National Environmental Public Health Tracking Program

Strategic Plan

Fiscal Years 2016 – 2020

CDC's National Environmental Public Health Tracking Program

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Executive Summary

For more than a decade, the Environmental Public Health Tracking Program ("Tracking Program") has collected, integrated, and analyzed non-infectious disease and environmental data from a nationwide network of partners. The purpose of this Program is to deliver information and data to protect the nation from health issues arising from or directly related to environmental factors. The Tracking Program has amassed over one billion rows of validated data, collected on more than 20 different topic and content areas. Data have been captured from a variety of federal, state, and local programs that track health, exposures, environmental hazards, and other risk factors. While the amount and variety of data captured is an accomplishment in itself, the involved efforts to integrate and validate multiple data streams are what makes the Program a truly valuable and unique national resource. Through thoughtful application of these data, consumers and communities may be empowered to take action to promote health and wellbeing within their communities.

The potential impact of such a robust and extensive set of data is more apparent now than ever, as advances in data science and analytics provide new ways to unlock the potential predictive value of this information. While the future is bright for the Tracking Program, we recognize the many existing and emerging challenges that must be overcome within the next several years. This strategic plan describes our focus for 2016-2020 and plan for addressing the opportunities, as well as the challenges.

The purpose of this document is to communicate CDC's five-year plan for environmental public health tracking efforts. The strategy presented serves as both a guiding framework for CDC activities and statement of capabilities to help the Program achieve its vision of *healthy informed communities*. This strategy represents the Program's plan for how it will respond to and take advantage of the opportunities presented by recent and emerging advances in science and technology. The following strategic "pillars" will help guide the direction of the CDC Tracking Program over the next five years:

- Science & Content: Deliver scientific content that addresses key environmental health issues and enables improvements in public health outcomes and practice
- Technology & Informatics: Modernize technology and tools, and implement efficient processes to enhance the functionality and capabilities of the Tracking Network
- Awareness & Impact: Strengthen outreach and communications with Tracking Program stakeholders and end-users to increase awareness, expand usage, and enhance utility of the Network

Figure 1 summarizes the goals supporting each of the strategic pillars, which define CDC's approach for driving innovation and increasing operational efficiency across the nationwide Network. It is important to note that these "pillars" are connected, and do not function independently. The activities undertaken under one pillar can inform or drive activities under another pillar. At the base of all three pillars are cross-cutting, foundational components that are vital to the future success of the Program. These components include a strong workforce and

the ability to evaluate the impact being made by Program activities. **Figure 1** summarizes the Tracking Program's 2016 to 2020 goals.[1]

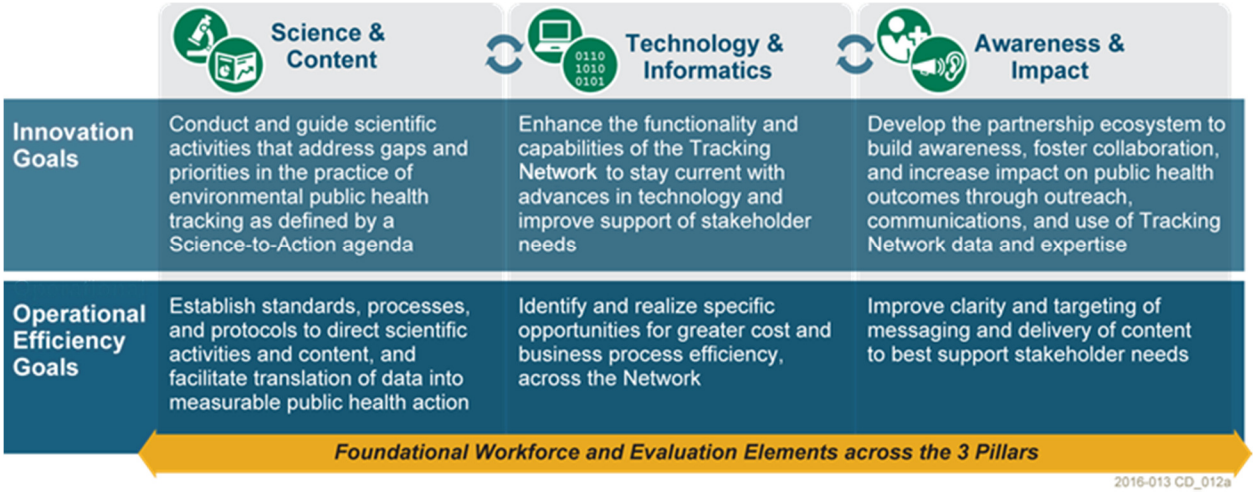

Figure 1. Summary of Tracking Program Goals

With a renewed vision, clearly defined goals and objectives, focus on public health impact, and plethora of new opportunities, CDC is optimistic about the future of the Tracking Program. This strategic plan positions the Program to be the Nation's leader in environmental public health tracking by expanding capacity, promoting evidence-based practice, and ultimately increasing its contributions to the health of our Nation.

[1] Refer to **Strategic Framework** for additional context and detail underlying goals and objectives.

The Vision and Mission of the Environmental Public Health Tracking Program[2]

Our Vision: Healthy Informed Communities
Translating environmental and public health data into meaningful information leads to increased knowledge; applying that knowledge leads to actions that result in healthy communities.

Our Mission: To provide information from a nationwide network of integrated health and environmental data that drives actions to improve the health of communities
The Environmental Public Health Tracking Program strives to achieve its vision of *Healthy Informed Communities* by empowering environmental and public health practitioners, healthcare providers, community members, policy makers, and others to make information-driven decisions that affect their health. At the local, state, and national levels, the Tracking Program uses a network of people and information systems to deliver a core set of health, exposure, and hazards data, information summaries, and tools to enable analysis, visualization and reporting of insights drawn from data.

[2] "Tracking Program" is defined as the CDC-led program encompassing all people (CDC and grantees) and activities related to environmental health tracking. In contrast, the "Tracking Network" is defined as the Web-based system of environmental health data and information. The Network is a discrete product of the Program.

Introduction

Background

The Division of Environmental Hazards and Health Effects (DEHHE), a component of CDC's National Center for Environmental Health (NCEH), is charged with investigating the relationship between the environment and human health. A key responsibility of DEHHE is to lead CDC's environmental public health tracking efforts, which involves the collection, integration, analysis, and dissemination of disparate streams of environmental and health data. This form of environmental health surveillance is critical for guiding and evaluating public health actions that can prevent or mitigate the impact of environmental hazards on health and for elucidating trends that may increase our understanding of the relationship between environmental hazards and health.

As shown in **Table 1**, the data and information provided by the Tracking Program addresses health surveillance needs across the entire continuum of care by empowering individuals and communities with the means to detect and respond to health concerns, as well as better protect against potential threats. Specific examples of the applications and uses for tracking data are indicated in **Table 1**, which are grouped into three categories to indicate how Tracking Program data can be applied throughout the tracking value chain.

Table 1. Specific Examples of the Applications and Uses for Tracking Data

How Tracking Data Are Used to Drive Public Health Actions[3]		
Detect	Respond	Protect
• Detect unusual trends and occurrences of natural and man-made environmental issues • Quantify the magnitude of a suspected environmental health concern • Support and facilitate environmental exposure research	• Document the distribution and spread of a hazard or health event and identify populations at risk • Develop information that informs clinical care providers and stimulates individual health action • Measure the result and impact of changes in health practice related to environmental exposure	• Enable interventions to be targeted to those most at risk • Enable more informed, data-driven, decision making and policy development to reduce health impacts of environmental hazards and/or improve environmental amenities • Plan and evaluate actions taken to protect communities from environmental hazards.

Environmental public health tracking provides a national baseline for how chemical and physical hazards in our environment[4] impact the health of people and communities. Data and insights from tracking also elucidate where gaps in knowledge exist and additional research may be required, or when intervention is warranted. In order to provide an impactful set of data, the CDC integrates and standardizes data from a multitude of health, human exposure, and environmental information sources.

The scope and scale of the Tracking Program continues to grow in response to the needs of public health practitioners, researchers, and others to have a better understanding of how the environment may be impacting human health. It continues to advance the availability and

[3] Thacker SB. Historical development. In: Teutsch SM, Churchill RE, eds. Principles and Practice of Public Health Surveillance. 2nd ed. New York: Oxford University Press; 2000.
[4] Refer to **Appendix A** for listing of chemical and biological toxins the Program currently tracks and investigates

access to data, analytical tools and methods for using these data, and information translated from these data. CDC is now at a key turning point as it determines the future direction of the Tracking Program and how it must evolve both technically and operationally to support its growing user base. This requires a new approach for how the Program interacts with its varying stakeholders, in anticipation of serving traditional and non-traditional users, and delivering data, information and services to best enable public health action.

Who the Tracking Program Serves

The Tracking Program directly serves six distinct stakeholder communities that have a clear need and purpose for tracking data and information.

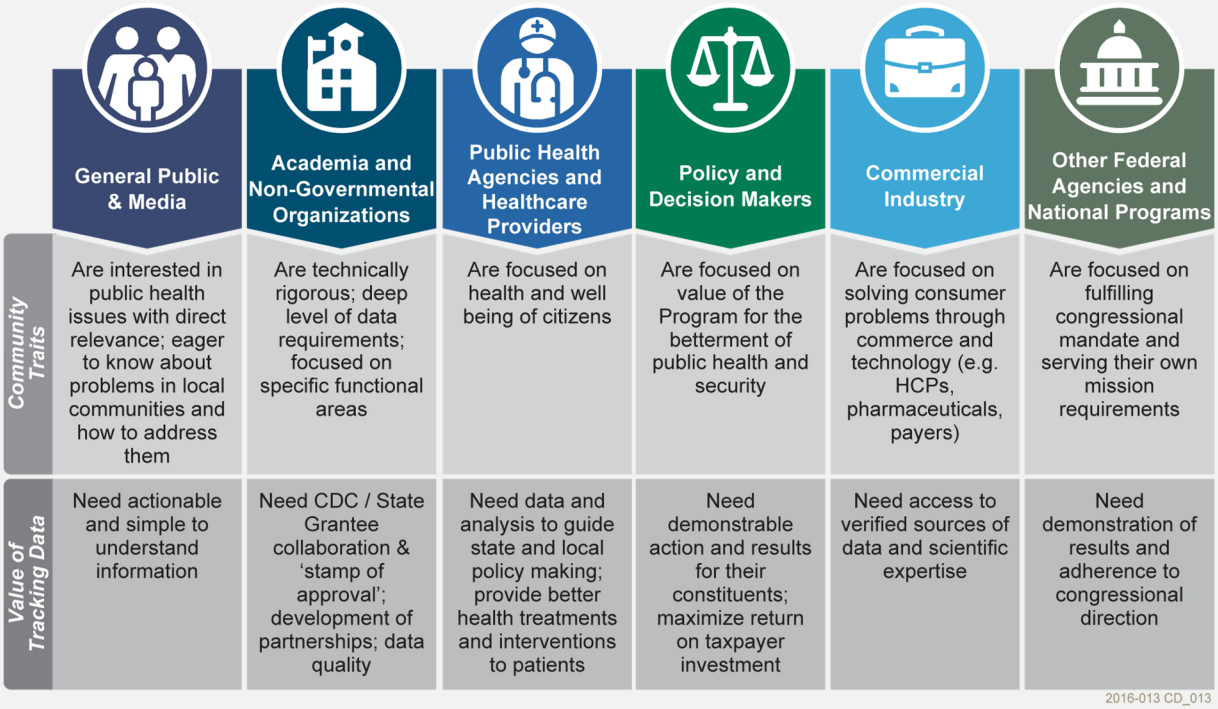

Figure 2. Stakeholder Segments and Needs Served by the Tracking Program

Understanding the unique needs of each of these six segments allows the Program to use the most appropriate method of communication to ensure clarity and relevance of the content and messaging to best enable public health actions. For example, short simple statements coupled with intuitive charts and maps that are accessible through a user-friendly mobile platform are a preferred method of communication and delivery for reaching a broader audience. Stakeholders differ in their connection to the Tracking community as well as their use of Tracking Network products and capabilities. For example, health care providers and accountable care organizations are able to utilize geo-coded tracking data to target preventive services, whereas the general public can utilize the Info by Location product to better understand health trends and events within their communities.

The Tracking Program provides CDC, the environmental public health community, and the Nation with valuable information on a growing number topics that relate human health to the environment. More importantly, the program advances the public health science agenda in two ways. As a unique national-scale resource, it enables science to support and inform national "top down" questions and policies. However the program also supports a wide range of

independent investigators who are interested in varied questions, and who bring innovative analyses and perspectives. This helps generate new scientific insights in a "bottom up" fashion as well. The sweeping requirement to track environmental factors that have potential implications for human health presents a major management challenge and resource burden. As the number of content areas that the program covers expands,[5] there will continue to be a proportionate increase in the volume of underlying data measures that must be tracked.

Environmental Health Topics Currently Covered by the National Tracking Network

Table 2 includes the extended list of topics and content areas the program currently covers. While the purpose of the Tracking Program has not changed, it has undertaken significant modifications to adapt to the changing public health landscape.

Table 2. Topics and Content Areas Currently Covered by the Program

Health Effects	Population Health	Environments
• Asthma • Birth Defects • Heat Stress Illness • Reproductive & Birth Outcomes • Cancer • Heart Disease • Development Disabilities • Childhood Lead Poisoning • Carbon Monoxide Poisoning	• Population Characteristics (Census Data) • Lifestyle Risk Factors • Biomonitoring: Population Exposures[5]	• Climate Change • Community Design • Housing Conditions • Outdoor Air Quality • Community Water Quality • Pesticide Exposures • Toxic Substance Releases • Natural Disasters

Currently, the National Tracking Network offers data and information resources on over 20 different health topics in three primary subject areas: Population Health, Health Effects, and Environments. To maintain relevance, the CDC and broader Tracking community of funded state and local health departments must be able to adapt to constantly changing public health priorities and other global trends influencing how it can and should operate over the next five years. These factors include:[6]

- Progress in environmental science and public health practice
- "Globalization" of populations, diseases, and the environment
- Rapid changes in information technology, tools, and methods for data analysis
- Digitization of health care along with increasing data needs and expectations
- Policy changes related to health care reform and electronic health records

[5] Pew Commission Technical Report identified nine key topic areas of focus for a national tracking program. At present, there exist 21 distinct content areas.
[6] Qualters J, et al. Data to Action: Using Environmental Public Health Tracking to Inform Decision Making. J Public Health Management Practice, 2015, 21(2 Supp), S12–S22

A Brief History of the Tracking Program

Established in 2002, the CDC's Environmental Public Health Tracking Program ("Tracking Program") was originally driven by a need for basic information to understand the relationship between chronic disease and related potential environmental factors. The program is the first national effort to provide the United States with standardized health, environmental, and hazard data from multiple information systems that includes linkage of these data as part of regular surveillance activities. An initial set of pilot projects served as the basis for the program, which were informed by the recommendations of the Pew Environmental Health Commission (**Table 3**). This initial focus of study then evolved into the tracking of core data consisting of a defined set of diseases and conditions and potential exposures.

Table 3. Environmental Health Topics Originally Recommended for Tracking

Original Recommendations	
Diseases and Conditions	Exposures
• Birth Defects • Developmental Disabilities • Cancer • Neurological Disease	• Persistent Organic Pollutants (PCBs, dioxin) • Heavy Metals (mercury, lead) • Pesticides (organophospates, carbamates) • Air Contaminants (toluene, fine particulates) • Drinking Water Contaminants (including pathogens)

Components of the Tracking Program

Environmental public health tracking is a multidisciplinary collaboration that leverages electronic health and environmental data collected by a variety of federal, state, and local programs. As the lead and sponsor of the Tracking Program, CDC works with partners to establish standards and requirements to govern how data and measures are collected and reported. These data are known as Nationally Consistent Data and Measures (NCDMs). Today, the Tracking Program consists of a *network of people (i.e., individuals and organizations)* with responsibilities in protecting public health, which enable a *network of information systems (i.e., data systems and Web-based portals)*.

Figure 3 describes the four components of the Tracking Program and illustrates the interdependency of the people and the systems that comprise the Program. The program provides the means for the environmental public health community to collect and integrate data and information, as well as actively engage in the exchange of ideas to address major public health challenges.

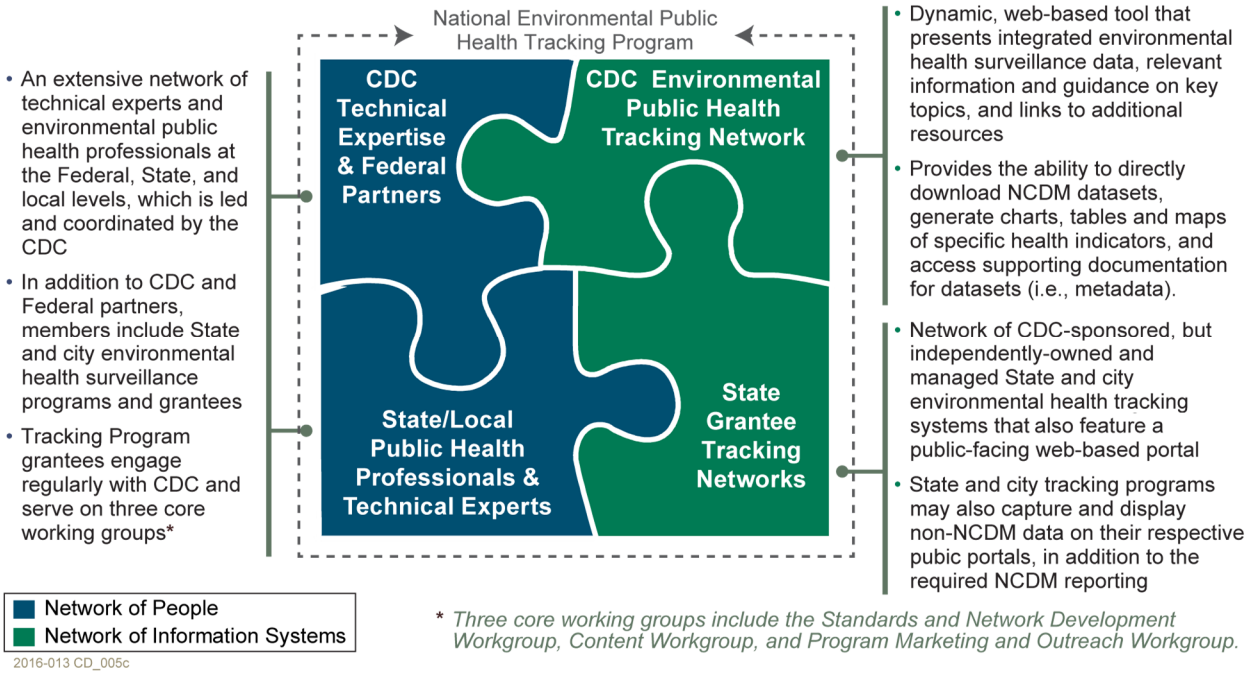

Figure 3. The Four Components of the Tracking Program

NETWORK OF PEOPLE

- **CDC National Tracking Program Technical Experts** work with data partners and stakeholders to establish spatial and temporal standards for NCDMs and reporting requirements to enable consistent analysis of data and comparison of results. In addition to grant funding, CDC also provides technical assistance for state and local environmental public health surveillance programs to help ensure grantees present and report accurate, relevant public health data. CDC technical experts are responsible for the development, maintenance and enhancement of the CDC's Tracking infrastructure (public and secure portals); lead core workgroups; use Tracking data to assess trends and address environmental health issues; and conduct outreach to disseminate Tracking data and information.
- **State/Local Public Health Professionals and Principal Investigators (PIs)** work with CDC to establish standards; are responsible for the development, maintenance, and enhancement of their jurisdiction's network and tracking workforce; ensure the capture, analysis, and reporting of required NCDM data to CDC for integration[7]; and use tracking data and expertise to address environmental health issues. PIs and other representatives from grantee organizations also serve on core workgroups to ensure collaborative development of network components, data use, and communication.

[7] Note that grantees may also capture non-NCDM data that are specific to the grantee and only presented on their respective portals. These data are not required to be reported to CDC.

NETWORK OF INFORMATION SYSTEMS

- **Grantee Tracking Networks** house required NCDMs, as well as non-NCDMs, which are collected to address jurisdiction-specific environmental health issues. At present, the Tracking Program funds and has helped establish tracking information systems (also referred to as portals) in 25 States and New York City (**Figure 4**).

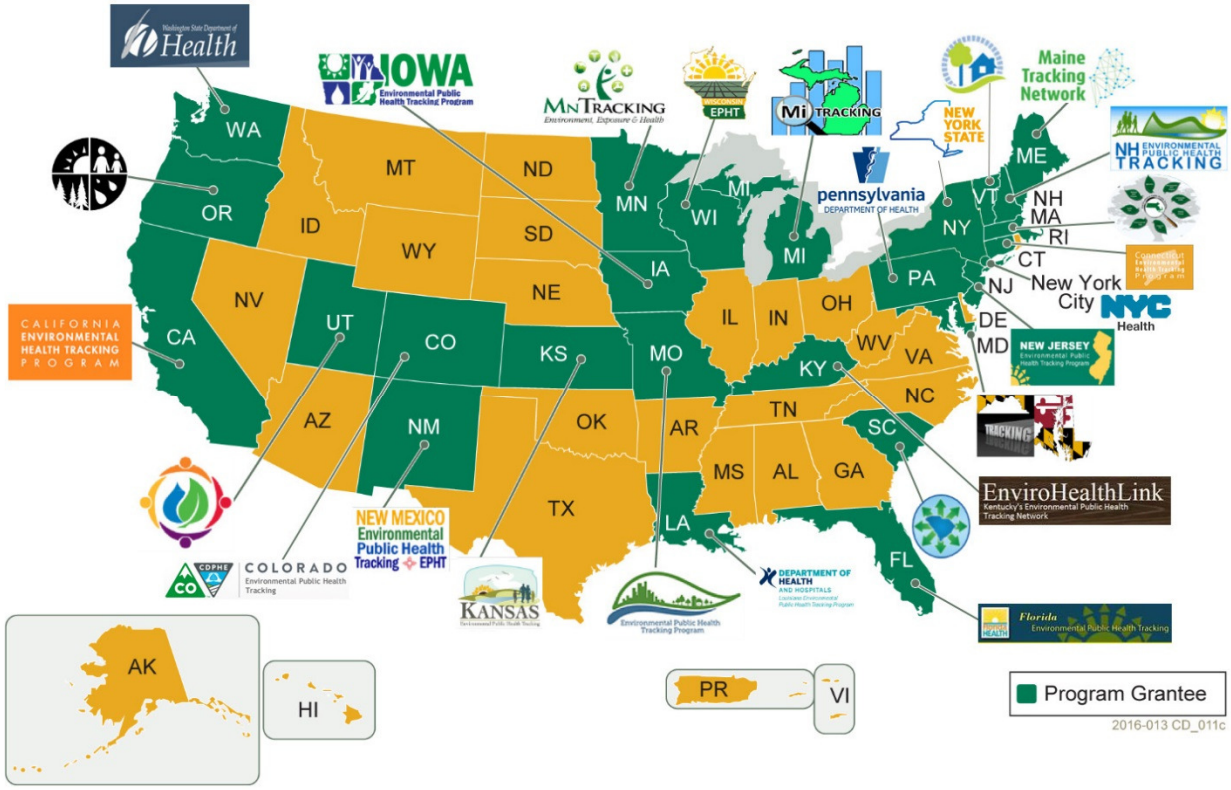

Figure 4. The Tracking Program's Grantees Nationwide Network

- **The National Tracking Network**, operated and maintained by the CDC, consists of the suite of products and tools that are operated and maintained by the CDC and used to synthesize environmental public health surveillance data (i.e., NCDM and other non-NCDM data of national interest), as well as deliver actionable insight and information (**Table 4**). The National Network serves the critical function of integrating the multiple streams of data provided by grantee and national partners.[8]

[8] Data integration by the Tracking Program includes reconciliation of multiple data formats, spatial and temporal standards, and required display parameters.

Table 4. Descriptions of Tracking Network Products and Capabilities

Product	Description
Information Resources	Compilations of information resources on specific environmental public health topics and issues covered by the Tracking Program. This includes fact sheets, training material, infographics, quick reports, and scientific publications. All are directly accessible through the Tracking Program website as well as links to partner web-pages.
National Tracking Network (Explore Tracking Data)	Primary gateway for users to access tracking data using a dynamic web-based tool where users are able to generate data tables, maps, and charts based on specific search criteria (i.e., combination of measure/indicator and time period of interest).
Info by Location	An interactive, user-friendly web-based application for use by the general public. It is designed to generate easy to understand infographics and narratives on key environmental public health indicators for a particular location based on a simple zip-code or county query.
Metadata	Documentation detailing the context and assumptions underlying datasets including why it was created, how it should be used, limitations, and recommended citation.
Training Modules and Analytical Toolkits	Frameworks and detailed guidance on how tracking network data can be used to answer public health questions or examine health effects.
Application Program Interface (API)	Set of routines, protocols, and tools allowing external parties the ability to build software applications that interface directly with Tracking Network data.
Secure Portal	A restricted part of the CDC's Tracking Network system with role-based access for authorized users to access non-public data, as well as access a collection of data validation tools designed to assist grantee and national data partners with improving the integrity of the data collected by tracking.

Evolution of the Program: Drivers for Change

The Tracking Program was authorized in FY 2002 when Congress appropriated funds to CDC to begin the development of a nationwide network to link information on environmentally related diseases, human exposures, and environmental hazards. The purpose of the information from this network would be to respond to, and eventually reduce, the burden of environmentally related diseases on the nation's population. This authorization followed publication of a Pew Environmental Health Commission Report in September 2000, which highlighted the need to connect data silos in order to obtain consistent and reliable health, exposure, and environmental surveillance data for linking environmental factors with health outcomes. Since then, the Tracking Program has gone through progressive phases of development with each characterized by a distinct theme.

As illustrated in **Figure 5**, each phase of development has put in place the necessary program elements, infrastructure, and systems to enable collection and integration of environmental public health data, while being scalable and flexible enough to support evolving capacity and technical requirements.

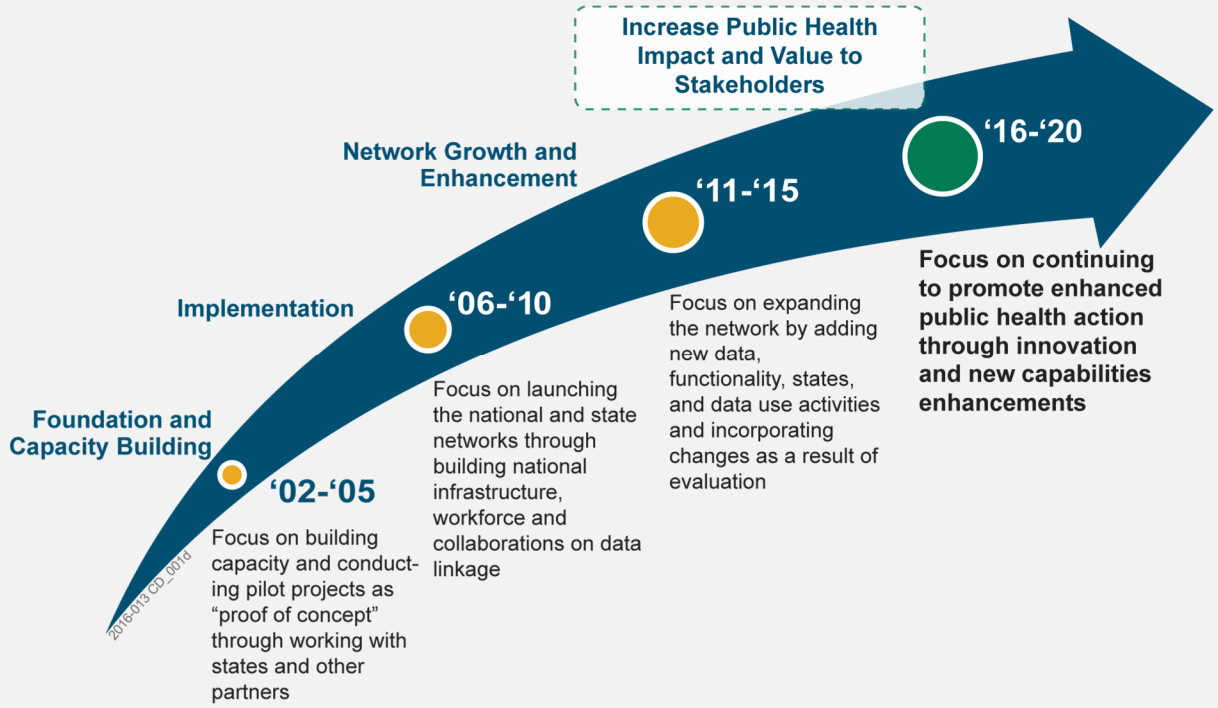

Figure 5. Evolution of the Tracking Program and Focus for 2016-2020

Strategic Framework

Overview of Strategic Pillars

The strategic pillar framework shown in **Figure 6** structures the Tracking Program's path over the next five years. Each pillar supports the Program in a unique way, and across all three pillars are foundational elements that not only strengthen the efforts under each pillar, but also display the interconnectedness of the three pillars in support of the larger program. To realize the benefits of each pillar, the CDC has identified goals to encourage Tracking Program innovation and enable greater operational efficiency within the 5-year timeframe. These include what will be addressed (Goals) and how they will be addressed (Objectives) in both the near-term (1-2 years) and long-term (3-5 years). In addition to increased emphasis on innovation and efficiency, the three pillars provide the framework and roadmap to help guide successful achievement of the Tracking Program goals and objectives through:

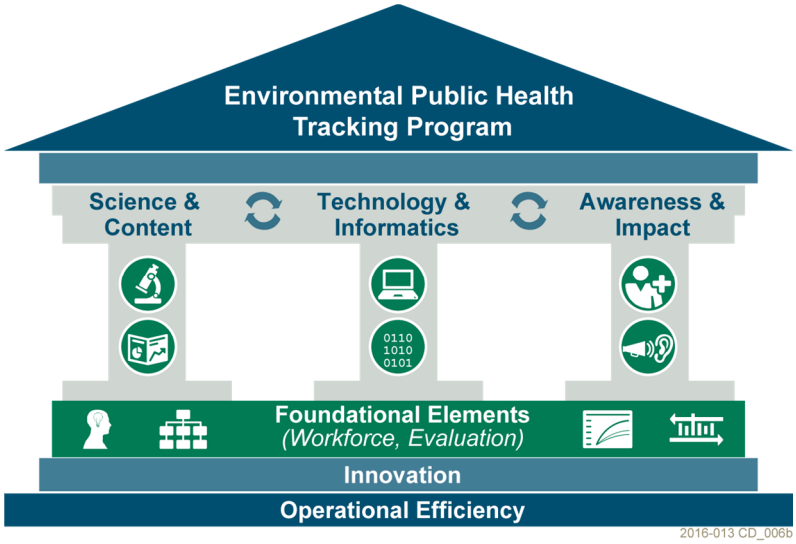

Figure 6. Strategic Pillar Framework

- Improved alignment and integration of Tracking Program activities
- Increased collaboration within the National Program and across the broader stakeholder community
- Skillful management of priority issues and gaps identified by stakeholders

Science and Content Pillar: Enhances the value of the Program to the various communities of users by delivering relevant and actionable scientific content that addresses key environmental public health priorities and needs.

Technology and Informatics Pillar: Focuses attention on the need to continually modernize the technologies and data analytics tools used by the Network and improve processes to efficiently generate and deliver data and information to stakeholders.

Awareness and Impact Pillar: Drives efforts to strengthen relationships and channels of communication with key partners and with other end-users, both new and existing, by expanding awareness of Program capabilities and resources and use of data, information, and expertise to increase public health impact.

Foundational Elements: The foundational elements display the inter-connectedness of the pillars by focusing on program capacity to support the Network and other related environmental health efforts. An enhanced infrastructure provides the capacity to complete strategic goals and

objectives, create an effective workforce, and evaluate impact and performance, all of which are critical for program sustainability. These foundational elements are connected to each pillar as fundamental to the success of the overall program. Accordingly, these activities will be driven by collaborations between the Program's science, technology, and awareness functions to promote cohesiveness and consistency of effort.

Strategic Goals and Objectives

Each strategic pillar is supported by goals and objectives to promote innovation and improve efficiency within the Tracking Program. To improve alignment of activities and increase collaboration, these goals and objectives are designed to be mutually reinforcing. For example, a high priority surveillance question that is reinforced by a clearly defined stakeholder requirement will better inform decisions and investments in technology. **Figure 7** uses the example of agricultural pesticide use to illustrate how tracking activities driven by each strategic pillar can be mutually reinforcing or interdependent.

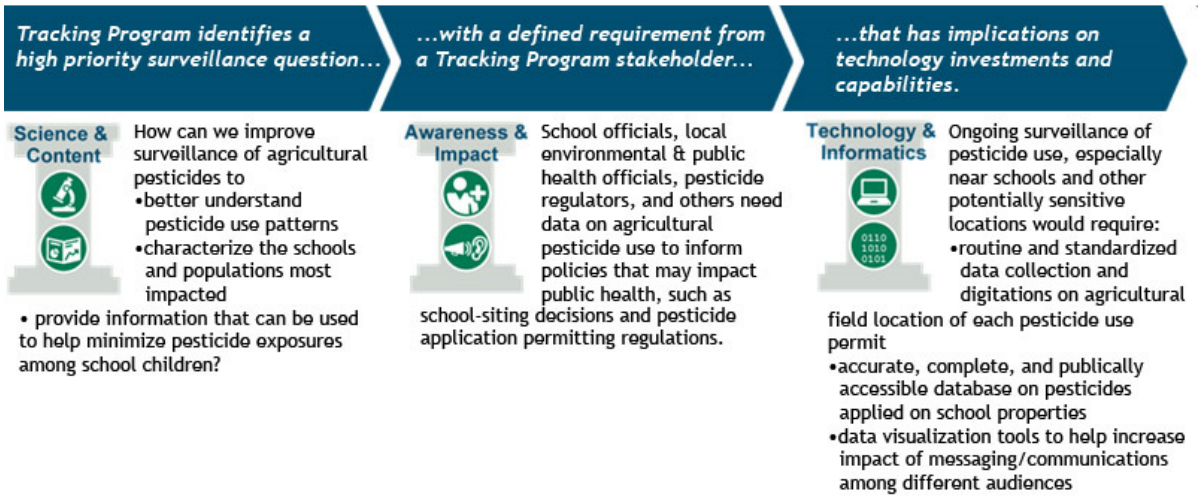

Figure 7. Example of Mutually Reinforcing Activities of Strategic Pillars

Foundational Elements

The three strategic pillars cover what and how the Program plans to address key scientific issues in environmental health, modernization and enhancements to technology, and outreach and engagement with stakeholders for greater impact. The goals and objectives that support each pillar are designed to promote innovation and improve efficiency of the Tracking Program. However, the successful achievement of these goals and objectives is dependent on a strong workforce and the ability to consistently measure and evaluate the impact of Program activities **(Figure 8)**. As such, the Tracking Program has integrated objectives for workforce development and evaluation into the strategic pillars as appropriate.

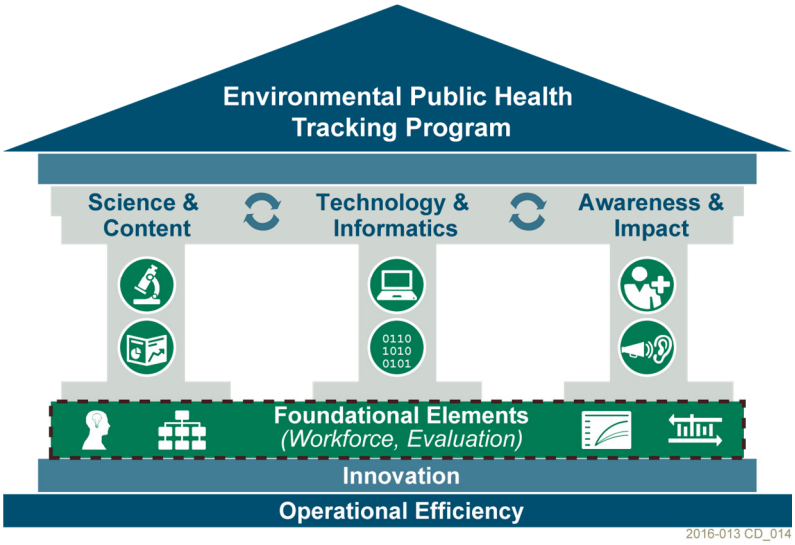

Figure 8. Foundational Elements

Workforce Development

The future success and impact of the Tracking Program depends on a strong foundation of talented and dedicated people. The Program remains committed to the development, engagement, and retention of its multidisciplinary workforce. This includes a diverse array of scientific, analytical, technology, and communications skills that are vital to the Program's mission.

Over the next five years, the Tracking Program will identify and acquire the necessary skillsets and capabilities to address emerging trends in environmental public health, data science and informatics, and better enable community outreach and stakeholder engagement (e.g., social media, public private partnerships).

In addition to attracting new talent, the Tracking Program will focus on opportunities to enhance the technical capabilities of the existing workforce and promote development and growth of the next generation of leaders in environmental public health. The Tracking Program will be more efficient in how it cultivates the necessary expertise and supports growth of the tracking workforce such as leveraging relationships with government organizations, academia, and industry to facilitate new workforce opportunities where possible.

Evaluation of Impact and Performance

Consistent across all three strategic pillars is the need to effectively monitor and evaluate the impact and performance of Tracking Program activities and outputs. This includes the ability to measure the value and impact of the Program's scientific pursuits, data products and insights,

and methods of delivery (e.g., technology capabilities, targeted communications) on effectively responding to stakeholder needs.

By establishing the necessary business processes and evaluation framework, the Program is able to regularly and consistently monitor the effectiveness of key activities; assess their degree of impact on public health outcomes; and adjust efforts as needed. This ongoing self-assessment will ensure activities and investments have value and clearly address stakeholder requirements.

Science and Content

Given the broad and ever-changing scope of environmental public health, the program must be thoughtful in both identifying key environmental health issues and anticipating emerging threats to ensure that the translation of science into health action is timely and relevant. As such, the program will work with key stakeholders to establish a *"Science-to-Action"* agenda that provides clear direction and prioritizes what environmental health issues and surveillance questions must be addressed. This agenda will serve as a roadmap to connect scientific challenges and surveillance questions to data needs, data to information and knowledge, and then knowledge to specific actions that improve public health. This allows the Program to be more strategic and rigorous in determining methods and metrics that ascribe value, and be more effective in articulating how Tracking enables community level interventions, informs changes in clinical practice, enables community level interventions, and informs development of national, state and local policies. The *Science-to-Action* agenda will be supported by a structured process and utilize defined criteria (e.g., strength of scientific knowledge, clarity of surveillance question, magnitude of public health burden, and available resources) to be more strategic in deciding on scientific pursuits, selection and organization of scientific content, and potential new tracking efforts, as well as help unify the tracking community around a set of core topics that have national significance which have been prioritized by the CDC. Creating the *Science-to-Action* agenda and establishing supporting processes enables the program to concentrate limited resources on key indicators, measures, and priority surveillance questions.

Innovation Goal

Conduct and guide scientific activities that address gaps and priorities in the practice of environmental public health tracking as defined by a Science-to-Action agenda

The additions to the Tracking Network content over time exemplify the large scope of information that needs to be available to address environmental public health issues and the varying needs of the stakeholders Tracking seeks to serve. In moving forward, it is important that the Tracking Program articulate a *Science-to-Action* agenda that presents the scientific direction of the program and implications for the Tracking Network. To do this, the program will work with key stakeholders to review the landscape of current and emerging environmental public health concerns and identify priority surveillance questions and key gaps in data, tools, information, and knowledge for addressing those concerns. With the establishment of a Science-to-Action agenda, the program will develop and conduct collaborative projects with a clear focus on those key gaps with the greatest potential impact on reducing environmentally related health outcomes.

Short Term Objectives

- Develop a *Science-to-Action* agenda that addresses environmental public health priorities, shows clear alignment to public health sections and outcomes, implications for the broader Tracking Program (e.g., identification of key gaps in data, tools, information, and knowledge), as well as prioritization of gaps based on feasibility, actionability, stakeholder needs, and potential for impact

- Develop surveillance, data linkage, or other projects needed to address critical gaps, as defined by the *Science-to-Action* agenda, through the development or application of novel and non-traditional data, tools, technologies, and methodological approaches
- Identify and fill potential knowledge gaps, particularly in key areas of need and incorporate tracking into the core curriculum of schools of public health

Long Term Objectives

- Prioritize and address science and policy challenges that persist within the Tracking community related to the timely accessibility, analysis, and dissemination of data at the necessary spatial and temporal resolution (e.g., sub-county and real-time data, electronic health records, "data suppression"[9] and privacy restrictions)
- Fill key gaps in the availability of quality and complete data in the network by integrating new and enhancing existing sources of data as defined by the *Science-to-Action* agenda (e.g., longitudinal patient or clinical outcomes data; sensor technology data)
- Generate and disseminate information using data within the Network by applying innovative analytical and informatics methods that bring together multiple sources of data and information to address specific stakeholder's needs and priorities (e.g., surveillance summaries, community profiles, or reports)
- Address national or regional environmental public health priorities by conducting projects that translate data and information to support public health actions that reduce environmentally related health outcomes
- Expand current environmental public health education and training offerings to include the latest tracking data, practices, and methodologies, as well as new technical skills and capabilities while also creating interdisciplinary curricula and practicum that utilize the latest tracking data, practices, and methodologies

Operational Efficiency Goal

Establish standards, processes, and protocols to direct scientific activities and content, and facilitate translation of data into measurable public health action

Given the breadth and complexity of environmental public health issues that could potentially be addressed by the Tracking Program, a process is necessary to ensure that existing and new national and grantee tracking efforts collectively support a common set of scientific priorities, as defined by the *Science-to-Action* agenda. To increase the rigor of the prioritization process, the Tracking Program will implement a formal decision making process for authorizing new content and data requirements consistent with existing data sharing rules and policies. This approach will encourage a sustainable rate of growth, allowing the program to focus time and resources on topics that are designated as top priorities, while also creating a pipeline of key topics for future consideration. Aligning around a set of common scientific needs also allows the Tracking

[9] "Data suppression" refers to the process of withholding or removing selected information to protect the identities, privacy, and personal information of individuals. This presents a statistical challenge as public health policy decision makers must balance the need for privacy and data confidentiality with the need for accuracy.

Program to focus its efforts on translating data into knowledge and actionable insight. In addition to improving sustainability of the program, this approach will increase the transparency of the decision-making process, reduce redundancies in how data are collected and analyzed, and help promote awareness of how the tracking network and related resources contribute to public health.

Short Term Objectives

- Strengthen internal processes for managing scientific content on the Tracking Network and implement processes and tools to evaluate new or proposed changes to content.
- Develop a process for ongoing evaluation and update of the *Science-to-Action* agenda
- Re-evaluate the Tracking Program FOA Logic Model (see **Appendix B**) and update as needed. Facilitate alignment of grantee tracking activities by aligning grant requirements and evaluation criteria with the *Science-to-Action* agenda, and with near-, mid-, and long-term outcomes
- Develop protocols and standards for performing routine descriptive and trend analyses of data and measures to proactively identify potential health issues and risk factors
- Develop standard protocols or additional tools for using tracking data to perform routine health and economic impact analyses that address priority public health issues, at the national and regional levels (e.g., health impact assessment toolkit for high risk populations).

Long Term Objectives

- Develop or apply advanced analytical tools to improve the utility and timeliness of information generated from data within the network
- Develop protocols and processes for translating data to support public health actions and interventions at the community level

Success Story Spotlight: Tracking Program Helps Residents Determine Smoke Danger in New Mexico

Wildfires in 2011 spurred a proactive approach by the New Mexico Department of Health in **preparing for and dealing with the wildfire season**. In support, the New Mexico Tracking Program created a number of resources, including fact sheets and posters, to educate residents about ways to protect their health during wildfires. Tracking program staff developed the 5-3-1 Visibility Method to help residents more easily judge smoke danger and decide when to head indoors. In addition, they devised an interactive mapping tool to help residents determine when wildfire smoke is near enough to cause them harm. Using the tracking program's method and resources, New Mexico residents do not have to wait for official smoke alerts before making decisions about how to protect their health during wildfires. Now they can monitor their community and move more quickly if needed. More residents are learning about the tracking program's resources through the efforts of the US Forest Service, National Weather Service, and Southwest Coordination Center. The tracking program's impact also extends beyond New Mexico – two states have adopted the program's visibility tool for use in their forest management programs.

Technology and Informatics

Information technology and informatics are core to the Tracking Program, and are the backbone of the Tracking Network. As such, the modernization and enhancement of technology and tools is an imperative for the Program given the need to analyze increasingly complex and granular datasets, such as the ability to define both aspects of time and space, at varying scales. Further, the resulting insights and information gleaned from the data must be presented and delivered to a broad-range of end-users in ways that are meaningful, timely, and relevant. As the user community base broadens and the size of the Tracking Network expands, new software tools and functionality will increase the value of the database and promote its usage.

Since launch of the National Tracking Network in 2009, the amount of health and environmental data housed and maintained by CDC has grown dramatically in size and complexity. In addition to the increasing size and complexity of datasets for the required annual reporting of NCDMs, new measures continue to be added each year along with new requirements for how data is displayed or measures are calculated. Collectively, this growth is placing increasing pressure on the Program as the operational and management needs of the Tracking Network begin to outgrow the resources available to support it.

Given resource and capacity limitations, the Tracking Network will also focus on optimizing the processes it uses to maintain, expand, and operate the database, and approaches to more efficiently manage integration and use of new indicators and data. It is also important to understand that these limitations are not a pure IT concern. Rather, this is a shared responsibility that will be collectively addressed through the goals and objectives underlying both Technology & Informatics and Science & Content Pillars.

Innovation Goal

Enhance the functionality and capabilities of the Tracking Network to stay current with advances in technology and improve support of stakeholder needs

Since the last strategic plan, major advances in technology and informatics have significantly changed the availability, accessibility, and use of environmental and health data. While this has created new tracking opportunities, it also challenges it with obsolescence. The Tracking Network will modernize and enhance its underlying IT and informatics technology as the landscape changes, in a way that is both pragmatic and sustainable. Improving Tracking Network functionality to more effectively address stakeholder requirements and information needs is a shared responsibility supported by the goals and objectives underlying both the Technology & Informatics and Awareness & Impact Pillars.

Short Term Objectives

- Extend roll-out of the Tracking Network's Application Program Interface (API) to a broader set of users or communities of interest and encourage development of applications that can be supported by common mobile platforms

- Establish innovation-focused partnerships with industry based on shared objectives that may include data science challenges to broaden awareness and explore utility of data, or more formal collaborations with industry big data providers and accountable care organizations to enhance capabilities
- Identify and integrate data visualization capabilities and presentation styles that best fit the needs of non-scientific users and audiences
- Modernize existing infrastructure to the extent allowable by CDC including transition of the National Tracking Network to a partial or full cloud-based platform and movement of the Web application to HTML5

Long Term Objectives

- Explore novel approaches and capabilities to enhance functionality and expand capacity including the use of advanced data analytics
- Assess the implications of emerging technology trends for the Tracking Network such as the Internet of Things (IoT)[10] paradigm including wearable technologies,[11] as well as emerging types and sources of health data such as electronic health records (EHRs) and patient outcomes data

Operational Efficiency Goal

Identify and realize specific opportunities for greater cost and business process efficiency, across the Network

CDC uses appropriated funds to support IT development and operations and maintenance (O&M) activities at CDC headquarters and within the state grantee system. Although many states have unique IT policies governing the type of infrastructure, information security requirements, and hosting capabilities that currently preclude the use of a common technology platform for all state public portals, there exists opportunity to realize efficiencies. Moving forward, the Tracking Program will focus on establishing IT system and operating guidelines to promote best practices and use of common technology platforms to the extent practicable. This will help reduce variability across the network of tracking information systems and reduce duplication of effort. Through this, there will be greater uniformity and interoperability of tracking network IT systems and practices. In short, the CDC will work with grantees to promote use of the most effective and efficient IT systems.

[10] The Internet of Things (IoT) refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems. This may include wi-fi enabled environmental monitors and sensors, and smart homes.
[11] Examples include smart watches, fitness and biometric trackers, smart glasses, wearable cameras

Short Term Objectives

- Evaluate and implement processes that improve the operational efficiency of data validation and processing to include increased usage of "Smart Checks",[12] timeliness of data uploads, and coordination with grantees and other data partners
- Conduct State grantee "IT inventory" and identify where cost and process efficiencies may be applied to capture economies of scale, and inform mechanisms that promote sharing of operational best practices and technology innovations
- Increase understanding of how tracking data are being used by Tracking Program stakeholders to inform requirements for further technology development, as well as where opportunities may exist to increase return on investment for the entire network

Long Term Objectives

- Identify existing business models/practices that can be adopted by grantees and CDC to enhance sustainability and expand network

Success Story Spotlight: Small Area Mapping Tool Identifies Communities at Risk for Public Water Challenges in California

To address water quality issues for the most impacted communities, it is essential to know the areas and locations that public water systems serve. Historically, this information has been difficult to obtain because there was no central, digital map of public water systems in California, and some water systems only had paper diagrams of their service areas. Additionally, it was challenging to find information for water systems serving areas that crossed zip code or county boundaries. The California Environmental Health Tracking Program created an easy-to-access web-based Water Boundary Tool (WBT), which allowed water systems to produce and upload digital maps of their service areas. To date, the tool has mapped public water systems serving over 90% of the state's population, and has been used for research on water quality and costs, as well as for the ongoing surveillance of California's water systems. Because of its utility, several state grantees within the National Environmental Public Health Tracking Network are considering using the tool.

[12] "Smart Checks" are performed using the Data Integrity Validation Engine (DIVE), which automatically pre-checks and validates data before it is submitted to CDC. This automated process reduces or eliminates the need for iterative data submissions due to errors.

Awareness and Impact

The effectiveness of the Tracking Program on public health can be measured by its ability to improve our understanding of the link between health and the environment, drive changes in public health practice, guide community-level interventions, and support policy and decision-making. Increasing general awareness of the Nationwide Tracking Network and the Program's capabilities and products and promoting use by stakeholders creates additional opportunities to generate public health actions and outcomes. This is a complex undertaking considering the Program's diverse set of stakeholders, the broad range of topics it covers, and various methods for delivering content. Communicating information and data that are of value to individual stakeholders has historically been a challenge for the Tracking Program and environmental health community as a whole.

Given the complexity and breadth of the Tracking Program's ecosystem of stakeholders, the Program must be deliberate with its messaging and communications. This is important to be sure the latest science and content from the Program reaches stakeholders in a way that is timely, relevant and usable. By engaging directly with stakeholder communities the Tracking Program can understand their environmental health priorities and determine how to best address their needs. In addition, broadening Tracking Program "reach" through more effective messaging and targeted outreach helps increase awareness of Tracking Program capabilities and resources and promote its use. This engagement also includes training and educational opportunities to attract new communities of users to cultivate the environmental public health workforce, to ensure adequate capacity for intervention and to respond to community needs.

Innovation Goal

Develop the partnership ecosystem to build awareness, foster collaboration, and increase impact on public health outcomes through outreach, communications, and use of Tracking Network data and expertise

The Tracking Program has traditionally focused communications and outreach efforts on the general public and the environmental public health community, which primarily includes public sector stakeholders. Focusing on these legacy audiences has limited the growth of the Program's community of users and advocates. Over the next five years, the Program will identify new champions and partners that can serve as advocates and collaborators to amplify marketing efforts, expand "reach" and delivery of content, expand impact, as well as attract new users and talent into the environmental public health community. In particular, the Program will identify and engage potential partners that have aligned interests or common scientific goals, an immediate interest and need for Tracking Network data, or that provide opportunities to enhance Tracking Network capabilities and increase public health impact. Potential partners and collaborators may include, but are not limited to, accountable care organizations, "big data" providers, new commercial technology and service providers in consumer-driven healthcare, and non-traditional public sector organizations (e.g., Department of Transportation).

Short Term Objectives

- Map out the partnership ecosystem and define objectives for partnering in coordination with activities and outcomes of related objectives underlying Science & Content and Technology & Informatics pillars; identify specific opportunities for collaboration as well as resources to support
- Increase or enable community outreach to support stakeholder needs assessments, and inform metrics for evaluating Tracking Program impact on specific stakeholder needs
- Strengthen plain communications of technical and non-technical components of the Tracking Program to enable more clear and focused messaging
- Develop and refine approach to social media and other media, as appropriate, with focus on expanding outreach and awareness of the program, with emphasis on non-traditional communities of interest and potential users (i.e., those outside the traditional environmental public health communities)

Long-Term Objectives

- Develop a framework for an environmental health tracking fellowship or internship program that addresses Tracking Program and grantee workforce needs
- Engage potential partners whose interests align with Tracking priorities as defined by *Science-to-Action* agenda and informatics landscape to mutually enhance capabilities and impact environmental public health (e.g., capitalize on opportunities for the workforce to gain experience in applied and interdisciplinary science through cross-agency collaboration)
- Ensure clear and culturally sensitive communications are integrated into planning, development, implementation, and reporting of all projects occurring across the Program
- Develop strategic partnerships with health delivery systems (e.g., Accountable Care Organizations) and private sector technology companies to more efficiently facilitate the exchange of information, ideas, and talent

Operational Efficiency Goal

Improve clarity and targeting of messaging and delivery of content to best support stakeholder needs

To promote utility of the Tracking Network, the Program will develop focused communications plans geared to each stakeholder segment. This will reduce the potential for message dilution and raise the prospect of greater advocacy and action from the segments. Due to the Tracking Network's massive scope and the breadth of potential user interests, efforts will be carefully prioritized. However, it is critical to the long-term viability that the Tracking Program clearly articulate its value proposition to individual stakeholder segments, incorporating unique considerations and cultural awareness and sensitivities, in a manner that best resonates with them.

Short Term Objectives

- Promote visibility of Tracking Program within traditional and non-traditional stakeholder communities through communications that are refined for different stakeholder communities
- Formalize and improve efficiency of knowledge management and information sharing processes
- Develop standard education programs or training modules to facilitate greater use of tracking data and resources that are tailored to address the specific needs of stakeholder groups

Long Term Objectives

- Develop an evaluation framework, tools, and supporting processes for conducting routine assessment of Tracking Program impact on stakeholder needs and discrete health outcomes such as reduction in health disparities at national, regional, and community levels
- Develop a plan to foster greater use of the Tracking Network within CDC, as well as increase advocacy and buy-in to promote use of tracking data across the Federal government

Success Story Spotlight: Using Tracking Data to Support Decision Making in Massachusetts

A major transportation initiative proposed in Massachusetts brought together the State Departments of Health and Transportation. This partnership made use of tracking data to inform decisions on an infrastructure improvement project for the McGrath Highway. In this case, Tracking Network data on cancer, asthma, heart disease and diabetes were used to inform the Environmental Impact Assessment process. Based on the findings of their study, planning officials were able to make an evidence-based decision to pursue project alternatives for the proposed elevated roadway that would reduce risks to community health while still meeting the transportation needs of the area. The evidence-based decision to select a plan with better health and safety profiles is helping to significantly reduce the risk of disease, while also creating new opportunities to improve health by enabling community access to healthy foods.

Milestones and Timelines

The goals and objectives under the three strategic pillars will be pursued concurrently. Many are synergistic and pursuing them in parallel will help enable successful accomplishment.

To help in programmatic implementation, key milestones and timelines are provided here that make the accomplishment of specific goals and objectives concrete and verifiable.

By Fiscal Year	
2016	• Disseminate report on lessons learned on (1) use of electronic health records for environmental public health tracking and (2) analysis and visualization of sub-county data • Develop a strategy for program evaluation at state and national level • Upgrade CDC Public Portal Design incorporating query panel transition to HTML 5 and static pages transition to new CDC template • Add new content on Climate Impacts and Disaster Preparedness • Publish Updated Grantee portal Standards and Recommendations • Publish Updated Grantee standards for nationally consistent data and measures (update annually) • Release Tracking Application Program Interface (API) • Implement Tracking Communications and Outreach Plan (annually) • Execute and evaluate inaugural Tracking Awareness Week Communication Activity • Disseminate updated guidance for proposing new content for Tracking Network
2017	• Publish Tracking Science-to-Action Agenda • Publish new Tracking FOA • Launch new tools to assist state and local partners in preparing for and responding to wildfires, heat, and drought • Complete national collaborative study on air and respiratory health and disseminate results • Initiate at least 2 new projects aimed at filling data and/or science gaps based on Science-to-Action agenda (annually) • Implement standardized, routine analyses of surveillance data received by the Tracking Program for 4 datasets (annually) • Add 2 new content areas (annually) • Conduct workshop on analytic methods for small area analyses and visualization • Launch Tracking Central Knowledge Management System (version 1.0) to facilitate information sharing among grantees and CDC • Complete technology landscape review to assess options for expanding network capabilities to address stakeholder needs and reduce operational costs • Release Tracking API 2.0 (update biennially) • Sponsor a data challenge • Update Tracking Gateway with new “smart checks” to ensure quality data reporting • Develop Massive Open Online Course (MOOC) • Complete state and national portal evaluations • Develop and implement partnership plan focused on traditional and non-traditional partners to enhance Tracking use and impact on health protection

By Fiscal Year	
	• Conduct regional meeting(s) of Tracking grantees • Develop analytic toolkit (version 1.0) (update bi-annually) • Produce guidance document sharing best practices for data visualization for different audiences • Publish scientific papers based on small area workshop in journal monograph/special issue. • Initiate biannual training opportunities around environmental health and tracking • Implement Tracking training fellowship program
	• Conduct National Environmental Public Health Tracking Conference • Conduct Program evaluation/review by external expert(s) • Update Tracking Central Knowledge Management System (version 2.0) • Update Science-to-Action Agenda based on current state of the science of tracking and environmental health knowledge gaps • Begin development of 2021-2025 strategic plan
	• Conduct state and national portal evaluations • Develop Tracking Program enhancement plan based on external review and program evaluations • Publish 2021-2025 strategic plan

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Appendix A. List of Chemicals, Compounds, and Toxins

This table lists the chemicals, compounds, and toxins, both NCDMs and non-NCDMs, that are currently used within the Tracking Network.

NCDMs	Non NCDMS
Biomonitoring • Arsenic • Benzene • Cadmium • Chloroform (Trichloromethane) • Cotinine • Lead • Mercury • Naphthalene metabolite • Pyrene metabolite (1-hydroxypyrene) • Toluene • Uranium **Drinking Water** • Atrazine • Arsenic • Di (2-Ethylhexyl) phthalate (DEHP) • Haloacetic acids (HAA5) • Nitrate • Radium • Tetrachloroethene (PCE) • Trichloroethene (TCE) • Trihalomethane (THM) • Uranium	**Biomonitoring** • Antimony • Barium • Beryllium • Cesium • Chloropyrifos Metabolite (TCPy) • Molybdenum • Platinum • 3-phenoxybenzoic acid (3-PBA) • Thallium • Tungsten **Pesticide Use** • Carbamate • Organophosphate • Pyrethroid/Pyrethrin

There are also measures within the national portal that target the incidents, injuries, and fatalities due to acute toxic substance releases. The more common toxic substances tracked include:[13]

Common Toxic Substances	
• Ammonia • Carbon Monoxide • Sulfuric Acid • Sodium Hydroxide • Hydrochloric Acid • Mercury	• Chlorine • Benzene • Methamphetamine and Methamphetamine Chemicals • Alkaline Hydroxide (including sodium hydroxide and potassium hydroxide) • Propane • Natural Gas

[13] http://www.atsdr.cdc.gov/ntsip/reports.html

Appendix B. Funding Opportunity Announcement Logic Model Outcomes

There are three key outcomes that an FOA grant recipient is expected to deliver during the 2014 – 2016 project period:

a. Short-term outcomes

   i. Public health decision makers and public users aware of and have access to comprehensive and integrated public health/environmental data and are able to view trends and measure impact

   ii. Public health decision makers, communities, and public utilize environmental surveillance

   iii. Enhance technical capacity of state/local environmental and public health professionals and their jurisdictions

b. Mid-term outcomes

   i. Public health and environmental professionals develop and deliver strong, informed programs, targeted interventions, and policies to address environmental health issues

c. Long-term outcomes

   i. Communities improve their health outcomes

   ii. Impact of environment on community health is reduced or prevented

Appendix C. Abbreviations and Common Definitions

Abbreviation[14]	Definition
ACO	Accountable Care Organizations
API	Application Program Interface
CDC	Centers for Disease Control and Prevention
CEHN	Children's Environmental Health Network
CHSI	Community Health Status Indicators
CWG	Content Workgroup
DEHHE	Division of Environmental Hazards and Health Effects
EHR	Electronic Health Records
EHTB	Environmental Health Tracking Branch
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPH	Environmental Public Health
FOA	Funding Opportunity Announcement
HHS	Department of Health and Human Services
HIA	Health Impact Assessment
IoT	Internet of Things
IT	Information Technology
M&E	Monitoring and Evaluation
NCDM	Nationally Consistent Data and Measures
NCEH	National Center for Environmental Health
NGO	Non-Governmental Organization
PMO	Program Marketing and Outreach (Workgroup)
ROI	Return on Investment
SND	Standards and Network Development (Workgroup)
USG	United States Government

[14] CDC's National Environmental Health Tracking Program: CDC's Strategy for the National Environmental Public Health Tracking Program (FY 2005-2010) (http://www.cdc.gov/nceh/tracking/pdfs/strategy.pdf)

Appendix D. Glossary

Term	Definition
Biomonitoring	The assessment of exposure through direct measurement of environmental chemicals or its breakdown product (metabolite) in human specimens, such as blood or urine.
Environmental public health	The science of protecting humans from environmental factors that can adversely affect health or the ecologic balances essential to long-term health and environmental quality. Such factors include air, food, and water contaminants; radiation; toxic chemicals; disease vectors; safety hazards; and habitat alterations.
Exposure	Contact with a substance by swallowing or breathing or by direct contact such as through the skin or eyes. Exposure may be short term, intermediate duration, or long term.
Hazards	A factor that may adversely affect health.
Health Effects	Chronic or acute health conditions that affect the well-being of an individual or community. Health effects are measured in terms of illness and death.
Population Health	The health outcomes of a group of individuals, including the distribution of such outcomes within the group.[15]

[15] Kindig D, Stoddart G. What is population health? *American Journal of Public Health* 2003 Mar; 93 (3):380–3.

Appendix E. National Environmental Public Health Tracking Program Strategic Goals & Objectives

Science and Content	
Innovation	
Goal	*Conduct and guide scientific activities that address gaps and priorities in the practice of environmental public health tracking as defined by a Science-to-Action agenda*
Short-Term Objectives	• Develop a Science-to-Action agenda that addresses environmental public health priorities, shows clear alignment to public health sections and outcomes, implications for the broader Tracking Program (e.g., identification of key gaps in data, tools, information, and knowledge), as well as prioritization of gaps based on feasibility, actionability, stakeholder needs, and potential for impact • Develop surveillance, data linkage, or other projects needed to address critical gaps, as defined by the Science-to-Action agenda, through the development or application of novel and non-traditional data, tools, technologies, and methodological approaches • Identify and fill potential knowledge gaps, particularly in key areas of need and incorporate tracking into the core curriculum of schools of public health
Long-Term Objectives	• Prioritize and address science and policy challenges that persist within the Tracking community related to the timely accessibility, analysis, and dissemination of data at the necessary spatial and temporal resolution (e.g., sub-county and real-time data, electronic health records, "data suppression" and privacy restrictions) • Fill key gaps in the availability of quality and complete data in the network by integrating new and enhancing existing sources of data as defined by the Science-to-Action agenda (e.g., longitudinal patient or clinical outcomes data; sensor technology data) • Generate and disseminate information using data within the Network by applying innovative analytical and informatics methods that bring together multiple sources of data and information to address specific stakeholder's needs and priorities (e.g., surveillance summaries, community profiles, or reports) • Address national or regional environmental public health priorities by conducting projects that translate data and information to support public health actions that reduce environmentally related health outcomes • Expand current environmental public health education and training offerings to include the latest tracking data, practices, and methodologies, as well as new technical skills and capabilities while also creating interdisciplinary curricula and practicum that utilize the latest tracking data, practices, and methodologies
Operational Efficiency	
Goal	*Establish standards, processes, and protocols to direct scientific activities and content, and facilitate translation of data into measurable public health action*
Short-Term Objectives	• Strengthen internal processes for managing scientific content on the Tracking Network and implement processes and tools to evaluate new or proposed changes to content. • Develop a process for ongoing evaluation and update of the Science-to-Action agenda • Re-evaluate the Tracking Program FOA Logic Model (see **Appendix B**) and update as needed. Facilitate alignment of grantee tracking activities by aligning grant requirements and evaluation criteria with the Science-to-Action agenda, and with near-, mid-, and long-term outcomes • Develop protocols and standards for performing routine descriptive and trend analyses of data and measures to proactively identify potential health issues and risk factors • Develop standard protocols or additional tools for using tracking data to perform routine health and economic impact analyses that addresses priority public health issues, at the national and regional levels (e.g., health impact assessment toolkit for high risk populations).
Long-Term Objectives	• Develop or apply advanced analytical tools to improve the utility and timeliness of information generated from data within the network • Develop protocols and processes for translating data to support public health actions and interventions at the community level

Technology and Informatics	
Innovation	
Goal	*Enhance the functionality and capabilities of the Tracking Network to stay current with advances in technology and improve support of stakeholder needs*
Short-Term Objectives	• Extend roll-out of the Tracking Network's Application Program Interface (API) to a broader set of users or communities of interest and encourage development of applications that can be supported by common mobile platforms • Establish innovation-focused partnerships with industry based on shared objectives that may include data science challenges to broaden awareness and explore utility of data, or more formal collaborations with industry big data providers and accountable care organizations to enhance capabilities • Identify and integrate data visualization capabilities and presentation styles that best fit the needs of non-scientific users and audiences • Modernize existing infrastructure to the extent allowable by CDC including transition of the National Tracking Network to a partial or full cloud-based platform and movement of the Web application to HTML5
Long-Term Objectives	• Explore novel approaches and capabilities to enhance functionality and expand capacity including the use of advanced data analytics • Assess the implications of emerging technology trends for the Tracking Network such as the Internet of Things (IoT)[16] paradigm including wearable technologies,[17] as well as emerging types and sources of health data such as electronic health records (EHRs) and patient outcomes data
Operational Efficiency	
Goal	*Identify and realize specific opportunities for greater cost and business process efficiency, across the Network*
Short-Term Objectives	• Explore novel approaches and capabilities to enhance functionality and expand capacity including the use of advanced data analytics • Assess the implications of emerging technology trends for the Tracking Network such as the Internet of Things (IoT) paradigm including wearable technologies, as well as emerging types and sources of health data such as electronic health records (EHRs) and patient outcomes data
Long-Term Objectives	• Identify existing business models/practices that can be adopted by grantees and CDC to enhance sustainability and expand network

[16] The Internet of Things (IoT) refers to the ever-growing network of physical objects that feature an IP address for internet connectivity, and the communication that occurs between these objects and other Internet-enabled devices and systems. This may include wi-fi enabled environmental monitors and sensors, and smart homes.
[17] Examples include smart watches, fitness and biometric trackers, smart glasses, wearable cameras

Awareness and Impact	
Innovation	
Goal	*Develop the partnership ecosystem to build awareness, foster collaboration, and increase impact on public health outcomes through outreach, communications, and use of Tracking Network data and expertise*
Short-Term Objectives	• Map out the partnership ecosystem and define objectives for partnering in coordination with activities and outcomes of related objectives underlying Science & Content and Technology & Informatics pillars; identify specific opportunities for collaboration as well as resources to support • Increase or enable community outreach to support stakeholder needs assessments, and inform metrics for evaluating Tracking Program impact on specific stakeholder needs • Strengthen plain communications of technical and non-technical components of the Tracking Program to enable more clear and focused messaging • Develop and refine approach to social media and other media, as appropriate, with focus on expanding outreach and awareness of the program, with emphasis on non-traditional communities of interest and potential users (i.e., those outside the traditional environmental public health communities)
Long-Term Objectives	• Develop a framework for an environmental health tracking fellowship or internship program that addresses Tracking Program and grantee workforce needs • Engage potential partners whose interests align with Tracking priorities as defined by Science-to-Action agenda and informatics landscape…to mutually enhance capabilities and impact environmental public health (e.g., capitalize on opportunities for the workforce to gain experience in applied and interdisciplinary science through cross-agency collaboration) • Ensure clear and culturally sensitive communications are integrated into planning, development, implementation, and reporting of all projects occurring across the Program • Develop strategic partnerships with health delivery systems (e.g., Accountable Care Organizations) and private sector technology companies to more efficiently facilitate the exchange of information, ideas, and talent
Operational Efficiency	
Goal	*Improve clarity and targeting of messaging and delivery of content to best support stakeholder needs*
Short-Term Objectives	• Promote visibility of Tracking Program within traditional and non-traditional stakeholder communities enabled through communications that are refined for different stakeholder communities • Formalize and improve efficiency of knowledge management and information sharing processes • Develop standard education programs or training modules to facilitate greater use of tracking data and resources that are tailored to address the specific needs of stakeholder groups
Long-Term Objectives	• Develop an evaluation framework, tools, and supporting processes for conducting routine assessment of Tracking Program impact on stakeholder needs and discrete health outcomes such as reduction in health disparities at national, regional, and community levels • Develop a plan to foster greater use of the Tracking Network within CDC, as well as increase advocacy and buy-in to promote use of tracking data across the Federal government