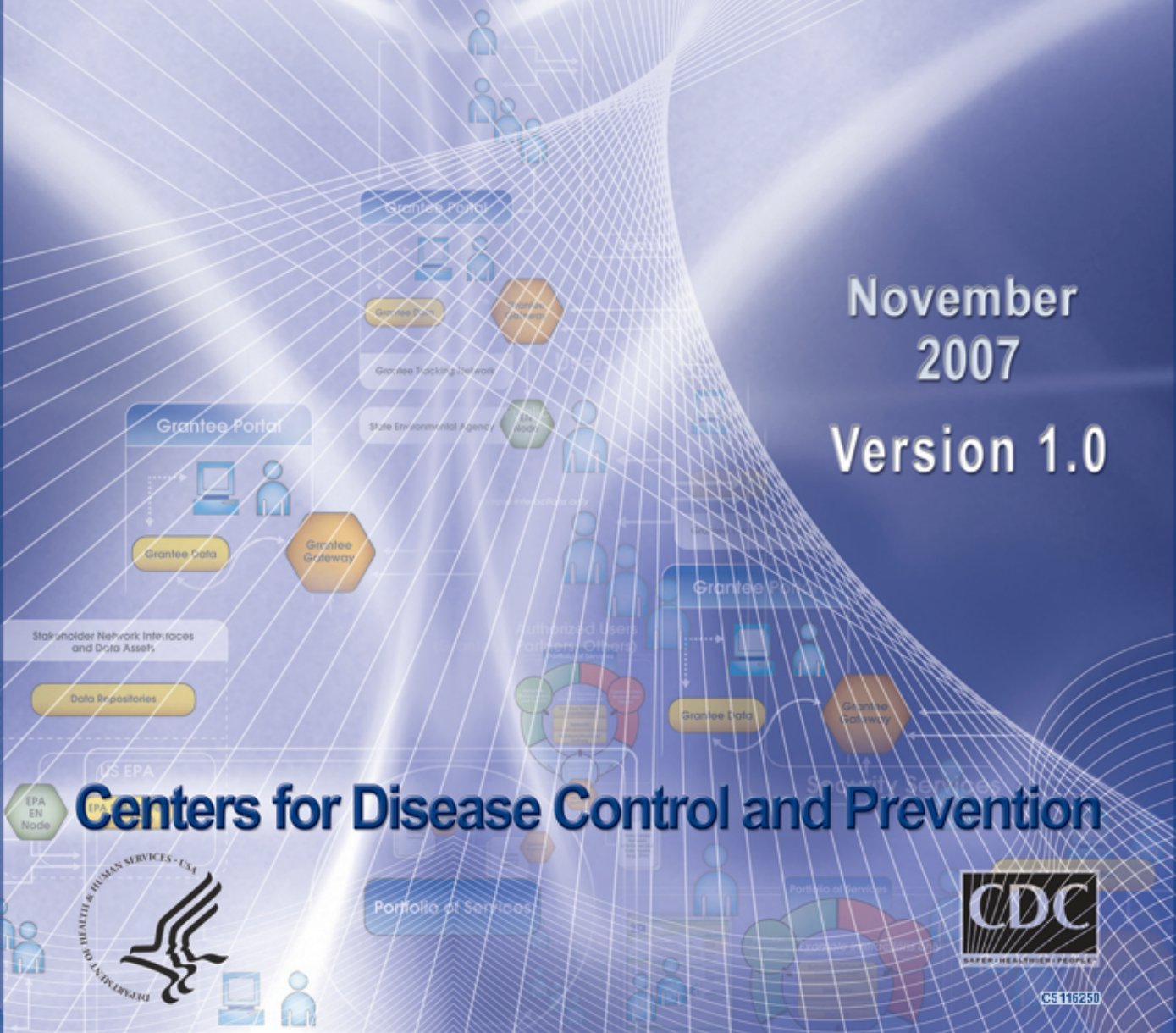


National Environmental Public Health Tracking Network

Technical Network Implementation Plan

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Version 1.0



Centers for Disease Control and Prevention



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**National Environmental Public
Health Tracking Network
Technical Network Implementation Plan (TNIP)**

V 1.0

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1 INTRODUCTION

Congress appropriated funding to the Centers for Disease Control and Prevention (CDC) in 2002 to begin development and implementation of a National Environmental Public Health Tracking (Tracking) Program and Network. With the funding, CDC's National Center for Environmental Health (NCEH) established the Tracking Branch to oversee the effort and initiated cooperative agreements with state, local, and academic partners. A key aspect of the Tracking Program is to develop the Tracking Network described in this Technical Network Implementation Plan (TNIP). The Tracking Network will provide a coordinated way for agencies responsible for protecting human health to systematically and comprehensively track information about the health of people and the environment, from local to national levels. Such information will enhance the country's ability to examine the relationship between environmental hazards and disease, to identify at-risk populations, and to track progress toward achieving a healthier nation and environment.

Initial concepts about the Tracking Network were outlined in the National Network Implementation Plan (NNIP), published in August 2006. The NNIP and other details about the overall program, its inception, partners, and various activities can be found at www.cdc.gov/nceh/tracking/. This TNIP describes the technical approach to develop the Tracking Network.

1.1 Document Purpose

The TNIP is intended to guide the technical development and deployment of the Tracking Network. It complements, refines, and extends the NNIP by further specifying the technical scope, development approach, and implementation phasing of the Tracking Network functions and components.

The practice of environmental public health tracking and the electronic tools to support the aggregation, communication, and evaluation of data and measures are still evolving. The TNIP is intended to be a living document, updated periodically after release in 2007, as experience is gained and as the components are refined and implemented.

1.2 Document Audience

The target audience for the TNIP is the technical management and scientific staff of the Tracking grantees and partners who are collaborating and implementing and will ultimately be using the Tracking Network. It is designed to provide enough technical detail to support actual implementation activities related to the National Network. It is not intended for non-technical audiences. For this technical audience, the document:

- Articulates the current understanding and plans for the Tracking Network operation,
- Identifies areas requiring additional conceptualization or development, and
- Identifies the schedule and responsibilities for deployment of the Tracking Network.

1.3 Document Organization

Chapter 2 provides a high-level overview of the Tracking Network, including discussion about users, data, and the components that comprise the Tracking Network. Chapter 3 provides more detail on each of the components, with

descriptions of the technical aspects of each component. Chapter 4 specifies how the components operate together to perform the functions of the Tracking Network. Chapter 5 identifies challenges and cross-cutting issues to be addressed as the Tracking Network evolves. Finally, Chapter 6 integrates and summarizes the timeline for developing the Tracking Network. Appendix A is a list of acronyms in the document, and Appendix B is a glossary describing terms used in the document.

Development of the Tracking Network depends on the coordinated activities and investments of CDC, grantees, and other partners working in various contexts (national, regional and local). Both the NNIP and the TNIP focus on the “national” aspects of the Tracking Network, those for which CDC has primary responsibility, and on the coordination needed between national assets (e.g., Nationally Consistent Data and Measures and/or portals) and the efforts of grantees and partners. The interfaces of grantees and partners to their national counterparts at CDC are described in the respective components below. Two areas not covered by this TNIP version are:

- Grantee Tracking Networks: the functional requirements of grantee tracking networks for their participation in the Tracking Network (beyond the narrow technical interface requirements described here). (Note: Many grantees have developed internal networks and are prepared to interface directly with the national components described in this document. Other grantees are just initiating internal network development and will need additional guidance to interface with the national components. This guidance may require development on a grantee-by-grantee basis.)
- Trading Partner Tools and Agreements: the institutional approaches or administrative instruments needed to support/enable the broader sharing and use of sensitive public health data to support tracking. (Note: Some work has been done to identify generic approaches to developing these agreements, and that work is referenced in this document. Additional discussion of how these agreements are managed and used is needed.)

2 OVERVIEW OF THE TRACKING NETWORK

The Tracking Network, as envisioned, will enable direct electronic data reporting and linkage of health effects, exposure, and environmental hazard data. It will do this by inter-operating with other public health data systems and by providing standards, exchange mechanisms, and tools to promote more effective information sharing and collaboration among environmental health professionals.

The NNIP set the vision for the Tracking Network and defined it as a “Web-based, secure, distributed network of standardized electronic health and environmental data”. Subsequent discussions during development of the TNIP have recognized that included in this definition are many types of information resources such as tools, nationally consistent data, indicators, measures, and other regional or site-specific data. Data will reside at national sites, as well as within state and local agencies and not-for-profit and academic institutions. The many individuals, institutions, and workgroups developing and ultimately using the Tracking Network may be considered part of it. This TNIP primarily focuses on the technical aspects of the Tracking Network, but to do so it considers the “content” of the Network as well. The TNIP does not specifically address the “people network” that is required to develop and maintain the Tracking Network.

The Tracking Network is intended to add value to many other national efforts that collect and organize health and environmental information by providing a “one-stop” resource for identifying data specifically related to understanding environmental-health interactions. In some cases, it provides a means to combine data to produce views different from those other data sources might provide. The Tracking Network does not replace other networks and efforts; rather, it supplements and leverages the work others have done to add to and enhance the knowledge base of environmental contributions to health outcomes.

2.1 What is the Tracking Network for?

The NNIP defined five functions for the Tracking Network. These functions were reviewed, refined, and then used to guide development of this TNIP. The functions as refined in TNIP discussions are listed below and described in more detail in Chapter 4.

- Function 1: Refine and Compile a Core Set of Nationally Consistent Data and Measures
- Function 2: Describe and Discover Data
- Function 3: Exchange Data
- Function 4: Support Development of, Information Sharing about, and Access to Tracking Tools and Methods
- Function 5: Inform and Interact with the Public

2.2 Who Develops and Uses the Tracking Network?

The Tracking Network performs two major functions for two broad groups:

- It supports improved secure communication and collaboration among state/local public health agencies, CDC partners, other public health practitioners, other data partners, and researchers.
- It provides the public and policy makers (as well as the above) with integrated one-stop access to health and environment information.

These parties will access the Tracking Network directly or indirectly via a portal Web interface at the national, state, or local levels. Access to secure portals on the Tracking Network will be managed through a role-based security system that supports tailored levels of access to Tracking Network resources. Role-based protection of data and resources on the Tracking Network are required because some data may be in a form that is not appropriate for public access. The term *Registered User* refers to a user who has completed the required security registration process. The security system is described further in Section 3.7.

Following are more detailed descriptions of various Tracking Network developer and user categories. The user categories that will include Registered Users are labeled. All users will have access to all public content on the Tracking Network.

- CDC Tracking Staff (Registered User): CDC staff is engaged in EPHT and contributing to, supporting, and using the Tracking Network.
- EPHTN Grantees (Registered User): EPHTN grantees are those entities that CDC has funded to support the EPHT Program and Network. Working with CDC, they are the early developers of the Tracking Network, including the content (data, measures, tools, etc).
- Data Partners (Registered User): The Tracking Network will work to establish/maintain formal data partnerships (often documented in Memoranda of Understanding or other agreements) with partners such as EPA, the Bureau of the Census, and others. These partners will provide data resources (through their respective interfaces), and, where appropriate, specific staff from those partners may be registered as users to gain access to Tracking Network resources.
- Other Public Health and Environmental Practitioners (Registered User): As part of its strategy to grow the Tracking Network, CDC will invite other public health and environmental agency partner staff to join the Tracking Network. Staff, through their agencies, will register to gain access to and interact with and contribute resources to the Tracking Network. See section 3.3 for more discussion.
- Researchers (Registered User): Academic and other researchers who have undergone the registration process will have access to Tracking Network resources. Researcher access to secure data will likely be managed through some type of security or confidentiality agreement, such as Trading Partner Agreements.
- Policy Makers: Policy makers will have access to primarily public resources on the Tracking Network. They may also be registered users if they meet the criteria for the registration process.
- Public: Public users will have access to public data and other resources on the Tracking Network.

2.3 What Data are Included in the Tracking Network?

As identified in the NNIP, the Tracking Network will host and provide access to a wide range of tracking data and information resources. In general, these data, across

both content areas and providers, vary widely in their confidentiality, online availability, and standardization. Data suitable for public release will be made available or linked to via Tracking Network portals. Access to sensitive data will be restricted and require registration and specific rights for access. Exhibit 1 depicts the various levels of data that may be made available on the Tracking Network from both secure and public portals. Levels of access and dissemination of health data are governed by state and federal privacy legislation and regulations. Because of this, states may not make accessible higher resolution data (levels 2 & 3) other than through grantee/partner-specific formal agreements with individuals or institutions. These variables are frequently controlled by state regulations governing data use and resolution.

Exhibit 1: Health Data Levels

Health Data Level	Health Data Type	Identification	Location	
1	Source or Individual Data (Raw)	Identified	Grantee Secure Database	Secure
2	Individual Level Data (Key descriptors e.g., race, sex, age)	Partially De-identified	Grantee Secure Database (possibly Grantee Secure Portal)	
3A	Counts and interpreted data (high resolution—linkable)	De-identified	Grantee Secure Portal	
3B	Counts and interpreted data (high resolution—linkable)	De-identified	National Secure Portal	
3C	Pre-linked data (high resolution)	De-identified	National Secure Portal	Public
4	Counts and interpreted data (Low resolution—more masking & aggregation)	De-identified	National Public Portal	
5	Rates or other metrics (Measures/Indicators)	De-identified	National Public Portal	

Some of the data on the Network represent data specifically organized for national EPHT efforts. These data will be standardized and documented, and they are referred to as “Nationally Consistent Data and Measures” (discussed in more detail in Section 3.1). In other cases, data may be unique to a grantee or partner in the Network but nonetheless relevant and of interest to Tracking Network users. In some instances, data may not be directly available on the Tracking Network, but metadata (data about the data) will be available. The metadata may identify where the data can be found and accessed or may provide a direct link to data. Portals on the Tracking Network will help users access the data. Metadata are required for all data on the Tracking Network.

Additionally, the Tracking Network helps to add value to data in several other ways:

- *Making more comparable data available:* By supporting the development and adoption of data standards, the Tracking Network will make more data, as well as more comparable data, available. As data become more available in

standard formats, the tools for analysis and visualization on the Tracking Network will become increasingly useful.

- *Making data easier to use for tracking:* By providing access to data that has been transformed, the Tracking Network will make more data available for tracking. For example, the U.S. EPA is providing integrated data of air quality model outputs (e.g., grid estimates of air quality/hazard) using the methods defined in the Public Health Air Surveillance Evaluation (PHASE) project.
- *Providing automated access to data and services:* Over time, Tracking Network services will make it possible to provide automated, machine-to-machine access to data and services. Thus, over time, secure portals will be able to access data from other secure portals via Network functionality (discussed in more detail in Section 4.3). Grantees and other partners will be able to integrate data from other sites and sources in their own local applications.
- *Improved means to “link” environmental and health data:* As the data, methodologies, and tools available on the Tracking Network expand, the expectation is that users will link available health and environmental data to create linked data that future users will find valuable.

2.4 What Comprises the Tracking Network?

The NNIP identified eight basic components of the Tracking Network (shown in Exhibit 2 in the left hand column). As with the NNIP-defined Tracking Network Functions above, the TNIP development process began with a review of these components. During the review, refinements were made. A cross-walk of the NNIP components and those now under discussion and development in this TNIP is shown in the right hand column of Exhibit 2. The changes reflect the phasing for implementation and relationships among the components. These components are described in detail in Chapters 3 and 4.

NNIP Defined Tracking Network Components	TNIP Component Refinements
Nationally Consistent Data and Measures (NCDM)	<ul style="list-style-type: none"> ▪ Nationally Consistent Data and Measures (no change)
Stakeholder Data and Assets	<ul style="list-style-type: none"> ▪ Grantee/Partner/Other Data and Assets <p>The term <i>stakeholder</i> was a broad term used in the NNIP to encompass grantees, formal partners, and others participants such as researchers or public health practitioners. The TNIP distinguishes among these—recognizing specific responsibilities for grantees and specific roles for partners. Other entities may participate in the Tracking Network, but their responsibilities for development are not part of the TNIP.</p>
Tracking Network National Repositories <ul style="list-style-type: none"> • NCDM • Metadata 	<ul style="list-style-type: none"> • Tracking Network National Data Repository • Tracking Network National Metadata Services

NNIP Defined Tracking Network Components	TNIP Component Refinements
<ul style="list-style-type: none"> Standards/Protocols/Methods 	<p>(includes a National Metadata Repository)</p>
<p>Portfolio of Services</p> <ul style="list-style-type: none"> Metadata Management Data Management, Analysis, and Display Standards, Protocols, Agreements Search, Exchange, and Access 	<ul style="list-style-type: none"> Tracking Network Tools, Methods, and other Resources (includes Tools, Methods, and other Resources [TMR] Repository) <p>The NNIP defined a portfolio of services that were supported by the National Repositories. The TNIP has combined and refined these into the separate service components above.</p>
<p>Tracking Network National Portal</p>	<ul style="list-style-type: none"> Tracking Network National Secure Portal Tracking Network National Public Portal <p>CDC security architecture requires that public and protected applications be physically segregated. Per the NNIP, the secure and public portal will share a common underlying platform, components, and services, but the TNIP defines each as a separate component.</p>
<p>Tracking Network National Gateway</p>	<ul style="list-style-type: none"> Tracking Network National Gateway (no change)
<p>Grantee Tracking Network Interfaces</p>	<ul style="list-style-type: none"> Tracking Network Grantee Portals (both Secure and Public) Tracking Network Grantee Clients and Gateways <p>The NNIP identified several possible options for grantee interfaces. The TNIP has refined these options into two specific components. A portal generally represents a human-machine interface, while a gateway is a machine-machine interface.</p>
<p>Stakeholder Tracking Network Interfaces</p>	<ul style="list-style-type: none"> Data Partner Interfaces <p>As stated previously, the NNIP aggregated several types of developers/users into the "stakeholder" category. The TNIP discusses specific expectations for partner interfaces with the Tracking Network.</p>

Exhibit 2: Tracking Network Components in NNIP and TNIP

2.5 How is the Tracking Network to Be Deployed?

The implementation approach presented in this TNIP consists of three phases: from November 2006 to Sept 2008; Sept 2008 to Sept 2010; and after Sept 2010. The expectation is that the basic technical functionality described in this TNIP will be fully deployed by September 2008, with further iterations thereafter. The content (e.g., data and tools) on the Tracking Network will continually evolve. This evolution in content will likely be complemented with an evolution in access and exchange mechanisms, including expansion beyond the approach based on portals outlined

here to one that also includes automated, machine-based services (also known as “Web services” or “service-oriented architecture”).

For each phase, the development, dependencies, and required iterations of the eleven major Tracking Network components are established. A major goal of the TNIP is to support CDC and grantees in managing the dependencies so that each component, in the appropriate iteration, is ready as needed. These three phases are described below.

June 2007—Sept 2008:

- Activities will focus on identifying and developing data elements and workflow processes to establish the first compilation of NCDM.
- Platforms for the National Secure and Public Portals will be selected, tested, and deployed, and integration of other components will begin.
- The following milestones will be reached:
 - NCDM will be populated by grantees and sent to CDC for compilation and made available via the National Secure and Public Portals.
 - A metadata creation tool will be developed and deployed, and grantees will use it to create metadata.
 - Initial tools for conducting analysis, visualization, and reporting (AVR) for NCDM and other data are identified and tested.

Sept 2008—Sept 2010:

- The focus will shift to testing and enhancing the components developed in the previous year.
- NCDM will continue to be populated by grantees and sent to CDC for compilation and made available via the National Secure and Public Portals.
- The following milestones will be reached:
 - The National Secure and Public Portals will be enhanced and tested.
 - The Metadata Creation Tool will be fully integrated with the Secure and Public Portals.
 - Additional AVR tools will be deployed on the National Secure and Public Portals.

Post-Sept 2010

- Activity will focus on completing the build-out of components and adding priority enhancements.
- A full suite of NCDM (originally identified by CDC) will be made available via the National Secure and Public Portals.
- Metadata will be created for other data on the Tracking Network, including what is available via the Grantee Portals.
- Service-oriented automated data exchange capability using the Public Health Information Network Messaging Service (PHIN MS) and EPA Exchange Network Clients will be deployed (future evolutions of both PHIN and Exchange Network will be considered and incorporated).
- Additional AVR Tools will be made available via the National Secure and Public Portals and potentially Grantee Portals.

3 TRACKING NETWORK COMPONENTS

The components described in the previous chapter are displayed in Exhibit 3, as they function as part of the Tracking Network. These components are described in the following sections. The components that represent content and services available on the Tracking Network are described first, and the components that represent the technical infrastructure follow. The role that each component plays in the Tracking Network is discussed, as well as specific characteristics, features, and approach to implementation. Chapter 6 details the approach to implementation in a timeline that tracks steps for development of each component, including entities responsible for development.

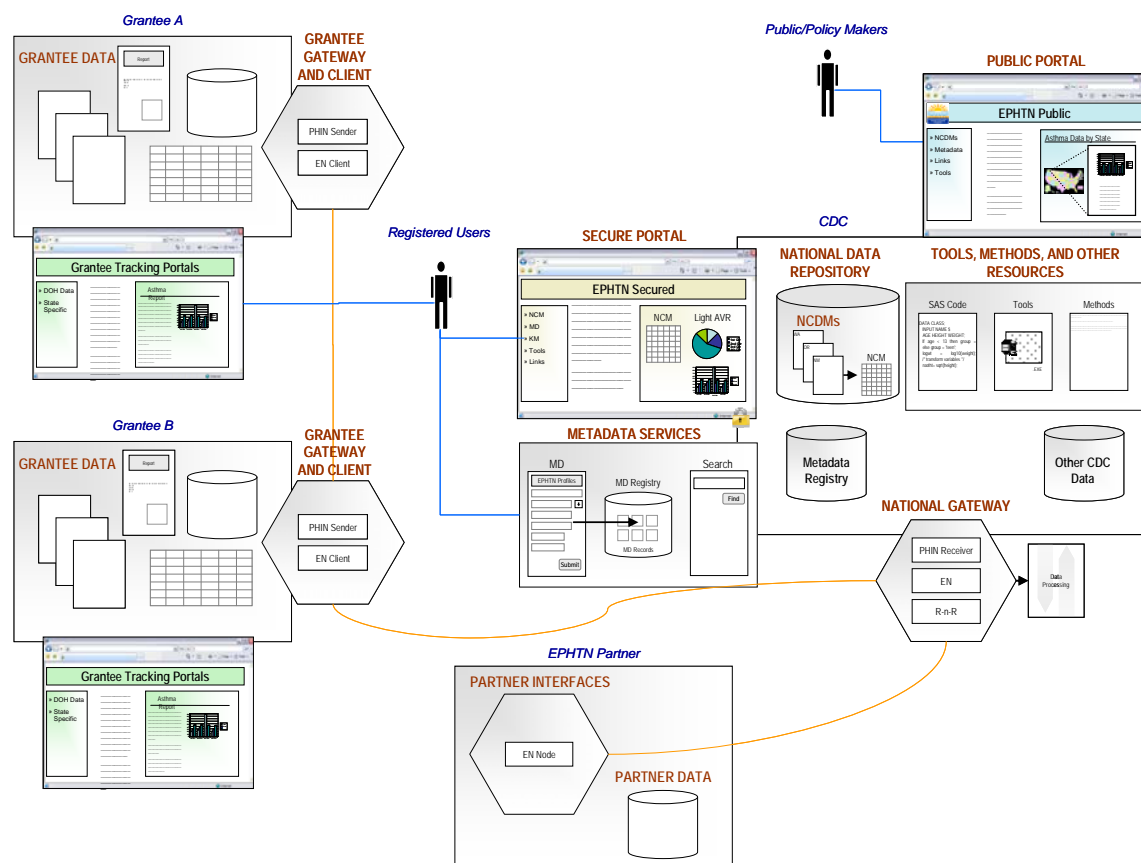


Exhibit 3: Tracking Network Overview

3.1 Nationally Consistent Data and Measures (NCDM)

As defined in the NNIP, Nationally Consistent Data and Measures are specific data collected, organized, and pre-processed according to standards that have been recommended by a Tracking Content Workgroup (CWG)¹ and adopted by CDC for the Tracking Network. The TNIP further recognizes that a *Nationally Consistent Measure* is a specific combination/ calculation/ derivation of health and/or environmental data

¹ Composed of representatives of Tracking grantees and other relevant local, state, and national partners (e.g. EPA, state environmental agencies, specific health programs such as cancer and birth defects, and national organizations).

that yields a composite number, such as a rate for a specific geographical unit and a time period of analysis. Exhibit 4 depicts one possible flow to develop NCDM—from CWG development of data to the availability of the NCDM on the National Public or Secure Portal.

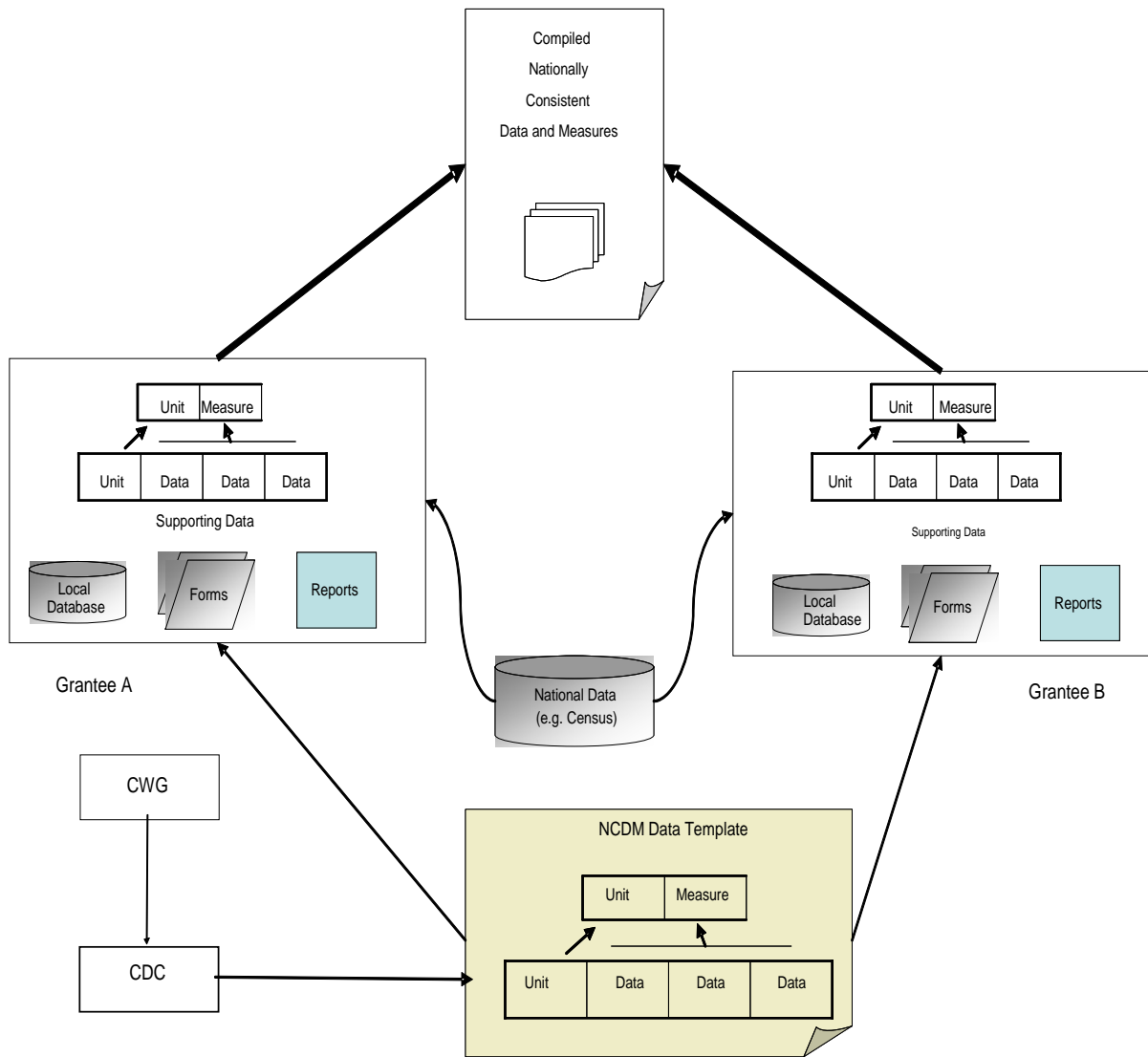


Exhibit 4: Example of Development of Nationally Consistent Data and Measures

Some NCDM may become part of the Tracking Network on the basis of interactions with internal federal data collections and external partners. For example, health data currently provided by states to CDC programs include child lead-screening case data to the NCEH Lead Poisoning Prevention Branch, cancer incidence data to the CDC National Program of Cancer Registries, and vital statistics data to the CDC National Center for Health Statistics (NCHS). States also provide environmental data to EPA on water, air, and toxic hazards in the environment. Health data will need to be de-identified and made accessible to the Tracking Network Portals. The CWG

Teams will work to recommend guidelines that promote consistency for NCDM wherever possible.

The *nationally consistent health data* are likely to be based on health data originally collected as patient/individual level records, identifying specific health events. These data are highly sensitive. While they may be ideal for Tracking Network purposes, the restrictions on their distribution and their use often require that they first be de-identified. Environmental data may also have restrictions on the identifiers or levels of resolution at which they are available. Both health and environment data can be aggregated and/or de-identified in various ways to create new data or measures, which may still invoke privacy concerns due to fine resolution (spatial, temporal or other attributes), and the issues of small cell size. Exhibit 1 in Chapter 2 provided an initial introduction to “levels” of health data that may be accessible on the Tracking Network. The lowest levels of health data (Levels 1 and 2) are likely to be maintained behind firewalls by state or local health agencies, with access granted only on the basis of formal sharing agreements² with data owners and with IRB review and approval. Procedures for access will likely be unique to each entity engaged in a data partnership, given varying regulations and procedures. The highest levels of data (Levels 4 & 5) are representative of NCDM on the Tracking Network, with pre-processing based on guidelines developed by the CWG to minimize their sensitivity. They will be available via the National Public Portal. Level 3 data, which will be more highly resolved, will require specific agreements or rights for access, and they may be available on the National Secure or Grantee Secure Portal, primarily depending on specific grantee regulations.

Work is currently being done by the CWG in eight different content areas (air, birth defects, cancer, carbon monoxide, hospitalizations, lead, vital statistics, and water) to identify measures and data for use on the Tracking Network. Additionally, the CWG is examining methods and practices to develop these data.

3.1.1 NCDM Features

The NCDM will most often consist of “tables” of data covering a specific time period and presented at a specific unit/level of analysis such as a ZIP code, county, or other spatial or administrative division. Each record (table row) of the data may represent a unit of analysis (e.g., data for one ZIP code), and each column may contain the attributes from which the measure can be calculated. Grantees will obtain the data from local, state, and/or national sources (provided through the Tracking Network) of environmental and health data and process them locally into recommended formats. These sources may include local/state environmental agencies (via the Exchange Network or other mechanisms), the local/state public health agencies, EPA, or CDC. These data will then be submitted via the National Secure Portal or the National Gateway on a regular basis for compilation as part of the Tracking Network. For some NCDM, data available at the national level will be compiled and processed centrally at the federal level and made available to state/local agencies.

As noted above, Nationally Consistent Data are data that have been pre-processed into a standard EPHT format, and they may be either linkable or linked data. Fully de-identified data will be available on the National Public Portal, and restricted-

² Information on data sharing agreements is available in *CDC-ATSDR Data Release Guidelines and Procedures for Re-release of State-Provided Data* (available at <http://www.cdc.gov/od/foia/policies/drgwg.pdf>).

access data will be available on the Secure Portal. These data will, in some cases, be the basis for calculations necessary for specific measures. In other cases, the NCDM may be of interest for linking with other data.

In addition to the NCDM, the CWG will develop and/or recommend other supporting information and resources, such as

- common surveillance goals for the respective data areas,
- key information sources to derive needed data,
- statistical methodologies to process or derive the data and/or measure,
- core data vocabularies and associated definitions for core data concepts
- identified information gaps, and
- tools, methods, and procedures that can be used to implement and interpret the NCDM.

3.1.2 NCDM Implementation Approach

The overall objectives for the creation and compilation for the NCDM were outlined in the 2006 Request for Applications (RFA)³. The RFA requires grantees to track and make data accessible to develop the NCDM on the Tracking Network. The following data are required to be made available on the Tracking Network by September 30, 2008:

- Hospitalizations for asthma;
- Hospitalizations for myocardial infarction;
- Ozone and particulate matter hazards or exposures;
- Data/information on key water contaminants to be defined by the CWG. These may include substances such as heavy metals, pesticides, or others that may influence the health of individuals or communities; and
- Data/information from at least two of the following data sources or tracking systems: birth defects, cancer, child blood lead levels, or vital statistics.

The RFA also specifies that by September 30, 2010, the following are required:

- "Data/information from *all* of the following data sources or tracking systems—birth defects, cancer, child blood lead levels, and vital statistics.
- For each year, additional core tracking health, exposure, and environmental measures must be included, based on recommendations of the CWG.
- Core measures must be tracked each year. However, applicants may also track health, exposure, and hazard data that are not included in the core areas. Multiple states tracking the same non-core measures should collaborate with CDC to develop data standards and share lessons learned."⁴

The NCDM will be developed in a staged approach to meet the requirements outlined in the RFA. The details of the timing of these activities and responsible parties are shown in Chapter 6. The general steps include the following:

- The CWG will identify and recommend to CDC data and measures for all of the above content areas and develop guidelines and procedures for producing measures with the supporting data.

³ RFA Section: Activities 1.d. "Coordination: Collaborate with data owners to establish data sharing agreements and make appropriate data and information accessible on the state and National Tracking Network gateways."

⁴ RFA Section Activities 1.a.iii

- Best practices for the aggregation and design of the NCDM will be developed and made available to the grantees through the work of the CWG.
- CDC will develop data schema to represent the data for transfer and exchange on the Tracking Network.
- Grantees will create NCDM in the prescribed XML Schema format and send them to CDC by using the supported transport protocols on the Tracking Network for storage in the National Data Repository. Initial NCDM will be submitted to CDC in 2008.
- CDC will develop procedures and tools to compile the submitted NCDM, as appropriate, and assist grantees in compiling NCDM.
- CDC will make the grantee and compiled NCDM available on the Secure and Public Portals. Additional NCDM will be developed and compiled over time.

3.2 Tracking Network National Data Repository

Support of some portal and gateway functions (e.g., Function 1: Support the Refinement and Compilation of a Core Set of Nationally Consistent Data and Measures) that are discussed in more detail in Chapter 4 will require access to a national repository of data at CDC. CDC will establish and manage a National Data Repository⁵ to store compiled NCDM data and other data that are to be made available from the federal level.

3.2.1 National Data Repository Features

NCDM received from grantees via the National Secure Portal or the National Gateway will be stored in the National Data Repository. The National Data Repository may contain both secure and public data. Using the agency's Secure Data Network (SDN) system, CDC will ensure the secure interface. Processes will be run on data that are made available to or compiled for the National Data Repository; these processes will edit and format the data for use on the National Public Portal. Data from the Repository will also be made available through the National Secure Portal and National Gateway. Exhibit 5 depicts these processes internal to the Repository.

⁵ The National Data Repository is treated as separate from the Metadata Repository although they may use the same infrastructure. This is due to the development plan which calls for the Metadata Repository to be developed before the Data Repository.

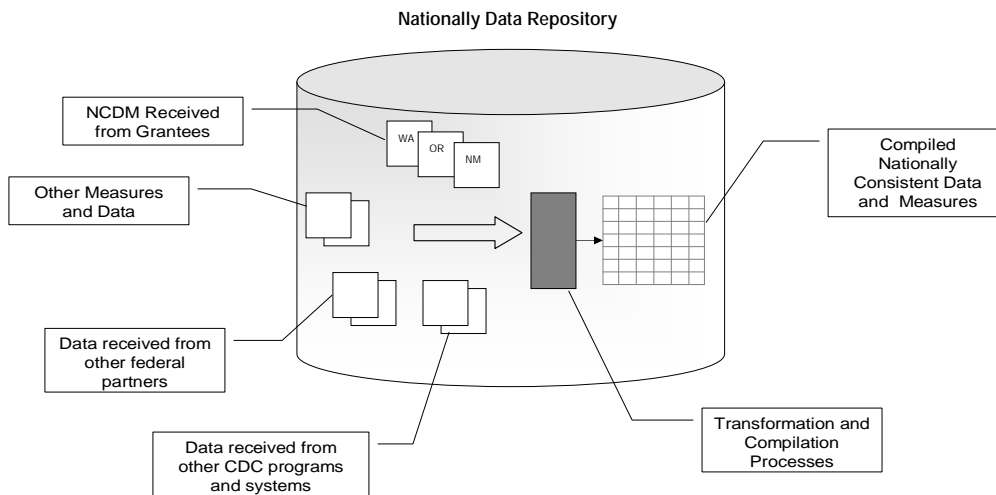


Exhibit 5: National Data Repository

3.2.2 Implementation Approach

CDC will identify a platform to house and maintain the National Data Repository. Processes to store data received via the National Secure Portal and the National Gateway will be defined and tested as the NCDM are being developed. CDC will deploy the National Data Repository as NCDM become available.

3.3 Grantee/Partner/Other Data and Assets

Many of the data of interest and potential use for Tracking will not necessarily be immediately available as NCDM. This component is intended to cover data resources provided by grantees and other partners beyond the NCDM, as well as such other potential tracking assets as methodologies, studies, expertise, etc.

3.3.1 Grantee/Partner/Other Data Features

The Tracking Network will provide mechanisms to lower the overhead (e.g., resources and time) of sharing data relevant for environmental-health assessments. As stated previously, the intent of the Tracking Network will be to provide a “one-stop shop” for identifying and/or accessing data and information and other relevant assets, while maintaining a sufficient level of security. Examples of the types of resources that may be identified and made accessible via the portals on the Tracking Network include

- CDC’s Wide-ranging ONline Data for Epidemiologic Research (WONDER) system
- US EPA data (via existing Exchange Network and the EPA Central Data Exchange—CDX)
- US Census data
- Grantee data (not part of NCDM)

The data and resources that are deemed secure will be retained by the original data “owner” or “steward,” depending on the policy requirements for the data. Metadata on the Tracking Network, however, will identify the existence and availability of the data, with appropriate access rights.

3.3.2 Implementation Approach

In the process of development of the NCDM, the CWG, CDC, and grantees may identify other health conditions and/or environmental data that would be useful to reference or to provide access to on the Tracking Network. Grantees may, as part of Tracking Network-supported collaborations, also exchange or make specific data available. Grantee data will be made available via either Grantee Portals (Section 3.9) or in some cases the National Secure or Public Portals (Section 3.6, 3.7). Partner data will be available on the Tracking Network via Partner Interfaces (Section 3.11). Sensitive data will be restricted to specific users of the Secure Portal and/or to the specific registered exchange partners. These data may not be standardized among grantees, but a common data transport format may be needed to facilitate processing between senders and receivers.

3.4 Tracking Network Metadata Services

Metadata Services will be provided on the Tracking Network to support the creation and use of metadata. Metadata are commonly referred to as “data about data.” There are several different types of metadata. These can be broadly defined under the categories of Descriptive, Structural, and Administrative. The Tracking Network has focused efforts on the creation of descriptive metadata to facilitate the discovery and description of data. The Tracking Network is using a subset of the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata.⁶

Descriptive metadata are required of all data on the Tracking Network, and they will be standardized. The public will have access to some of the metadata about publicly accessible data, but the public may not be able to access all of the metadata that pertain to sensitive data.⁷ Metadata support critical Network functionality by

- Providing users means to locate and access resources based on title, purpose, abstract, keywords, geographic boundaries, date, and time.
- Providing an approach for potential users to determine the content of a data resource, why it was created, how it was created, limitations, access and use restrictions, data quality, contact information, and links to detailed information such as data dictionaries. Metadata can help a user decide if a resource is appropriate for the intended use.
- Providing the ability to identify potentially secure data resources, to identify data stewards, and to negotiate access to the data.

3.4.1 Metadata Service Features

The Tracking Network is developing three integrated services (collectively called Metadata Services) to ease the process by which grantees and partners create, store, and search metadata. These are described below and depicted in Exhibit 6.

⁶ The FGDC metadata standard will make a transition to the ISO 19117 standard for metadata when the standard is finalized.

⁷ Criteria for determining availability of specific metadata elements on the Tracking Network are currently under development.

a. Metadata Creation Tool

The online Metadata Creation Tool will enable grantees to create metadata records for data, using a standardized metadata template called the Tracking Network Metadata Profile. The Metadata Profile outlines the format and content for describing data resources on the Tracking Network. The Metadata Creation Tool includes required elements for providing data to the Tracking Network. The profile consists of a template and recommendations to assist in the completion of each element. In the future, the tool may interface with other metadata tools and repositories, using the same or similar standards (e.g., EPA's metadata repository). The Metadata Creation Tool is designed to be implemented both centrally at CDC and locally at grantee sites. Initial deployment will be central, although the Tool is accessible to grantees for their internal use. The main features of the Metadata Tool include

- o Accessibility for all grantees and partners through a Web-based interface.
- o Role-based access controls that determine who can access, edit, or delete metadata.
- o Built-in metadata creation forms to directly upload standard-compliant metadata that users have created locally.
- o The ability to link to more detailed non-standardized metadata (e.g., structural metadata), where available.
- o Currently, the Metadata Creation Tool and profile do not have a standardized vocabulary or a list of keywords, but it is expected that once the NCDM content has been fully developed, vocabularies will be identified and incorporated into the Metadata Creation Tool.

b. Metadata Registry

The Metadata Registry will store the standard-compliant metadata. The Registry will store metadata records created using the Metadata Creation Tool or uploaded in a format compliant with the Tracking Network Metadata Profile. The metadata records will contain links to the data that may or may not be publicly accessible, depending on the nature of the data. A directory of the records stored in the metadata registry, categorized either by data content or by state/region, will be created and displayed on the Public and Secure Portals.

c. Metadata Search Services

Although the Metadata Services will be created as a stand-alone application, they are intended to be integrated with the National Secure and Public Portals.

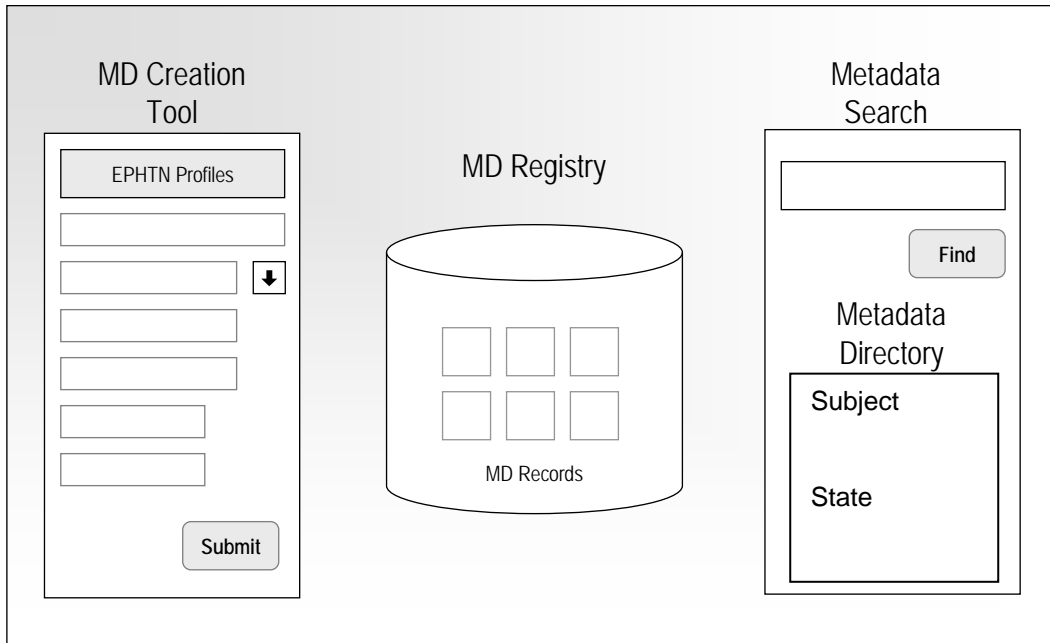


Exhibit 6: Metadata Services

3.4.2 Implementation Approach

The Metadata Services will be implemented by using a phased approach. This approach will allow continued development of the Tracking Network Metadata Profile as well as services for metadata creation and searching. The maintenance of robust Metadata Services requires periodic training of the public health workforce, data stewards, and others who will create metadata, as well as updates to the Tracking Network Metadata Profile. Metadata training and guidance documents are under development. National meetings and Web-conferences will be used as venues to provide training. Modifications will be made to the standard as required to reflect changes in industry standards and specifications. Efforts will be made to ensure that version changes in the metadata standard do not disrupt existing metadata records. The implementation approach addresses both the deployment of the technology and supporting activities to maintain and manage metadata on the Tracking Network.

- The Metadata Subgroup will continue to refine the Tracking Network Metadata Profile previously developed and create documentation and explanations of the different elements in the Tracking Network Metadata Template on the basis of input received.
- After testing and collection of further requirements, a final version (V1.0) of the tool will be deployed as a Web application for use by grantees to create metadata to be stored in the Metadata Registry.
- Grantees will create metadata for the NCDM and other data that may be stored in the National Data Repository or by the grantees on their state networks.
- CDC will create metadata that do not flow from grantee networks, as needed, for NCDM
- A search service will be developed for use of certain elements of the Tracking Network Metadata Profile as search attributes.
- Once the Tracking Network National Secure Portal is developed, the Metadata Services will be integrated into the Portal and be accessible to the Secure and Public Portal users.

3.5 Tracking Network Tools, Methods, and Other Resources (TMR) Repository

CWG Teams, in the course of their work to develop the NCDM, are identifying and sharing methods to both create and display measures. In some cases, these methods may be automated and implemented via the Secure Portal in such a way that the data or measures are provided “ready to use” for download or AVR use. These processes and methodologies are examples of the tools that will be part of the Tools, Methods, and other Resources (TMR) Repository. Effective deployment of the NCDM, and the associated information, will make new demands on grantees and partners’ current tracking or monitoring programs and information systems. One of the objectives of developing the NCDM is to expand the thinking about how data can be collected, organized, and used for environmental health purposes. NCDM methodologies and interpretations will help develop the future capabilities needed for more robust local and national tracking programs.

Using both the National Secure and Public Portals as platforms, CDC will host the development and maintenance of the TMR Repository. The TMR will focus on providing access to resources that directly or indirectly support users of the Network. The Tracking Network TMR is designed to support a Tracking “community of practice,” which will include researchers, along with environmental health, public health, and environmental practitioners. This can complement the ongoing improvements to the “data” side of the network (e.g., development and refinement of the NCDM) with the tools, methods, and procedures needed to assemble, manage, and interpret these improved data resources. In combination with other efforts of the CDC Tracking Branch, supporting this community of practice is a key objective under the Branch’s larger strategic goals of enhancing the Tracking workforce/infrastructure and fostering collaboration between health and environmental programs. These resources will be indexed according to common Tracking subject areas to enable easy navigation to/from related resource areas and their respective data areas.

Wherever possible, the TMR Repository content will also be made available via the National Public Portal. This public availability may include providing summary information on readily available and restricted-access tools, with references for more information, data dictionaries, links to other state and CDC programs, as well as all methods, standards, case studies, reports and other documents. Where possible, CDC will develop specific interpretive/descriptive explanations to support public understanding and use of the resources.

3.5.1 Tools, Methods and Other Resources (TMR) Repository Features

The tools and methods may initially focus on the health conditions, environmental hazards, and other data areas identified by the proposed NCDM. As additional needs or subject areas are identified (e.g., additional health conditions with suspected environmental etiologies), tools and methods for these areas will also be identified and collected. Additionally, tools to facilitate communication and collaboration among and within Workgroups and Teams as they develop documents and products have been essential (e.g., SharePoint). Other tools (e.g., Rapid Inquiry Facility or case-crossover software) are designed to serve specific analytic purposes. All of these applications in the TMR will be supported by access to reference information. In some cases, where they are hosted on the National Portals (e.g., AVR functionality for NCDM) or are available from partners, there may be direct links to tools or

methods. As shown in Exhibit 7 below, these will be organized and managed in the following categories:

- Online Tools
 - Data access (per Function 3)
 - Basic AVR functionality for use with portal hosted/accessible data
 - Data Description and Discovery (per Function 2)
 - Other tools as identified (this includes collaboration tools such as Web forums used by the Tracking Workgroups).
- Standards/Methods
 - Tracking best practices
 - Standards/Methods and Procedures (e.g., vocabulary, de-identification tools)
 - Documentation for NCDM and other data (measures definition, data template, procedures, data dictionaries, etc.)
- Tracking Network Downloadable Software Resources
 - Rapid Inquiry Facility
 - Case-Crossover software
 - Other analytic and linkage tools

The procedure for accessing and using these tools will depend on the portal platform selected and the capabilities that it can support. A Portal Analysis, Visualization and Reporting (PAVR) Workgroup will work with CDC and make recommendations regarding the specifics of this functionality.

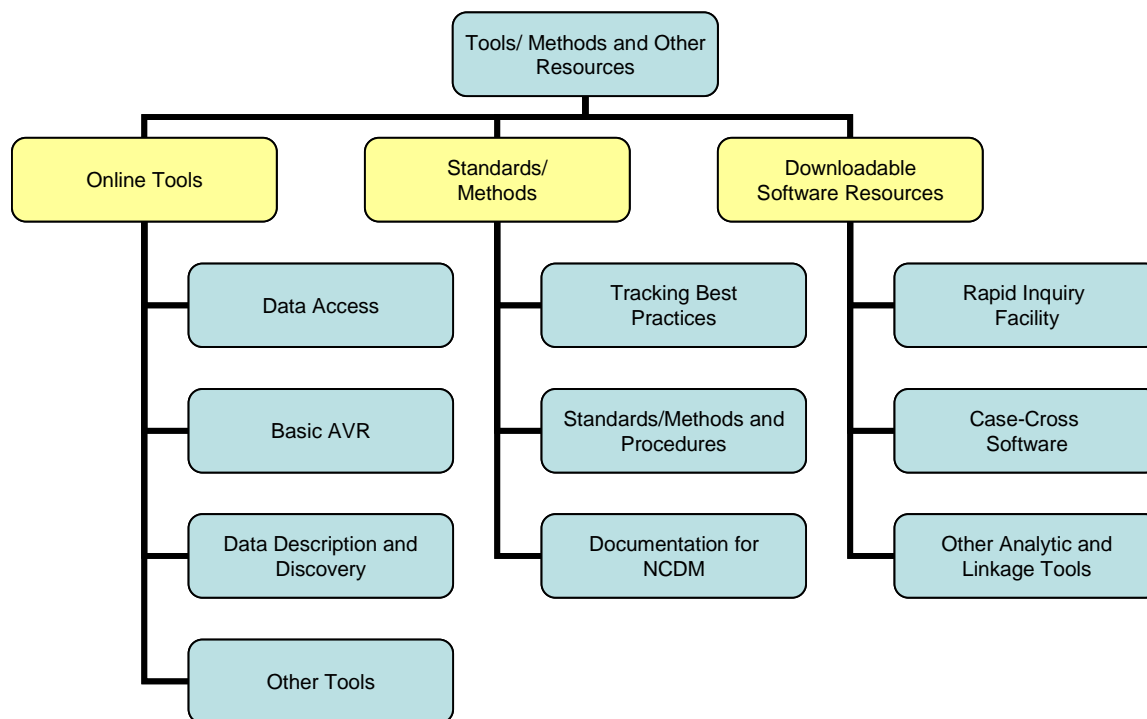


Exhibit 7: Tools, Methods, and Other Resources Repository

3.5.2 Implementation Approach

The Tracking Network TMR will be integrated into the National Secure Portal and, where possible, the National Public Portal. As appropriate, these resources will also be made available on the Public Portal. The utility of the TRM Repository will depend on its ability to provide value-added access to credible, relevant resources.

CDC and the Tracking Network PAVR Workgroup is defining and determining relevant tools. The TMR content will depend on the evolving products of CDC and its Workgroups. Repository development will therefore proceed in the following inter-related efforts:

- As part of National Portal deployment, the AVR capability needed to view the NCDM and other data will be deployed and tested;
- Using existing information already collected by grantees and CDC, a preliminary collection of resources will be created. These resources will be used to refine the organizational scheme sketched above;
- During the fall of 2007, the CWG will have identified and begun compiling relevant resources (e.g., data elements, collection guidelines, tools). These will be used to further refine the organizational scheme discussed above.
- The ongoing interaction among Workgroups and Teams will be supported in the near-term through enhanced functionality on a SharePoint Website. In the future, the National Secure Portal will provide registered users the opportunity to collaborate online.

3.6 Tracking Network National Public Portal

The Tracking Network National Public Portal is one of the primary interfaces to the Tracking Network. The Public Portal will be the public face of the Tracking Network. It will be accessible to the general public and will require only a Web browser and an Internet connection. All Tracking Network assets related to public data and information will be available via the Public Portal. By contrast, the National Secure Portal is home for content that is more confidential in nature. Section 3.7 describes in detail the National Secure Portal and identifies the differences between the two portals.

3.6.1 Public Portal Features

The Public Portal will provide users the capability to

- Access both the non-secure data and measures compiled as NCDM. The NCDM will be viewable in tabular form and via the “Public” AVR capabilities described below;
- Search and view metadata for Tracking Network data assets (NCDM and other);
- Use the metadata as a pointer to find information on the regulations and procedures for access to secure data.
- Browse and view other relevant Tracking Network data sources, which may include EPA environmental data, the Census, WONDER, and other CDC data;
- Perform “public” AVR functions on the NCDM and other data sources; these will consist of
 - Exploration of the specific measures developed by the CWG,
 - Execution of pre-configured and user-defined queries on selected data, including generating descriptive statistics, graphing and mapping.
- Browse and traverse relevant categorized links to other information sources, including the following:
 - Grantee and partner portals (e.g., EPA) and Websites for other data and other information
 - Other CDC Websites
- Access additional, descriptive content designed to assist the public in interpreting the NCDM and other data sources. Content may include
 - Fact sheets and other public health information materials
 - FAQ documents
 - Online reference information on selected topics
- Access online versions of CDC Tracking Branch publications, such as the Health and Environment Report. This may include the ability to supplement print versions of these publications, with the accompanying ability to “click through” the graphics and maps in the reports to access underlying public data sources.
- Download some content and tools from the Public Portal, with specific constraints in place to filter data that may have sensitivity due to small cell size. (On-line tools can maintain data confidentiality; other approaches will be needed to manage data downloads.)

Exhibit 8 provides a simple example of a Public Portal interface.

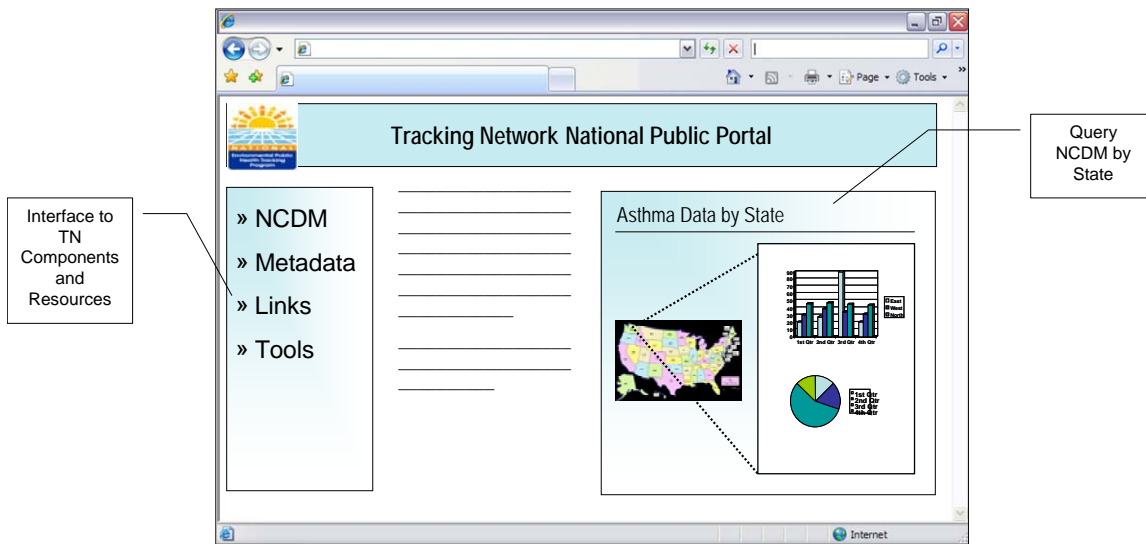


Exhibit 8: Example Tracking Network National Public Portal

3.6.2 Implementation Approach

Both the Public and Secure (see Section 3.7) Portals will depend on or host other Tracking Network components described in this TNIP. In most areas, the Public Portal will provide access to a subset of the content available on the Secure Portal. In addition, the Public Portal will contain content developed by CDC that is designed expressly for public use (i.e., public health education materials). Hence, the infrastructure for the Public and Secure Portals will be developed in parallel. Where possible, the Secure Portal will be used to test/evaluate content destined for the Public Portal. To achieve the Tracking Network goal of deployment of a robust Public Portal in September 2008, the development emphasis will be on functionality and content (e.g., the Nationally Consistent Data and Measures) that can be made available to the public via the Public Portal. The steps in accomplishing National Public Portal implementation include

- Identifying appropriate portal software
- Establishing organization and taxonomy for portal content (based initially on development of NCDM)
- Establishing a test environment to examine the interaction of portal content and tools that may be available on the portal
- Testing and soliciting feedback from stakeholders on portal functionality

The Secure Portal and the Public Portal, in their first iterations, may contain similar data. Over time, however, it is anticipated that the two Portals will overlap less, as significant non-public data/features are added to the Secure Portal. As the portal technology becomes stable and the content on the portals is finalized and organized, a Services-Oriented Architecture could be developed that would eliminate some of the redundancies between the portals and create a more cohesive system.

3.7 Tracking Network National Secure Portal

The Tracking Network National Secure Portal is the other primary means to access the Tracking Network for registered users. The Secure Portal will be designed for

use by and support from EPH practitioners and researchers, while the Public Portal is designed for the general public. The National Secure Portal is designed to provide the primary interface to all grantee/partner-focused Tracking Network resources. It will complement and use the system of Grantee Portals, Gateways, Clients, and Partner Interfaces. Its primary functions will be to directly support the implementation of the NCDM and to provide a secure, online resource center for grantees, partners, researchers, and other public health practitioners. The Tracking Network National Secure Portal will consist of a secure Website accessible only to registered users (as defined in Section 2.2) and an ongoing process for the identification, organization, and hosting of relevant Tracking Network information and tools.

3.7.1 Secure Portal Features

The Secure Portal will be the primary interface to more detailed data and components on the Tracking Network. Using a Web browser and security credentials, registered users will be able to access

- Compiled NCDM stored in the National Repositories
- Data discovery and description services (metadata)
- Tracking Network data with greater detail
- Robust online analysis, visualization, and reporting tools
- The repository of analytical tools and methods
- Collaboration and knowledge management functions (document sharing, discussion, contact management), including
 - Support for the CWG
 - Support for other Tracking Network Workgroups
 - Online reference information for selected topics (NCDM and others)

The Secure Portal will also be used to pilot and refine information and information resources that will then be provided via the Public Portal. Exhibit 9 provides an example of a National Secure Portal.

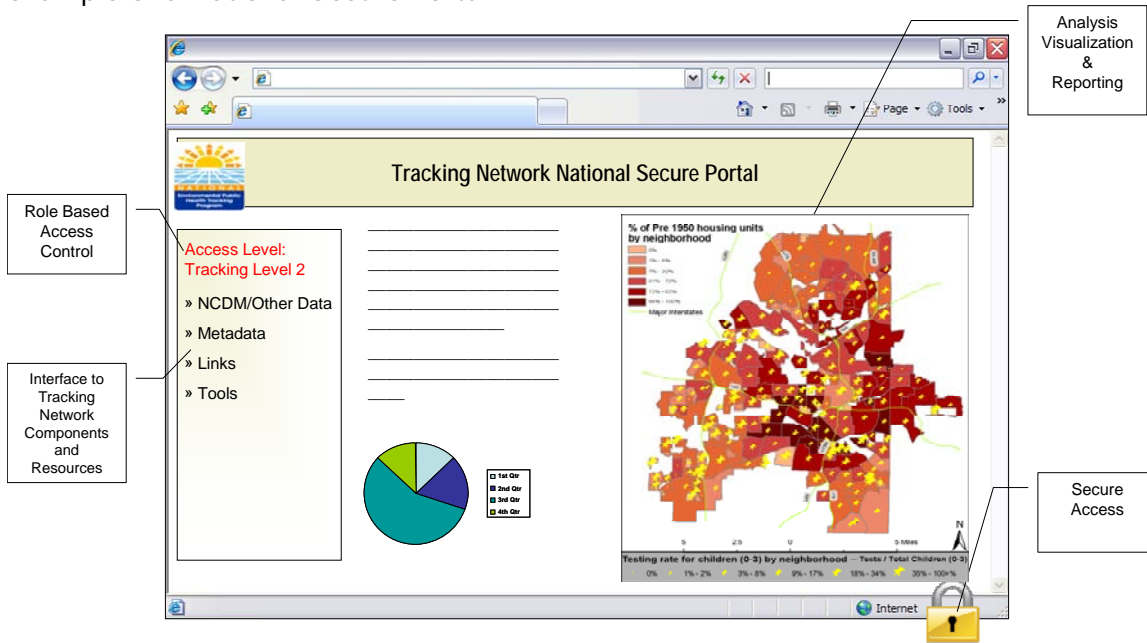


Exhibit 9: Tracking Network National Secure Portal

A fundamental premise of the Tracking Network is that registered users will benefit from a secure, reliable environment in which they can access and exchange data, share professional information, and access common resources. The Secure Portal will be a primary mechanism for delivering these capabilities, a function that will require the credibility of the security to be high. While initially many of the resources on the Secure Portal may be available from other sources, including some public sources, the Tracking Network is envisioned to include a growing inventory of non-public data and resources that will be made available to registered users.

The protection of content on the Secure Portal will be ensured through the use of the extensive security procedures and technical mechanisms of the CDC Secure Data Network (SDN). The SDN is CDC's way of protecting its sensitive data. Other applications using this infrastructure include BioSense and Epi-X, which contain data at least as or more sensitive than the data anticipated for the Tracking Network. These measures will include the following:

- Rigorous identity proofing conducted by CDC's registrar
- Electronic security certificates installed on accessing computers
- Role-based security measures implemented in the portal itself

CDC will allocate resources to create the security infrastructure. Grantees will be responsible for establishing access to SDN and installing any required security certificates. As described in the RFA, grantees must ensure that appropriate security controls are specified, designed into, tested, and accepted in developed products in accordance with appropriate guidance issued by the National Institute of Standards and Technology (NIST)⁸. Many grantee staff already access SDN through other programs and may be able to reuse existing infrastructure for accessing resources on the Tracking Network. This approach is guided by the assumption that stringent requirements for access will help develop and support the credibility of Tracking Network security. Registration is renewed annually, and it will be the responsibility of grantees on the Tracking Network.

Exhibit 10 depicts candidate information categories that will be used to organize and navigate the Secure Portal. Note that this diagram does NOT represent the Secure Portal interface. Rather, it is provided to identify the categories of information and potentially how they will be organized. Many of the important connections (e.g., between NCDM and related tools) are not depicted.

⁸ OMB Circular A-130, Appendix III
NIST SP 800-12 – Introduction to Computer Security: The NIST Handbook
NIST SP 800-26 – Security Self-Assessment Guide for Information Technology Systems)

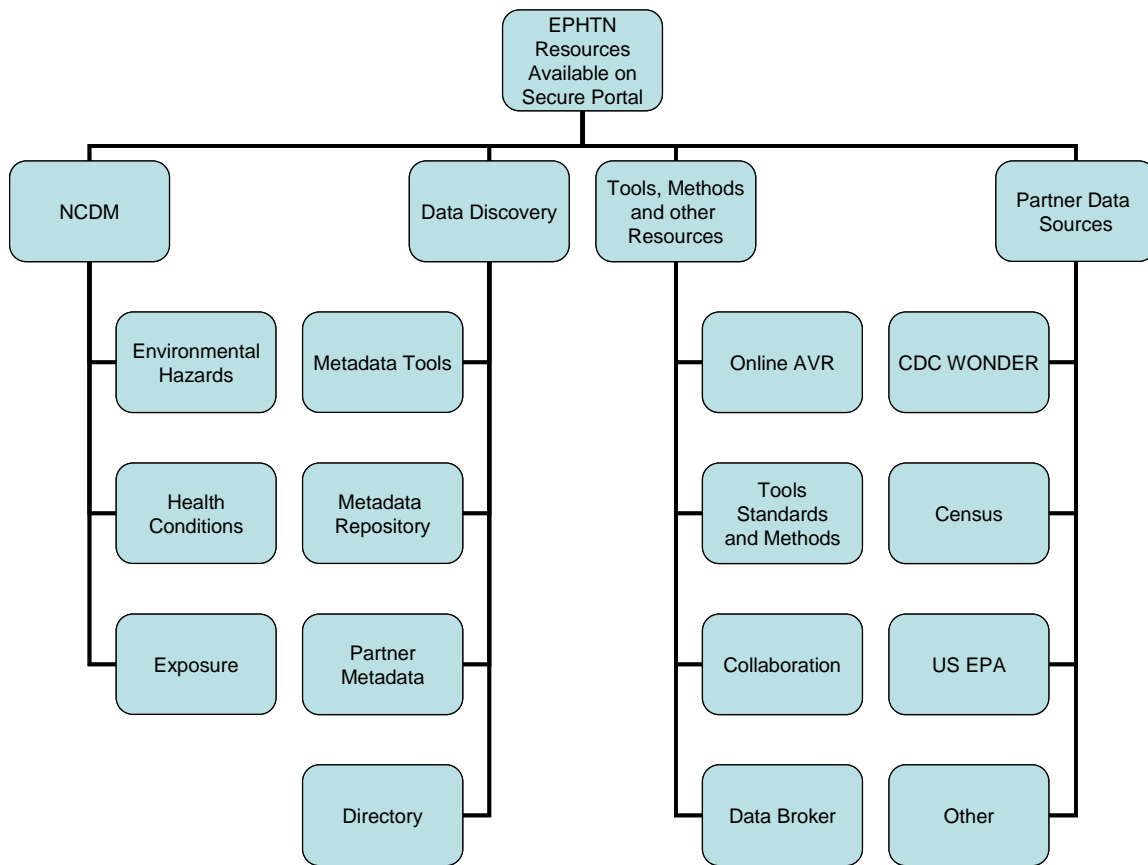


Exhibit 10: Organizing Information Resources on the National Secure Portal

3.7.2 Implementation Approach

The Secure Portal will be the primary interface to access other components and resources on the Tracking Network and will be developed in a series of iterations. These iterations will reflect the development of the different components as they are brought online and as interfaces are built to access them on the Secure Portal. The proposed implementation approach is as follows:

- The Secure Portal will be designed and hosted by CDC. Using the high level function descriptions in this TNIP, CDC will work with grantees and partners to refine, test, and mount the portal components.
- Portal components will be mounted in an iterative process, starting with readily accessible information and resources.
- CDC will support ongoing maintenance of the National Secure Portal infrastructure and content, including working with grantees to ensure that portal content is useful, up-to-date, and well organized. This will be accomplished as follows:
 - Feedback will be collected via the existing Workgroups, on current and needed content for their respective content/subject matter areas.
- The Secure Portal platform selection process was completed by CDC in June 2007. A thorough evaluation of existing Web portal products was conducted by the development team at CDC. Priority features evaluated for portal software (or components) included
 - Support for role-based security

- User profiles that can be used to improve navigation and search
- Adequate query, reporting, and analysis capability to perform or easily integrate the capability to provide basic descriptive statistical analysis, display, and mapping
- Adequate “knowledge management” capabilities (e.g., document/link and content management, including support for controlled vocabularies)
- Collaborative workspace functions (e.g., document sharing, discussion groups—see Section 3.5 for more details) to support CDC and Workgroups and subsequent implementations of the Tracking Network. Grantees will use the existing SharePoint site until such functionality is incorporated into the Secure Portal. There may be an overlap period when both are in operation.

As result of the portal software evaluation process, Business Objects Web Intelligence Software was selected to be the Web portal platform for the National Tracking Network Portals. This package provides features that meet current and future Tracking requirements on both functional and technical levels.

3.8 Tracking Network National Gateway

The National Gateway will serve as a mechanism for network participants to exchange data with CDC on the Tracking Network. The National Gateway will use the Public Health Information Network Messaging System (PHIN MS) as its primary transport protocol. The PHIN MS Transport protocol is a generic, standards-based, interoperable, and extensible message transport system. It is platform-independent and loosely coupled with systems that produce outgoing messages or consume incoming messages. The National Gateway and PHIN MS are ideally suited for frequent periodic exchanges of data (e.g., monthly exchanges of structured pre-defined data) and not for one time exchanges of small quantities of data. The Gateway is used for machine-to-machine transactions, where a server at one site pulls or pushes data from or to another. One-time exchanges can be more efficiently accomplished by using the National Secure Portal or other exchange mechanisms developed by the grantees. The National Gateway will be used to transport

- NCDM;
- The underlying data that support the NCDM (where such data can be made available);
- Metadata; and
- Data for which data sharing agreements have been established between Grantees involving the periodic, frequent exchange of data.

The National Gateway will facilitate dynamic or instant access to data kept at remote locations. The gateway will provide access to other "sources" of data not stored in the national data repository. For example, the National Gateway will facilitate the exchange of environmental information between the EPA's Environmental Information Exchange Network (Exchange Network) and the Tracking Network, using client software developed for use by the EPA.

In addition, Grantee gateways using a PHIN-MS sender solution can be installed for one-directional use, allowing the National Gateway access to data made available on the grantee's site. Through this mechanism, data not stored on the National Portal can be made available through the network.

Gateways may also function to facilitate bi-directional exchange of data. Grantee Gateways would be expected to send messages such as new or updated NCDM to the National Gateway. The gateways could also receive and act on messages from other gateways. The latter has the potential for the most benefit, because a request could be made for data and automatically serviced by a software agent pulling data from the grantee or national gateway, adding metadata, and returning the new data to the requester. It is also the most difficult to implement, because there are greater requirements on grantees to install and configure components.

3.8.1 National Gateway Features

The National Gateway has the following primary features (shown in Exhibit 12):

a. PHIN MS Sender

The PHIN MS Sender is a Java application that functions as a client. The Sender is used to send messages to PHIN MS Receivers or to applications that have been designed to accept PHIN-MS compliant messages. CDC will use PHIN MS Senders to send messages to grantees or to other CDC programs that have installed PHIN MS Receivers.

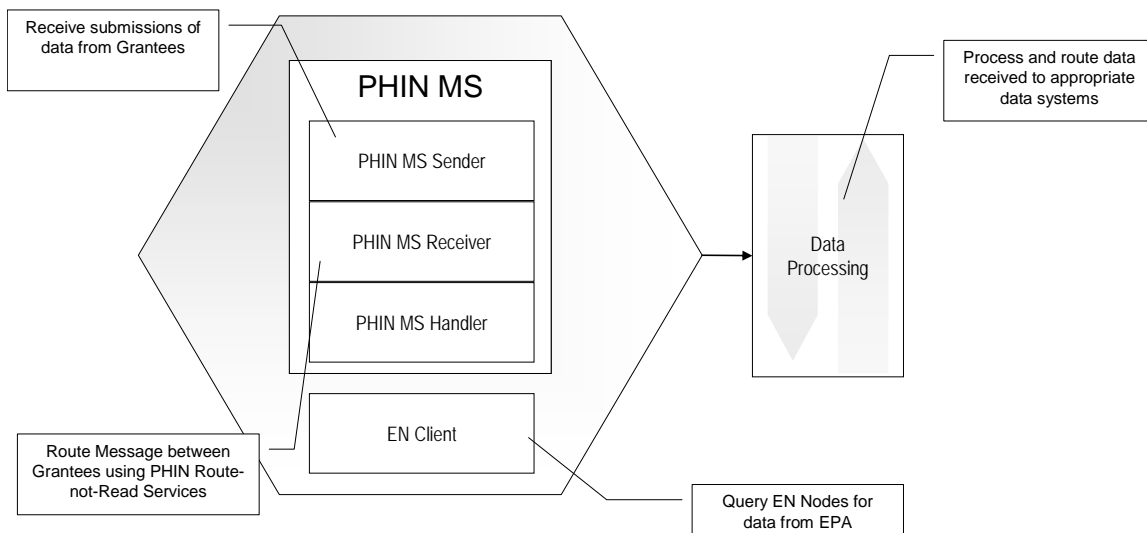


Exhibit 12: Tracking Network National Gateway

b. PHIN MS Receiver

The PHIN MS Receiver functions as a server. The PHIN MS Receiver listens for messages sent to it from PHIN MS Senders. When the Receiver receives a message, it processes the message envelope, decrypts the message, verifies the signature, and then forwards the message payload to the PHIN MS Handler. This can represent a “route-not-read” function. CDC will use PHIN MS Receivers to receive messages sent to it from network participants who have installed PHIN MS Senders.

c. Exchange Network Client

An Exchange Network Client is an application developed by the EPA Exchange Network that allows users to interact with EPA Exchange Network Nodes. Although an Exchange Network Client can be used to send data to other Exchange Network Nodes, it cannot service requests that it receives, and it is largely used for one-way communication. The capabilities of Exchange Network Clients and how they differ from Nodes are covered in detail in Section 3.10 and Exhibit 14.

3.8.2 Implementation Approach

CDC will implement the National Gateway to facilitate the exchange of data with grantees and provide the route-not-read functionality as a service to grantees who install only the PHIN MS Sender and not the PHIN MS Receiver. The following implementation approach will be followed to develop the National Gateway:

- Use cases for the National Tracking Gateway will be refined. These are likely to become more detailed as the contents of the NCDM are finalized and the need to keep some data secure is identified (vs. those data that can be made publicly accessible). The frequency of data exchanges and the volume of data being exchanged will also help define use of the Tracking Network National Gateway.
- The PHIN MS⁹ protocols are already widely used by different CDC programs, so that the specification and protocols do not have to be recreated. CDC, however, will develop procedures and documentation for how PHIN MS will be used specifically by the Tracking Program.
- CDC will create procedures for using the existing route-not-read functionality in PHIN MS.
- Accounts will be created on the National Gateway and guidance will be provided to grantees on the use of the National Gateway to send NCDM.
- Grantees will use the National Gateway to send NCDM to CDC.
- CDC will install an Exchange Network Client and will use it to access data from EPA's Central Data Exchange (CDX)—the EPA Exchange Network Node.
- Data received via the National Gateway will be compiled and aggregated by CDC and made available via the Secure Portal and/or the Public Portal.
- Currently, there is no process to check the validity of data received through the National Gateway. Business rules and validation will be developed once the XML schemas for the NCDM are developed.

3.9 Tracking Network Grantee Portals

The Tracking Network is envisioned as a “network of networks” that engages grantees, partners, CDC, and other users. Grantee tracking programs and the networks that support them are where most tracking will *happen* and where most of the national resources of the Tracking Network will be *applied*. Thus, grantee tracking networks are a critical component of the Tracking Network, but they are not the focus of this TNIP. Every component of the National Tracking Network has a direct counterpart in the grantee networks. In the case of grantee portals and gateways, each grantee is likely to implement something different, and the exact role that these components will play in grantee tracking will vary.

⁹ NCPHI is in the process of developing new versions of PHIN MS and the Tracking Network will make every attempt to use the latest version, when release by NCPHI.

Many aspects of the operation of these grantee network components will be within the *sole* purview of the grantees, although most will have some elements that must interface or be coordinated with their national counterpart if the whole of the Tracking Network is to function. Many of the grantees have already made significant progress on developing their networks. Future iterations of the TNIP may provide additional specifications for the functioning and integration of grantee networks. This will go beyond the limited discussion of the interfacing of these components to the Tracking Network national portals below.

Under the RFA issued by CDC, grantees are expected to deploy both Public and Secure Portals. These portals are envisioned as a critical component of the Tracking Network. Many grantees have already established public portals on their agency Websites, with a wide range of publicly available relevant tracking content. This information includes basic public information, interpretive reports, public data, Web-based query and reporting systems, and other content. Often, this information covers both CDC-funded projects and projects funded from a state or other sources. The long-term concept of operations for the Tracking Network is that both the National Secure and the Public Portals and their grantee counterparts will work together. The sections below sketch how this will be accomplished.

3.9.1 Grantee Portal Features

Grantee public as well as secure portals will be linked to the National Public and Secure Portals (see Exhibit 13). Working together, they will provide users, starting at the National Public or Secure Portal, with easy access to a *web* of Tracking content that can be cross-navigated and, over time, integrated to provide easier access to the content. Given that grantee portals will, because of their individual organizational IT requirements, have their own “look and feel,” consideration of the likely user scenarios for entry to the Tracking Network must be addressed in considering cross-navigation of the portals. The Tracking Program’s Portal, Analysis, and Visualization team is charged with providing recommendations to CDC to address functional and aesthetic requirements across the Network’s portals.

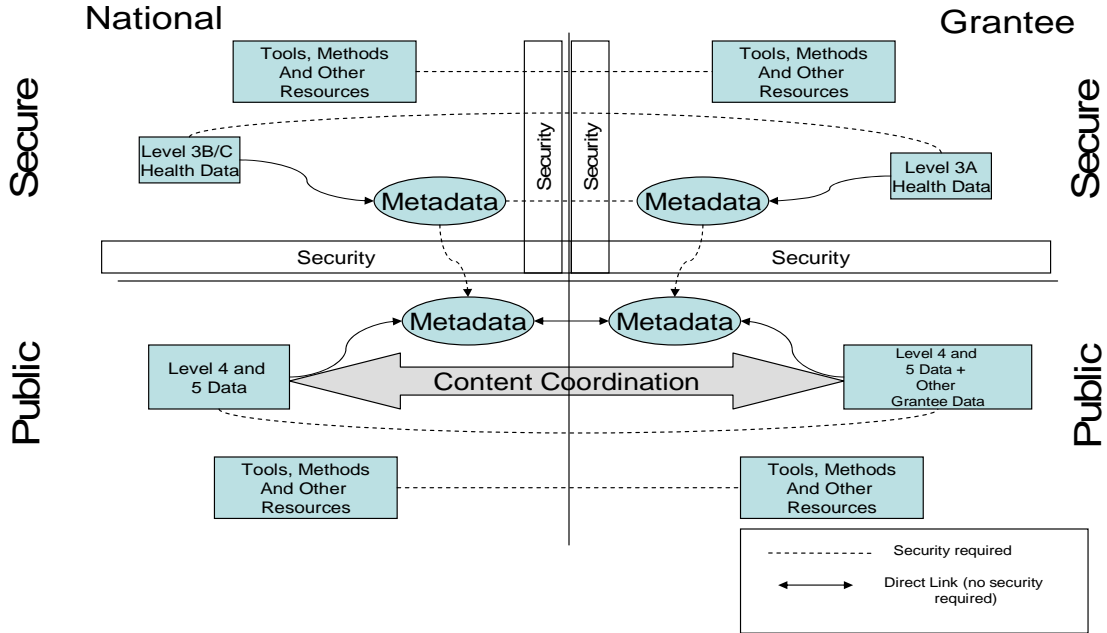


Exhibit 13: Relationship between National and Grantee Portals (based on the Health Data Model presented in Section 2.3)

- Tracking Network Metadata Services will provide links to data.
- Common use of standard Tracking Network keywords/vocabulary will categorize content on both sites. This categorization can be done without affecting the look and feel of grantee portals.
- Bi-directional links to/from related content on grantee and national portals will be created and managed.
- Recommendations will be established for specific, common, core information that will be covered on grantee portals, such as the NCDM and other data and information relevant to the grantees.

The technology tool chosen to create and manage these links will inform and be made in coordination with the platform choice for the National Secure Portal. A candidate for this technology is RSS¹⁰ (Rich Site Summary), which consists of a standard XML schema for characterizing Web content and a standard protocol for publishing and aggregating this content.

3.9.2 Implementation Approach

Currently, there is no national security infrastructure to exchange state and national identification credentials. While confidential information will be available on both national and state secure portals, separate authentication may be required. For

¹⁰ As initially envisioned, grantee portals need only make available RSS (or other) digests of their content, and, optionally, manually incorporate links (or feeds) to the National Portal. This avoids possible security concerns of grantees in *automatically* consuming an external feed (e.g. from the National Portal).

example, the national portal can identify secured information available on the state portal and direct the user to that data, but authentication would be required according to the state's established security procedures. Over time, selected content on Grantee Secure Portals may be directly accessible through the Secure National Portal. This will require establishing a procedure for obtaining/managing a "trust" bridge between the National Secure Portal security mechanism and the Grantee Secure Portal. A trust-bridge allows different institutions to share security credentials of users and trust the security credentials validated by another trusted institution. This functionality may be most practical (and desired) where grantees have already established Secure Portals specifically intended for collaboration with external partners (such as academics or other agencies). The primary challenge is largely institutional and not technical, and data stewards would need to be convinced that the security credentials validated by another institution are reliable.

In addition, over time, the Tracking Network will work to improve the quality and integration of both Grantee and National Portals by

- Using the terminology and categories developed by the CWG to consistently cross-index agency and national content;
- Collaboratively developing and sharing best practices for use of portals in the Tracking practice, including
 - Sharing expertise on how portals are being used for agency collaboration on specific tracking projects; and
 - Identifying and developing public content best practices and benchmarks across grantees and other partners. These will be made available in the Tracking Network repository.

3.10 Grantee Tracking Network Gateways and Clients

Grantees require the means to securely transport data across the Tracking Network. The Tracking Network requires transport protocols that facilitate exchanges between environmental and health agencies. CDC and some state health agencies currently use PHIN MS as their primary transport protocol. EPA and the state environmental agencies use the Exchange Network as their primary transport protocol. Currently, these two protocols are not interoperable. In the near term, the health and environmental agencies will use each other's transport protocol for exchanges. Grantees can use their Gateways to send data to CDC or to exchange data with other grantees, using the route-not-read functionality of the National Gateway.

3.10.1 Grantee Gateway Features

The CDC PHIN MS currently supports two kinds of interfaces for exchanging data—Senders and Receivers. The Exchange Network also supports two kinds of interfaces to exchange data—Nodes and Clients. Although the architecture of the two is different, the functionality of Senders and Receivers and Nodes and Clients is largely the same. Exhibit 14 below provides a comparison.

PHIN Messaging System		
Functionality	PHIN MS Receiver	PHIN MS Sender
Send data to Receiver	✓	✓
Send data to Sender	✓	
Receive data from Sender and Receiver	✓	

PHIN Messaging System		
Functionality	PHIN MS Receiver	PHIN MS Sender
Request ¹¹ and download data from Receiver	✓	✓
Respond to queries	✓	
Hold queries for later response	✓	
Exchange Network Messaging		
Functionality	EN Node	EN Client/EN Node in Client Mode¹²
Send data to Nodes	✓	✓
Send data to Clients	✓	
Receive data from Nodes and Clients	✓	
Request ¹³ and download data from Nodes	✓	✓
Respond to queries	✓	
Hold queries for later response	✓	

Exhibit 14: Comparison of PHIN MS and EN Messaging

Although PHIN MS Receivers and Exchange Network Nodes have more functionality than PHIN MS Senders and Exchange Network Clients, they are relatively more complex to install and require dedicated resources for installation and administration. The Tracking Program’s Standards and Network Development Workgroup (SND)—Network Architecture Subgroup (NASG) has made recommendations to CDC that clarify that client installations for both PHIN MS and Exchange Network will suffice for exchanging data for most grantees. The components that house both the PHIN and Exchange Network interfaces are generically called Tracking Network *Gateways* in this document.

3.10.2 Implementation Approach

The NASG transport options identified above give grantees a choice of installing either a PHIN MS Sender or a PHIN MS Receiver, and an Exchange Network Client. The proposed implementation path is

- Develop standard configurations for the installations of Grantee Gateways/Clients.
- The Tracking Branch of CDC will work with the National Center for Public Health Informatics (NCPHI) to set up accounts for Grantees on the National Gateway.
- Based on their needs, grantees can choose to install a PHIN MS Receiver or a PHIN MS Sender. If they set up only a PHIN-MS Sender, they can request that the CDC set up a route-not-read path for them.
- Grantees will also install an Exchange Network Client to exchange data with their environmental partners on the EPA Exchange Network. This would involve downloading a client made available by the Exchange Network and establishing an account on the Exchange Network Authentication and

¹¹ Route-not-Read

¹² Some organizations may implement an EN Node for better automation but run it in Client mode. This scenario is called EN Node in Client Mode and for the purposes of this paper is equivalent to an EN Client.

¹³ Client must initiate the exchange.

- Authorization Services (NAAS). The NAAS can also be configured to accept security certificates issued by CDC.
- Grantees have the capability to use their PHIN MS Senders or Receivers to send NCDM to the National Gateway.
 - As an initial step before Gateways are established, grantees can upload data to the Secure Portal through the use of Role-Based Access Controls. The Secure Portal upload functionality is best used with data that change infrequently.

3.11 Partner Interfaces

In addition to providing interfaces to grantees, the Tracking Network will establish interfaces to other partners prepared to provide access to Tracking Network-relevant data sources or services. Partners prepared to provide direct access to Tracking Network-relevant data sources will use Tracking Network standard interface supporting the PHIN MS or Exchange Network protocols (PHIN-MS Receiver and Node respectively). Other transport interfaces will be evaluated with specific data partners, if needed. Until national standards for data transport are established and adopted across a majority of partner organizations, flexibility in choosing a transport protocol should be allowed. This will facilitate the exchange of data through various means that may currently be supported among agencies outside the Tracking Network. If these options are not possible, CDC may store a copy of partner data in the National Repository.

3.11.1 Partner Interface Features

A key objective of the Tracking Network is to help support both technical and organizational “networks” to promote access to data when and where they are needed for tracking. While the National Secure Portal, the Gateways and clients, and the Partner interfaces will provide new technical mechanisms to transfer data, some EPHT-relevant data are already available to grantees and partners through traditional means or on individual public or secured Websites. The key value propositions of the Tracking Network for improving grantee and partner data stem from the ability to use the Tracking Network to

- Identify and establish access to *new* data assets from existing and *new* sources
- Pre-process existing data sources into EPHT formats/layouts, specifically designed (through the efforts of the CWG and others) to enable their easy use by staff
- Obtain/facilitate secured access to sensitive data based on established roles
- Provide integrated and organized access to these data resources via a single, searchable/browsable one-stop interface

These interfaces will allow Tracking Network users to access partner data directly. The National Portal will act in a “data brokering” mode, avoiding the need for other Tracking Network users to develop custom interfaces to these partners. The exact nature of the data brokering mode is not yet known, and more information will be made available once the contents of the NCDM are finalized. In some cases, especially for infrequently updated data, where performance, security, or other access requirements exist, CDC may elect to simply warehouse (copy and store) partner data to the internal National Data Repository.

3.11.2 Implementation Approach

Once priority partner data are identified, Partner Interfaces for these data will be negotiated and established. This will be an ongoing process, as more partner data are identified. During 2007–2008, CDC will focus on establishing an interface to the following candidate sources:

- CDC's Wide-ranging Online Data for Epidemiologic Research (WONDER) system
- US EPA via existing EN Node at CDX
- US Census
- US Geological Survey (USGS)

4 INTERACTION OF COMPONENTS TO SUPPORT TRACKING NETWORK FUNCTIONS

This section describes the scope, features, and development approach for the individual components in support of the overall functions of the Tracking Network. For most Tracking Network functions to be fulfilled, the multiple components will work together.

4.1 Function 1: Support the Refinement and Compilation of a Core Set of Nationally Consistent Data and Measures

Under the NCDM component in Section 2.1, the TNIP proposes a set of milestones for the activities to define the products of the CWG (e.g., formats, timelines, and supporting resources) and to refine the support needed by the CWG and NCDM implementers. The discussion below is provisional. It is based on early deliberations of the CWG and will be refined as their products are produced.

As defined in the NNIP, NCDM are specific data and measures collected and organized based on standards that have been recommended by the CWG and adopted by CDC for the Tracking Network. These NCDM are a cornerstone of the Tracking Network's goal of establishing and improving the nation's surveillance capabilities.

As discussed in Chapter 3, the core work of identifying, developing, and refining the NCDM is now under way within the CWG. Grantees will test and implement these NCDM within their own agencies. The results will be compiled on the National Public Portal and the National Secure Portal.

This work of NCDM refinement and implementation is anticipated to be an ongoing effort through the foreseeable future of the Tracking Network. As experience is gained with individual measures and their underlying data sources, the measures will be refined and re-issued. As improved data resources identify new potential areas of interest, new NCDM will be developed.

This function is supported by every other Tracking Network Function and component. Work on the NCDM can be separated into three activities to be addressed by the Tracking Network. The three activities are

- Provide support to identify, develop, and refine the NCDM
- Provide access to and share tools/methods needed to implement the NCDM
- Compile, store for access, and support basic analysis on the NCDM

Each of these activities is discussed in detail below.

Provide support to identify, develop, and refine the NCDM

Most of the "on the ground" work to collect, aggregate, and report the NCDM will be conducted by grantees, working, for the most part, with local data partners and their own agencies. In addition, CDC will also work to aggregate and report some NCDM by working with national data partners. The Tracking Network, specifically the Secure Portal, will support the work of the grantees, CWG Teams, CDC, and the early implementers of the NCDM by providing a secured collaborative workspace in which assessment, deliberation, analysis and information-sharing needed to develop the NCDM and their associated tools can be conducted. This function is currently being supported, to a limited extent, by the EPHTN SharePoint site. The Secure Portal, when

implemented, will significantly upgrade this functionality to provide much more enhanced collaboration capabilities and additional information, organization tools, and resources. These will include better electronic collaboration on space and knowledge management. This functionality will evolve with the Tracking Network to include supporting the identification, development, and implementation of additional NCDM for “emerging” health areas with potential environmental etiology.

Provide access to and share the CDC/grantee/partner tools/methods needed to implement the NCDM

Once standards for a given NCDM are developed, implementers will need support in their implementation. The Secure Portal will provide access to documentation, methodologies, and tools needed by practitioners to perform the acquisition, aggregation, and transformation of surveillance data into the formats specified by the NCDM and to calculate the measures themselves (if indicated) from these data. These resources will include

- NCDM documentation and procedures
 - Standards and format of the NCDM
 - “How to” guides
 - FAQ sheets and risk communication materials
 - Associated tools or methodologies needed to assemble the NCDM. This may include development and sharing of approaches for common issues such as de-identification techniques.
- Available software, such as
 - Application scripts (e.g., SAS scripts) that perform routine transformations or calculations
 - CDC/grantee/partner and/or collaboratively developed applications or application modules

Note: these information resources are related to but distinct from those described under Function 4 below. Under Function 1, these resources are targeted at implementers of the NCDM (which are anticipated to be a smaller core set of agencies), while the information resources described in Function 4 will be broader than NCDM and useful to a broader practitioner community.

Compile, store for access, and support basic analysis on the NCDM

Once populated by individual grantees/partners, the NCDM must be compiled (combined) as appropriate and provided for access and analysis to the Tracking Network members and, in some form, to the public, via the National Public Portal. The following Tracking Network components will support these activities. Exhibit 15 depicts how the process might work:

- Grantees will use the National Secure Portal, National Gateway and Client to transmit collected NCDM to CDC.
- CDC will store, compile, and process these data within the National Data Repository.
- The Secure Portal will be used to access the compiled data and provide access to selected Secure Portal-hosted AVR tools that can be used to analyze the data.
- The National Public Portal will be used to provide public access to NCDM and supporting interpretive information.

In some cases, NCDM will consist, in part, of data that has already been reported to other CDC programs by states in a format consistent with the NCDM standards. In

these cases, the Tracking Branch will work with other CDC programs to obtain state-provided data and compile these data into nationally consistent data. This will eliminate the need for grantees to re-report the data.

Exhibit 15 describes how selected Tracking Network components and Workgroups support the refinement and compilation of a core set of Nationally Consistent Data and Measures

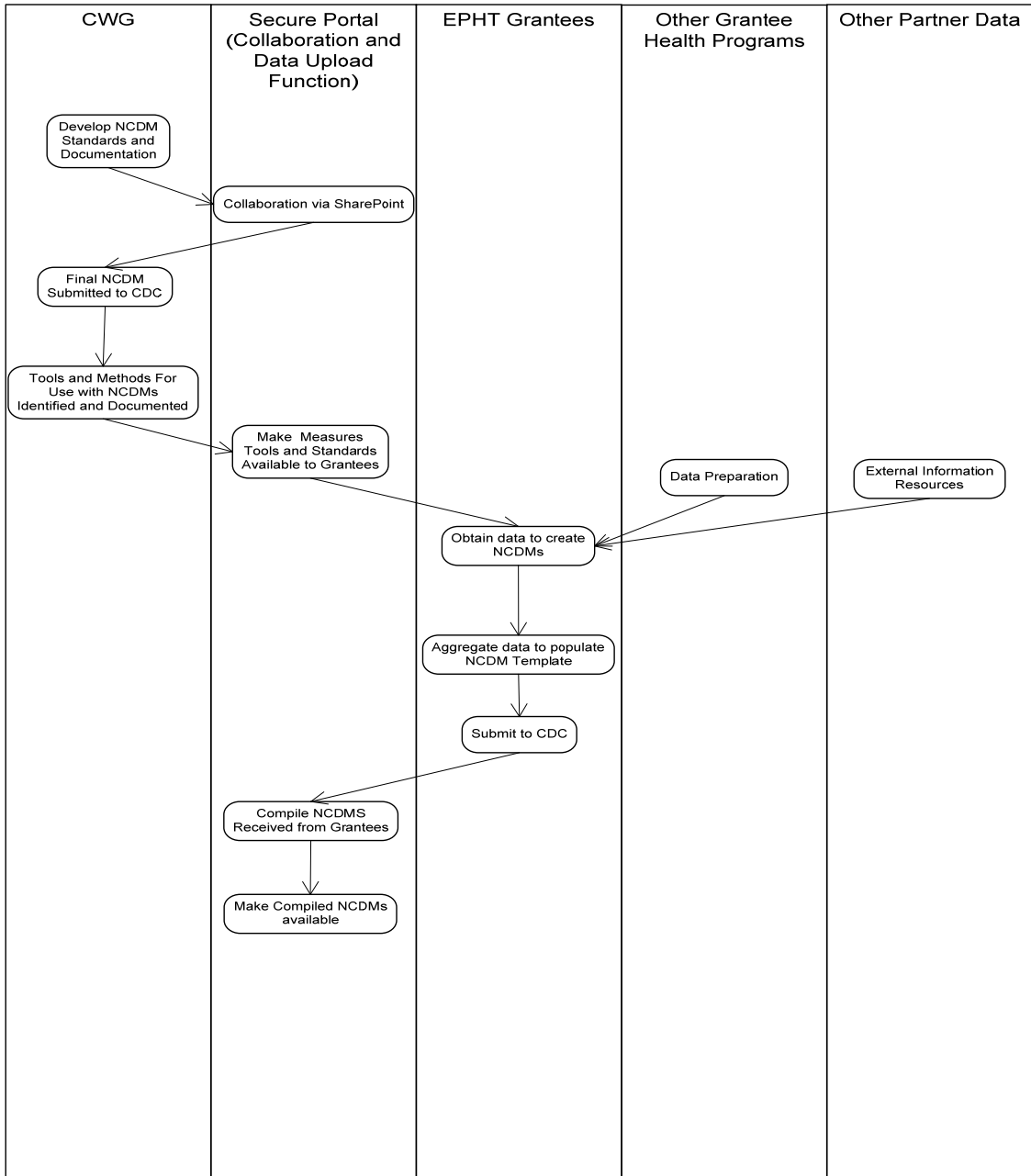


Exhibit 15: Function 1 - Compilation and Aggregation of NCDM

4.2 Function 2: Describe and Discover Data

A key function of the Tracking Network is to enable the description and discovery of data relevant to EPHT. The Metadata Services component will be the primary mechanism to facilitate the discovery and description of data on the Tracking Network.

Describing Data

The Metadata Services component facilitates the creation of a Metadata Record on the Tracking Network. Making metadata available does not always imply that the actual data are available to users on the Tracking Network. Data owners will have the ability to specify use and access restrictions in the Metadata Profile to restrict access to the data and to require signed Data Sharing Agreements. There are two ways in which data can be described. Exhibit 16 depicts these options:

a. Fill in the Metadata Profile

The proposed use of the Metadata Creation Tool is as follows:

- o Users¹⁴ log on to the National Secure Portal
- o Users Access the Metadata Creation Tool
- o A user interface will be displayed that shows the elements of the Tracking Network Metadata Profile¹⁵ as a form.
- o Users will fill in the elements and will have the option to save a draft that can be completed at a later time.
- o Once the metadata profile is completed, users will submit the metadata record for storage in the Metadata Registry.
- o The same process can be used to update or modify existing metadata records if the user is given rights to perform those operations.

b. Upload a Metadata Record

Some users may wish to create metadata locally by using their own metadata creation tools and then uploading to the Metadata Registry. The proposed use of the feature that facilitates the direct upload of a metadata record is as follows:

- o Users create a metadata record with their own metadata creation tool.
- o Users use the Tracking Network Metadata Profile as a template that will ensure that the Tracking Network metadata standards are adhered to.
- o Users log on to the National Secure Portal
- o Users access the Metadata Registry upload functionality
- o Users select the Tracking Network Metadata Standard-compliant metadata record from the local machine and upload it to the Metadata Registry.

¹⁴ Users who have been assigned rights to create/update metadata records.

¹⁵ The required fields in the metadata profile will be clearly identified with guidance on how to fill out the form.

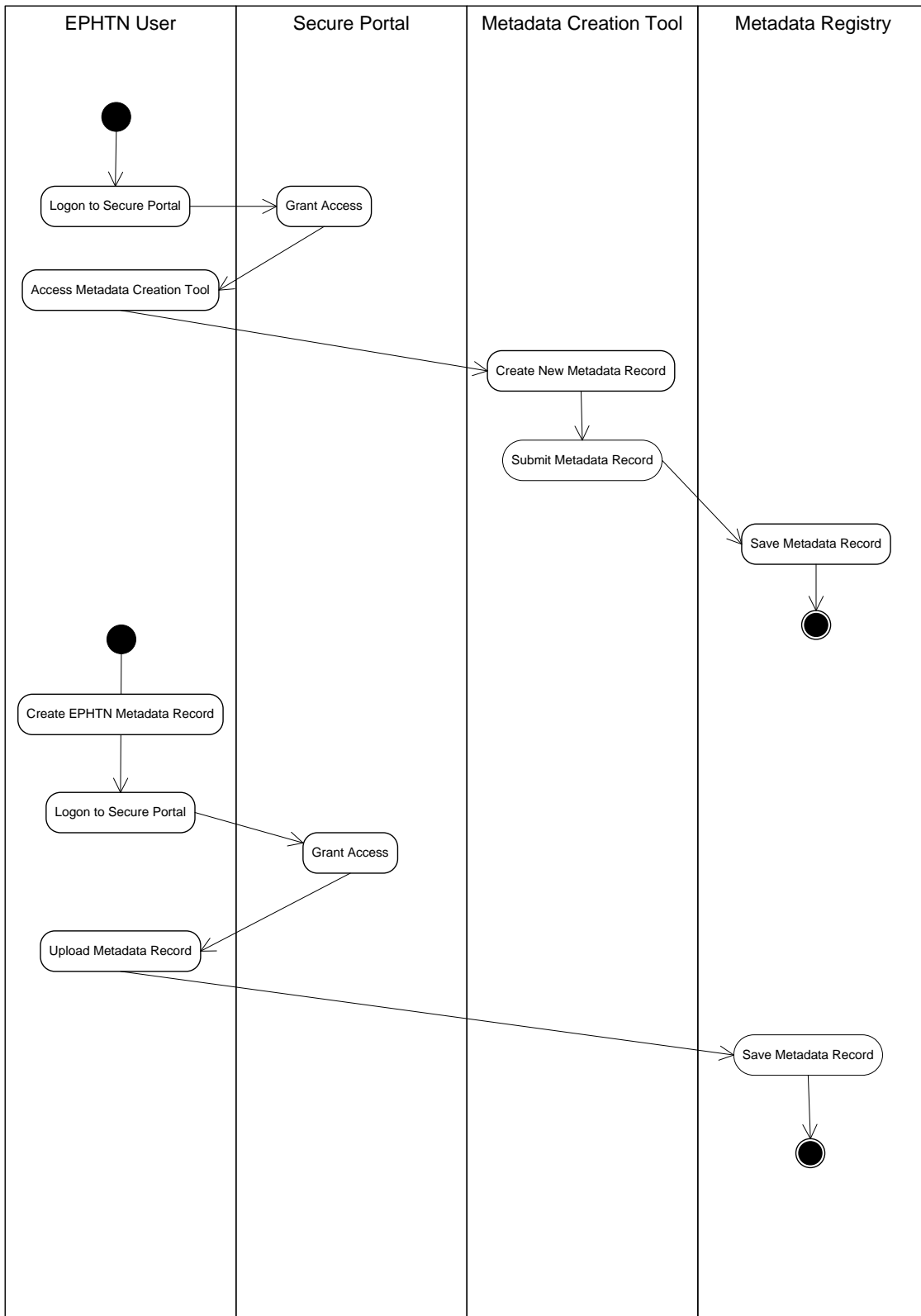


Exhibit 16: Function 2—Creating and Uploading Metadata Records

- *Discover Data*
Once metadata records have been created, users have two potential options for discovering the records (see Exhibit 17).
 - a. Metadata Search Tool
Users will be able to use the Metadata Search functionality to discover data on the Tracking Network. Users will be able to use selected fields of the Tracking Network Metadata Profile to build search criteria that will return metadata records from the Metadata Registry. Initially, only the metadata registry at the National Secure and Public Portals will be searched. As the network matures, this functionality may be extended to the Grantee Portals. The proposed use of the search functionality is as follows:

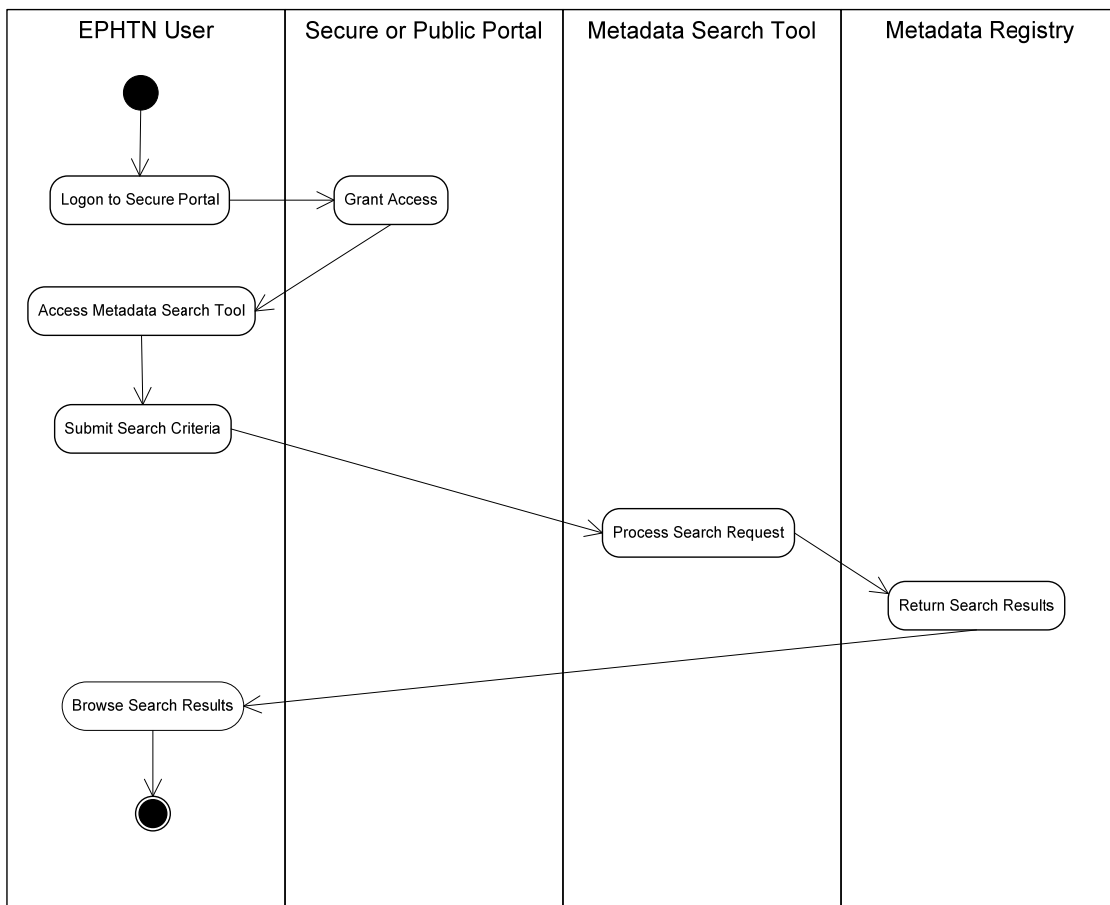


Exhibit 17: Function 2: Discovering Data Using Search Tool

- A Tracking Network user will log on to the Secure or Public Portal.
- The user will have access to the Metadata Search Functionality.
- The user will be able to use the fields in the Tracking Network Metadata Profile to specify the search criteria. For example, the user could specify the search criteria to return *all data developed after 2001 with the word asthma in the abstract*. The Metadata Search Tool would search the Metadata Registry for all records matching these criteria and return a list of all matches.

b. Browse Metadata Directory

Another potential way for users to discover data is through use of the Secure or Public Portal directory functionality. Metadata elements can be used to create a directory structure on the Secure or Public Portal. This structure can then be used to navigate between the resources on the basis of such variables as content area, geography, date, etc. In addition to the actual data, the user will be provided with related resources, such as the methods and tools used to create the data.

4.3 Function 3: Provide Data Access and Exchange Services

The primary mechanism for the Tracking Network to provide users with data access and exchange functionality is through the Secure and Public Portals, at both the national and grantee level. Over time, as gateways continue to develop, new options for authorized, automated access and retrieval will become available. These include the ability for grantees to access selected data sources automatically and to provide selective, authorized access to specific resources on their gateways.

National Secure and Public Portals

a. Data Access

The National Secure and Public Portals will allow users to access the NCDM and other data. Exhibit 18 uses the health data model presented in section 2.3 to illustrate how this can be done, In this illustration, different data will be accessible at differing levels of resolution/sensitivity, depending on whether the data are accessed from the Public or Secure Portal and the privileges assigned to users (e.g., via Role-Based Access Control RBAC). Some data may be viewed (e.g., pre-defined examples of county level rates may be displayed), downloaded, or queried. To protect confidential data, only Level 4 and Level 5 health data can be viewed, downloaded, or queried via the Public Portal. Some Level 3 health data will be made available via the National Secure Portal, with appropriate Role-Based Access Controls (RBAC) in place (these data may also or instead be accessible from Grantee Portals). Level 2 health data (which most likely will reside at grantee sites) may be made available via the Secure Portal for download in certain situations if appropriate agreements are negotiated with data owners. Level 1 health data will reside at grantee sites and will not be accessible via the National Portals.

Health Data Level	National Secure Portal		National Public Portal		
	Download	Query	Pre-defined View	Download	Query
1	No		No		
2	Project-specific, negotiated file sharing (RBAC)	No	No		
3	Yes (RBAC)		No		

Health Data Level	National Secure Portal		National Public Portal		
	Download	Query	Pre-defined View	Download	Query
4	Yes		Yes		
5	Yes		Yes		

Exhibit 18: Data Availability and Levels of Data Access

The National Secure and Public Portals will serve as the points for access to and information about EPHT-relevant data. There are several ways the Secure Portal can facilitate data access and exchange (See Exhibits 19 & 20).

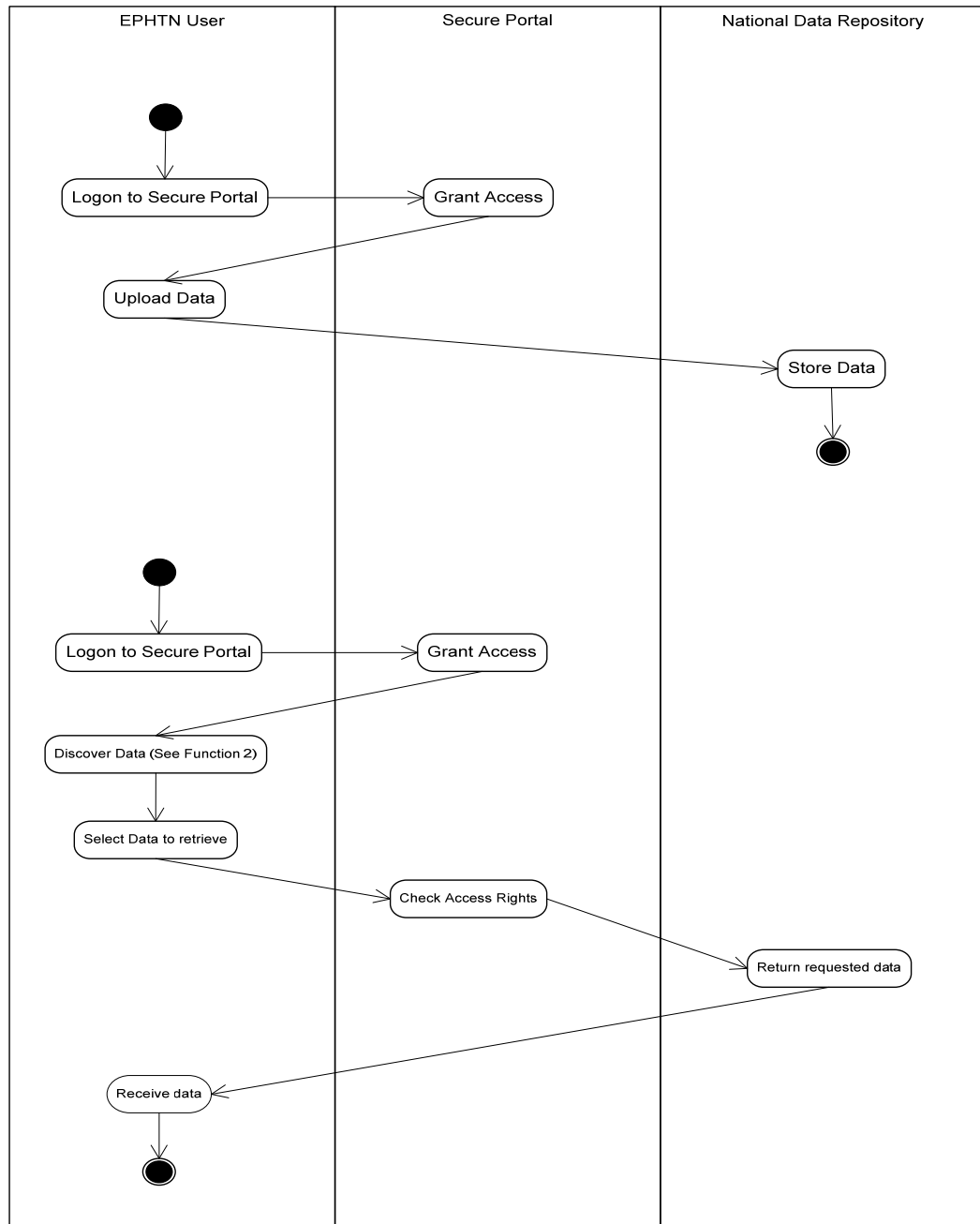


Exhibit 19: Function 3—Uploading and Accessing Data on the Secure Portal

b. Data Upload

The Secure Portal can be used to upload NCDM to the Tracking Network. Grantees can upload data to the Secure Portal through the use of Role-Based Access Controls and restrict access to the NCDM. The Secure Portal upload functionality is best used with single data that change infrequently.

c. Data Hosting

Once data are uploaded to the Portal, they can be made accessible through the Portal data directory structure and discoverable through creation of a metadata record in the Metadata Registry.

d. Access Other Data Sources

The National Secure Portal can also act as a “broker” for partner, grantee, and other external data sources to “registered users”. For these sources, the Portal, on behalf of a user, will act as a “client” (e.g., an Exchange Network Client) to search and retrieve data for download or to use with other portal functions (such as AVR).

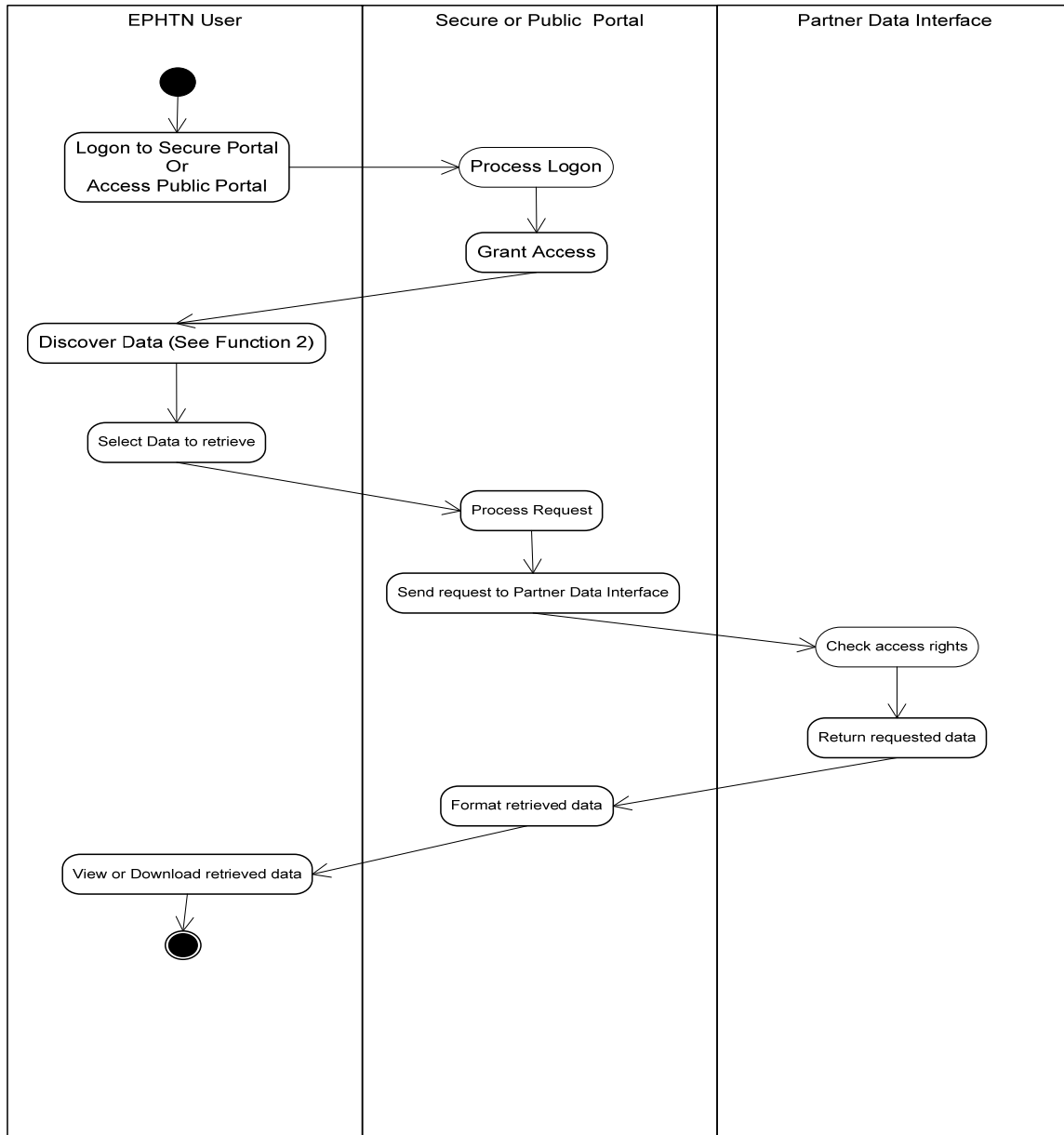


Exhibit 20: Function 3: Accessing Other Data Using National Portals

Tracking Network Messaging-based Data Exchange

As the number of data and the frequency with which they are exchanged increases, grantees who want to automate the process of exchange could use their Grantee Gateways to transport data. The Tracking Network has adopted PHIN MS as the primary transport mechanism for automated data exchanges. The Tracking Network will use Exchange Network protocols and clients to exchange data with environmental partners. There are several ways that Gateways could be used:

- a. Exchange Data with the National Gateway
Grantees will have the option of deploying either a PHIN MS Sender or a PHIN MS Receiver as Gateways. Either can be used to send data to the National Gateway (see Exhibit 21). To receive data from the National Gateway, grantees will need to deploy a PHIN MS Receiver.
- b. Exchange Data among State Gateways
Grantees who deploy PHIN MS Receivers can directly exchange data with each other. Grantees that have deployed a PHIN MS Sender can use the PHIN MS route-not-read functionality to post and then pull messages through the National Gateway (see Exhibit 22). All Grantees will require data handling and routing processes outside of PHIN MS to handle the proper routing of messages received via PHIN MS.
- c. Exchange Data with Environmental Partners
Grantees will use Exchange Network Clients to retrieve data from environmental partners.

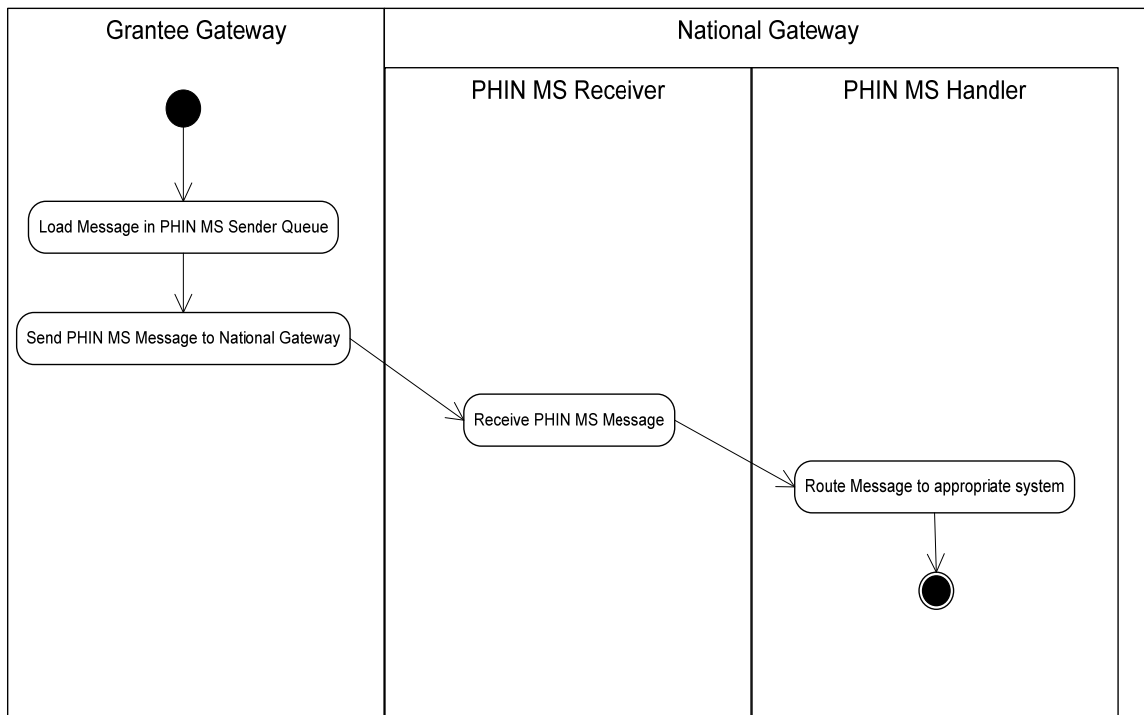


Exhibit 21: Send Data to National Gateway

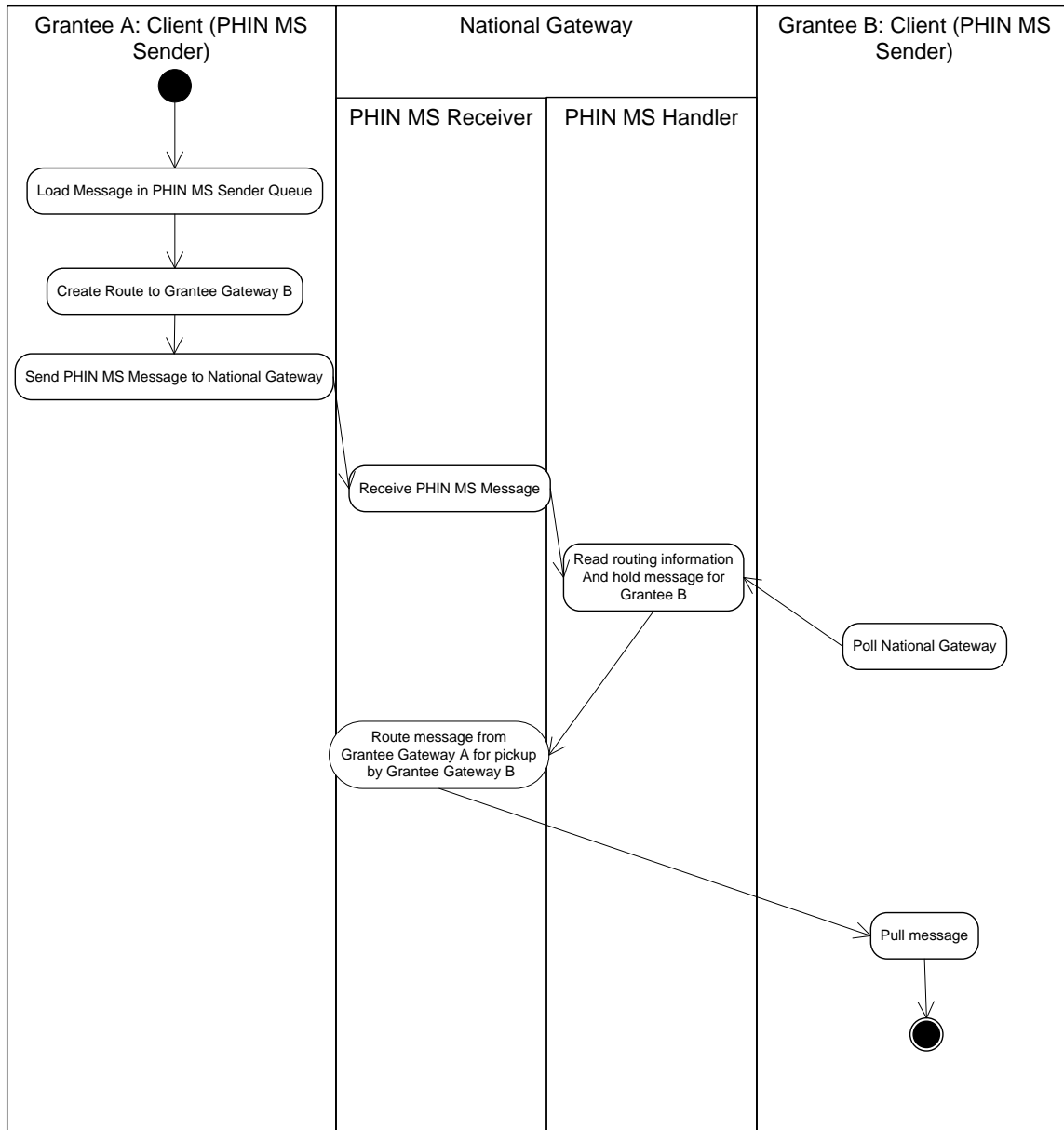


Exhibit 22: Function 3—Send Data between Grantee Gateways using Route-not-Read

4.4 Function 4: Support Development, Information Sharing, and Access to Tracking Tools and Methods.

As a complement to the “data centric” functions (NCDM, metadata, and data access) described above, the Tracking Network will provide information resources to support the development, information sharing, and access to tracking tools and methods. These resources will be focused on, but not limited to, the health conditions and environmental hazards identified by the NCDM. The information content and motivation for this function were discussed earlier; this section briefly outlines how the function will operate.

Similar to data, tools can be “on” the Tracking Network in different ways. Secure Portal users can access tools and other resources in the following ways (see Exhibit 23):

- Using the AVR tools available online within the Secure Portal to analyze online data;
- Finding and linking to online or downloadable tools (such as RIF) provided by CDC or other stakeholders;
- Finding and accessing documentation on how these tools have been and can be deployed in support of tracking programs.
- Online tools created and provided on the portal under the first and second bullets will constitute the National AVR Toolkit noted in the RFA. Information to support these functions will be stored and managed in the TMR. In the longer term, it may be possible and useful for the National Gateway and other stakeholders to offer Web-based services for direct use by other applications.

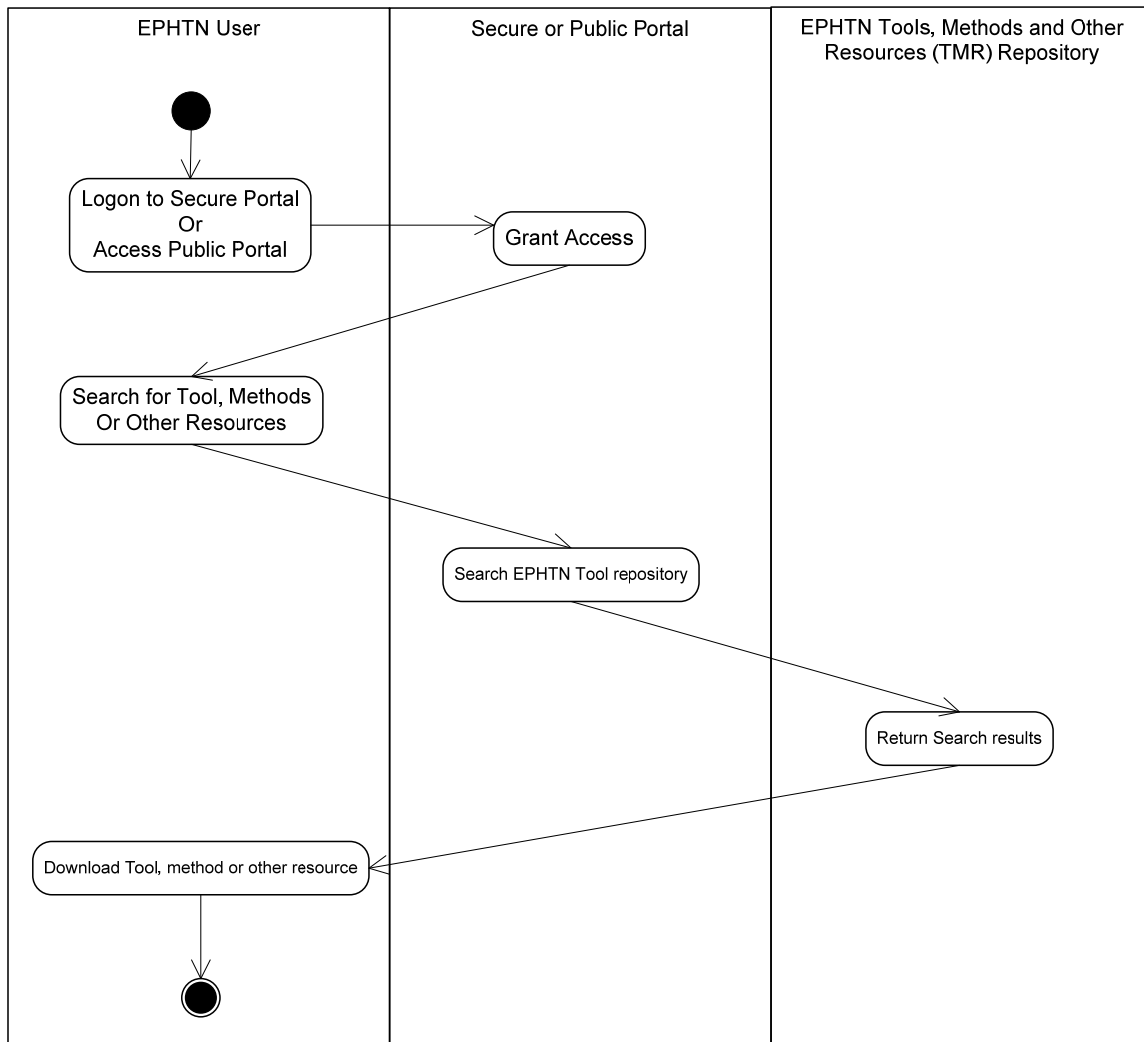


Exhibit 23: Function 4—Download and Access Tools

The Secure Portal and TMR will also provide access to documentation and links on the Tracking Network procedures and methods.

To establish this function, CDC will

- Implement and maintain the TMR Registry itself
- Establish a process to work with grantees and with academic and other partners to identify and document useful tools
- Past and ongoing efforts of CDC, Grantees and Academic partners, and the existing Tracking Network Workgroups have already created or identified significant, relevant content that could be re-purposed here, including
 - Evaluations of portal and Web-based query software for use in public health (based on the findings of the CDC portal software evaluation effort)
 - Hosting of an RIF tool site to support and share information about tool deployment
 - Tools being identified by the CWG, including model SAS scripts and modules customized for the NCDM

In addition, this information could be used by CDC to identify opportunities for, and support the collaborative development of, specific EPHT software.

4.5 Function 5: Interact with and Inform the Public

Congress and the Tracking Branch recognize the critical need for a comprehensive integrated information source that can effectively inform and interact with the public and public policy makers on environmental public health issues. This is the primary function (and rationale) for the National Public Portal. Built on the foundation of the other Tracking Network components, this Portal is designed to provide a significant, new, and integrated information source for environmental health.

The operation and content of the National Public Portal was reviewed in Chapter 3. As defined earlier, the National Public Portal will provide access to specific data and other resources identified. As important as any of these resources, however, will be the Public Portal's capability to act as the "one-stop shop" for members of the public seeking environment and public health information.

Exhibit 24 describes how other Tracking Network components support dissemination of information to and interaction with the public.

Tracking Network Component	Role in Supporting Informing and Interacting With the Public
NCDM	NCDM are expected to be used by a wide variety of audiences (beyond CDC and Grantees) as trackable information useful in communicating with the public. The NCDM will provide the first comparable set of measures for the public to explore and learn about environmental health issues.
Metadata Services	Many environmental health data resources are difficult to find. In many cases, they are effectively invisible to the public. The Tracking Network metadata services will make available Metadata for selected Tracking Network data. In many cases, this will represent the first time these resources have been characterized by a consistent set of publicly accessible Metadata—visible to the public in this

Tracking Network Component	Role in Supporting Informing and Interacting With the Public
	format.
Grantee Tracking Network Portals	Through the grants made by CDC, as well as the NCDM, Metadata, Tools/Methods Repository, and Secure Portal, the Tracking Network seeks to improve the capability of grantees to manage and make available tracking information to the public. In addition, through features of the Public Portal, the Tracking Network will supplement and provide additional context to locally provided data by providing links to additional data and resources.
Tools, Methods, and Other Resources (TMR) Repository	A key area of interest among grantees and other Tracking Network users is likely to be the ability to share methods and approaches, including means to effectively reach the public. The TMR Repository, as well as the collaborative space provided by the Secure Portal, is designed to improve the capabilities to perform public outreach.

Exhibit 24: Tracking Network Component Support for Public Access

5 KEY CROSS-CUTTING OPPORTUNITIES/CHALLENGES IN NETWORK DEPLOYMENT

This section summarizes preliminary observations on cross-cutting opportunities and challenges in Tracking Network deployment that have been identified in the development of this TNIP.

5.1 Tracking Network Content and Methods Evolution

If the early efforts of the Tracking Network are successful, public health practitioners, researchers, and policy makers of 2020 will be using the NCDM and other tools to harvest information from a stable network of mature state, local, and other partner tracking programs. Much of the interim work needed involves development of content, methods, and tools. The Tracking Network's technical ability to exchange and access data will support this development, but it will not determine it.

As Tracking Network experts produce new content products, there should be systematic processes to assess how those products are best supported by the existing or (needed) technical capabilities of the Tracking Network. For example, a product that describes a new effective statistical process for data aggregation/analysis should be examined to see if that process could be incorporated into the Tracking Network's AVR tools. The goal is to evolve the Tracking Network's technical capabilities in support of its content. This process will need to be iterative and ongoing (see Issue 5.2)

5.2 Need for Documented Examples of Tracking (How the Specific Technical Network Capabilities Identified Here Support Tracking)

The Tracking Network, including this TNIP, is still lacking illustrative examples, or use-cases, of exactly how the Tracking Network and its tools could be harnessed to provide new functionality to users. Once the CWG has identified its draft NCDM, a set of concrete examples should be developed. The examples should demonstrate how the content products of the CWG can be integrated with the online tools to support Tracking. CDC should work with grantees and other members of the EPHT community to develop and test these examples. Grant-supported Tracking data linkage demonstration projects provide a useful starting point for these examples. These have already been partially cataloged in the form of grantee presentations, poster sessions, and progress reports.

5.3 Expansion and Use of the Tracking Network beyond Current Grantees and Partners

The work being conducted by CDC and current grantees is laying the groundwork for the Tracking Network. Many of the components of the Tracking Network will be valuable to non-grantees as well. In general, most components will be enhanced as more users use/participate in them (more data are available; more opportunities for tool/method sharing exist). While resource constraints may limit systematic adoption of the NCDM by non-grantee agencies, many Tracking Network resources may be of value and may be adopted by non-grantees to provide support for national tracking efforts.

Ongoing discussions to support expansion of the Tracking Network to non-grantees could be valuable. The deployment approach proposed in the TNIP initially

emphasizes the Secure Portal as a primary access system. Access to this Portal could be easily extended to additional public health agencies, using the existing security procedures.

5.4 Data Availability, Timeframes, and Tracking Network Demands

Many health measure data are currently available only on a semi-annual or an annual basis, due to collection and reporting time frames, the necessary quality control, and other issues. On the environmental side, data for some programs (such as the Toxic Release Inventory—TRI) may be available only annually or with long delays. Initial implementations of the NCDM will need to be adapted to these local realities.

5.5 Data Completeness and Representativeness

Some data systems are more complete than others: some health events are not fully ascertained by existing data collection systems (e.g., they may not be fully population-based); some environmental monitoring data systems have gaps in coverage (in space or time or both). With adequate resources, data system completeness can be improved: routine evaluations show that many cancer registries capture over 95% of incident cases.

Incomplete health outcomes' ascertainment and gaps in environmental monitoring coverage may present greater challenges to data analysis and use than do problems with timeliness. Evaluations of representativeness (the extent to which characteristics of extant data are similar to missing data) need to be routinely performed.¹⁶ In fact, the CWG is documenting the limitations of NCDM, and these limitations will be made available on the Tracking Network. CDC and grantees should work with Tracking Network data providers to improve completeness, especially in data systems where operations are CDC-funded.

¹⁶ See CDC "Updated Guidelines for Evaluating Public Health Surveillance Systems" (available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5013a1.htm>).

6 CONSOLIDATED LIST OF ACTIVITIES AND TIMELINE

A consolidated list of activities and timeline will be available in a separate document.

APPENDIX A: ACRONYMS

Acronym	Term
AISSP	Automated Information Systems Security Program
ATSDR	Agency for Toxic Substances and Disease Registry
AVR	Analysis Visualization and Reporting
CDC	Centers for Disease Control and Prevention
CDC SDN	CDC Secure Data Network
CDX	Central Data Exchange
DHHS	Department of Health and Human Services
EN	Exchange Network
EPA	US Environmental Protection Agency
EPH	Environmental Public Health
EPHTN	Environmental Public Health Tracking Network
Epi-X	The Epidemic Information Exchange
FGDC	Federal Geographic Data Committee
ISO	International Standards Organization
LPPB	Lead Prevention Program Branch
MDSG	Metadata Subgroup (SND)
NAAS	Network Authorization and Authentication Services
NASG	Network Architecture Subgroup
NCDM	Nationally Consistent Data and Measures
NCEH	National Center for Environmental Health
NCHS	National Center for Health Statistics
NCPHI	National Center for Public Health Informatics
NEPHT	National Environmental Public Health Tracking
NIOSH	National Institute for Occupational Safety and Health
NNIP	National Network Implementation Plan
PAVR	Portal, Analysis, Visualization and Reporting Workgroup
PHASE	Public Health Air Surveillance Evaluation
PHIN MS	Public Health Information Network Messaging System
PMO	Program Marketing and Outreach Workgroup
RBAC	Role Based Access Controls
RFA	Request for Application
RIF	Rapid Inquiry Facility
RnR	Route-not-Read
RSS	Rich Site Summary
SND	Standards and Network Development
TMR	Tools, Methods and other Resources
TNIP	Technical Network Implementation Plan
TNR	Tracking Network Repository
TRI	Toxics Release Inventory
WONDER	Wide-ranging OnLine Data for Epidemiologic Research
XML	Extensible Markup Language

APPENDIX B: GLOSSARY OF TERMS

Term	Definition
Analysis Visualization and Reporting (AVR)	Tools on the Tracking Network that will be used for analyzing environmental health relationships (e.g., statistical analysis tools—SAS), visualizing environmental health relationships (e.g., Geographic Information Systems), and reporting results (e.g., graphic displays)
Authentication and Authorization Services	Network Authorization and Authentication Services (NAAS) are a set of centralized information security services that Exchange Network partners can use to authenticate and authorize their users. All NAAS operations are conducted over a Secure Socket Layer (SSL) channel, using 128-bit encryption
Automated Information Systems Security Program (AISSP)	Policies and procedures that are to be followed to assure that the information technology (IT) resources are appropriately protected when authorizing the remote access of automated information and systems
Central Data Exchange (CDX)	The point of entry on the EPA Exchange Network for environmental data submissions to EPA
Community of Practice	The process of social learning that occurs when people who have a common interest in some subject or problem collaborate to share ideas, find solutions, and build innovations
Content Workgroup (CWG)	The Content Workgroup is composed of grantees, academic and federal partners, and other stakeholders, including data owners/stewards tasked to identify and recommend standards and core measures to CDC for use in the Tracking Network
Data Stewards	Entities that collect and administer public health and environmental data for potential use on the Tracking Network
EPA Exchange Network	A partnership among states, tribes, and the EPA to exchange environmental information
Exchange Network Client	A program that can be used to interact with Exchange Network Nodes. Clients can only submit or download data and cannot make data available for other Nodes to access
EPA Exchange Network Node	An EPA partner's single point of presence on the Exchange Network that serves as the exchange point for all data requests and submissions
Link	(1) A database term used for joining database tables by using common fields or code sets to provide a unified table or view (2) to jointly analyze 2 or more types of data
Metadata Creation Tool	An online tool currently under development by CDC that provides an interface to create and manage metadata records
Metadata Registry	An online repository of Tracking Network Metadata records
Nationally Consistent Data	Specific data collected, organized, and in some cases pre-processed, on the basis of standards that have been recommended by the Content Workgroup (CWG) and that have been adopted by CDC for the Tracking Network
Nationally Consistent	A specific combination/ calculation/ derivation of health

Term	Definition
Measure	and/or environmental data to yield a composite number, such as a rate for a specific geographical unit and time period of analysis. Guidelines for developing the NCDM are developed by the CWG Teams.
National Data Repository	A repository of Tracking Network data that will be used to store, process, and make available NCDM and other data
National Gateway	A server installed by CDC that uses PHIN MS and Exchange Network protocols to securely exchange data with other Gateways and Clients
National Secure Portal	A portal (Website with special features) that will be accessible to the public to access data and other resources on the Tracking Network
National Secure Portal	A portal (Website with special features) that will be used by registered users as an interface to securely access data and other resources on the Tracking Network
Network Architecture Subgroup (NASG)	The SND Subgroup tasked with developing the architecture for the Tracking Network
Partners	Participants in the Tracking Network with formal agreements with CDC (e.g., EPA, Census, NASA, other CDC programs?, national associations)
Program Marketing and Outreach Workgroup (PMO)	The PMO Workgroup focuses on promoting interest and engagement in the Tracking Network by developing communication and outreach materials for use by grantees, partners, and the public
Public Health Information Network Messaging System (PHIN MS)	A messaging protocol developed by CDC to enable the secure exchange of sensitive health information
Rapid Inquiry Facility (RIF)	Software developed by Imperial College, London UK Rapid to generate rates and relative risks for any given health outcome, for specified age and year ranges, for any given geographical area. It also produces unsmoothed and smoothed maps of relative risks, together with maps showing the demographic, socio-economic, environmental, and geographical characteristics of an area
Rich Site Summary (RSS)	An XML-based format (using the Resource Description Framework (RDF)—a language for representing information about resources in the World Wide Web)—that allows the syndication of lists of hyperlinks, along with other information, or metadata, that helps viewers decide whether they want to follow the link
Role Based Access Controls (RBAC)	Model for advanced access control for the Tracking Network where users are assigned to particular roles and through those role assignments acquire the permissions to perform particular operations

Term	Definition
Standards and Network Development (SND)	The SND Workgroup identifies needed and existing standards to assist in Tracking Network development. Examples of this work include a draft template for data sharing agreements and standards for metadata to describe elements that must be captured about data to enhance the ability to search for data and determine data usability
Wide-ranging Online Data for Epidemiologic Research (WONDER)	An Internet system that makes the information resources of CDC available to public health professionals and the public at large. It provides access to a wide array of public health information
XML	A standard coding language that allows information and services to be encoded with meaningful structure and semantics that computers and humans can understand. XML supports information exchange and can be extended to include user-specified and industry-specified tags
XML schema	The structure for constraining the contents of XML documents