of health for analysis and public health decision making	Gravity Project, Community Information Exchanges
	Ensure data quality	Evaluate, measure, and monitor data quality Ensure and continuously work to improve data quality - including onboarding, testing, evaluating and iterating with reporters on data quality, along with instituting processes to standardize, filter and extract meaningful data from incoming electronic feeds

Table 2. Core Data Function Families, Core Data Functions, and Specific Examples

Data Function Family	Core Data Functions	Specific Examples (Selected subset, not intended to be an exhaustive list)
Management	Ensure data privacy, confidentiality, and security	<p>Ensure that data are shared as needed for PH action, while maintaining privacy/ confidentiality and data integrity</p> <p>Establish information security officer review and engage industry standards, third-party audits, Privacy Officer, Attorney General</p>
	Analysis	Perform analysis of <i>public health data</i>
Develop analytics and forecasting capabilities		Ensure training is available, and time dedicated to developing a skilled workforce
Ensure analysis management, transparency, and review		Develop <i>analytic policies</i> and <i>tools</i> to enable the development of high-quality analytic products
Information Dissemination	Ensure data dissemination to the public, the people and communities those data represent, and public health leaders / decision makers and programs	Develop and publish dashboards and datasets containing <i>public health data</i> that provide information, interpretation, and recommendations tailored to audiences (e.g., individuals and communities, elected decision-makers, academic partners, etc.)
		Dissemination of <i>public health data</i> for specific use cases according to response and intervention needs
		Provide data to partners tailored to audiences
	Interpret data and tell stories with data	Develop community health assessments (CHA)
		<p>Develop and publish descriptive and statistical reports addressing specific populations</p> <p>Provide data visualizations</p>