Building the Future of Environmental Public Health Tracking: Proceedings and Recommendations of an Expert Panel Workshop

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Abstract **Since 2002, the national Environmental Health Tracking Program of the Centers for Disease Control and Prevention (CDC) has provided vital support to state environmental public health efforts while simultaneously building a nationwide network of state, local, and academic partners to improve our nation's capacity to understand and respond to environmental threats to public health. As part of program review and strategic planning, national thought leaders in environmental public health were convened to assess progress, identify gaps and challenges, and provide recommendations for enhancing the utility and impact of the Tracking Program. Several opportunities were identified. Chief among these was the need for continued and expanded CDC leadership to develop a coordinated Tracking Program agenda identifying specific scientific goals, data needs, and initiatives. Recommendations for future growth included expanded data availability and program coverage: i.e., making data available at the community scale and establishing tracking programs in all 50 states. Finally, a set of recommendations emphasizing communication to decision makers and the public was made that will be integral to the future utility and success of the Tracking Program.**

Introduction

A Vision for Environmental Public Health Tracking

From the earliest days of organized public health, understanding environmental hazards and exposures has been critical to protecting the health of communities. As the national infrastructure for environmental protection evolved since the creation of the U.S. Environmental Protection Agency (U.S. EPA) in 1970, there has been an emphasis on controlling pollution sources and monitoring environmental quality. While these efforts have helped improve environmental quality, the creation of environmental agencies contributed to a fragmentation of environmental public health efforts among environmental and health agencies (Burke, Shalauta, Tran, & Stern, 1997; Institute of Medicine, 1988). To address the uncoordinated patchwork of environmental public health in the U.S., the Pew Foundation established the Pew Environmental Health Commission at Johns Hopkins University in 1998. The commission found that as a result of decades of neglect, the nation's public health system was operating without basic information about chronic disease and related potential environmental factors (Environmental Health Tracking Project Team, 2000; Litt et al., 2004). To address this gap, the commission developed a blueprint for environmental public health tracking (EPHT) summarized in this overarching recommendation:

> Create a federally supported Nationwide Health Tracking Network that informs consumers, communities, public health practitioners, researchers, and policymakers on chronic diseases and related environmental hazards and population exposures. This will provide the capacity to better understand, respond to, and prevent chronic disease in this country.

In response to the commission recommendations, in 2002 the National Center for Environmental Health of the Centers for Disease Control and Prevention (CDC) established the Environmental Public Health Tracking Program. Since then, the Tracking Program has supported and worked with agency, community, and academic partners to develop the necessary systems, training, expertise, and capacity to address the vision of the commission. The Tracking Program has spawned many successful projects from the first years of work, including funding tracking programs in state and local agencies in 25 states, exposure prevention and community environmental health assessments, and new policies and research (Kearney, Namulanda, Qualters, & Talbott, 2015; Litt et al., 2007).

Renewing the Vision: Tracking Program Progress and Next Steps

Environmental public health science has advanced with new understandings of population exposures and recognition of a broader range of health impacts (Gibb et al., 2015).

The increased recognition of the public health importance of climate change, the emergence of the health impact assessment (HIA) as a core tool for public health decision making, and vast improvements in health information technology and availability—all present great opportunities for the future of tracking (Mueller et al., 2015; U.S. Global Change Research Program, 2014). Recognition of and attention to the link between environment and health has never been greater. Public health policy decisions ranging from transportation to community development are increasingly dependent upon strong public health information (National Association of Chronic Disease Directors [NACDD], 2015). Despite these successes, in the 12 years since its inception, the Tracking Program has been hampered by continued fragmentation in the field, scientific uncertainties, and limited resources.

Methods

Considering the successes and challenges that remain, this project provided recommendations for the future of tracking, building upon the progress made and continuing to work toward the vision of a nationwide network and related public health capacity to better understand, respond to, and prevent environmental hazards, exposures, and diseases. The discussion and recommendations below are the result of an expert panel workshop that included persons with expertise in community health, emergency preparedness, environmental health sciences, epidemiology, and public administration. Agencies and organizations represented on the panel included: the Association of Public Health Laboratories; U.S. EPA; U.S. Geological Survey; and state health and environment agencies from Massachusetts, Michigan, New Jersey, Oregon, and Washington. Also represented were academic institutions: Colorado School of Public Health, City University of New York School of Public Health, and Johns Hopkins School of Nursing. The panel convened at a workshop in Baltimore, Maryland, in March 2015. The recommendations were designed to inform strategic planning for the Tracking Program as it seeks to enhance the utility of efforts to develop and sustain program activities to build a nationwide network, as well as advance environmental public health capacity at all levels to better protect the nation's communities.

Results: Expert Panel Discussion

At the start of the workshop, participants engaged in an assessment, each providing their perspectives on the Tracking Program's accomplishments and challenges, as well as participants' suggestions for next steps. Following the assessment exercise, the discussion turned to practical ways to enhance the Tracking Program and implement the next steps.

Assessment Activity: Accomplishments

The Tracking Program has enhanced and sustained environmental public health capacity, which was particularly critical during the recent recession years when, without the Tracking Program, such capacity would have been minimal or even nonexistent. Additionally, the Tracking Program was lauded for enhancing technical expertise, creating access to data, facilitating the development of a multidisciplinary "people" network of grantees and federal partners across the nation, as well as partnerships and data sharing across agencies and community organizations within states. These infrastructure supports, data sharing activities, and partnerships were identified as fundamental to achieving the vision of the commission. Participants felt that these fundamental features must be sustained and, if possible, expanded as the program moves forward.

For example, the Tracking Program has helped U.S. EPA to be accountable for both policy actions and inactions by highlighting the links between environmental exposures and health—and, in turn, the resulting health protection afforded by improved environmental quality. The primary example for U.S. EPA has been related to air data, which is readily available. For example, the Wisconsin Tracking Program was able to use air data to develop the Regional Air Impact Modeling Initiative to link geographic estimates of toxic air pollutants and cancer risk. This initiative allowed for the investigation into factory emissions of trichloroethylene and adverse health effects (Centers for Disease Control and Prevention, 2006). Moreover, U.S. EPA is looking to expand the datasets that can be available to tracking programs to allow for linkage of nationally collected, geographically focused exposure data and local level public health outcomes. For example, there is potential to link with a number of U.S. EPA data and mapping resources including the Community Focused Exposure and Risk Screening Tool, EJSCREEN, and EnviroAtlas (U.S. Environmental Protection Agency, 2016a, 2016b, 2017).

Assessment Activity: Ongoing Challenges

Ongoing challenges identified at the workshop were centered on different aspects of data access, integration, and dissemination. Data access due to confidentiality and data use agreement issues has been an ongoing challenge and obtaining data at granular levels has been particularly difficult. Additionally, lack of standardized network architecture including data collection platforms, databases, and portals has created data integration challenges. These data limitations have hindered progress towards the aims outlined by the commission; finding solutions to such challenges should be a priority in moving the program forward.

Lack of awareness about EPHT by agency decision makers is a challenge to assuring its continued use and sustained support and growth. While the data might be useful, if policy makers and key stakeholders are unaware of the potential of the data, this resource will not be used to inform decision making. Building such awareness and "traction for tracking" may require an integrated training, communication, and outreach effort to establish tracking data and analytical tools as the preferred resource for the public health workforce to use in addressing complex environmental health issues. When assessment results are communicated to decision makers, the results should be identified as products of tracking.

Panelists also commented on strategies for building resources for tracking. Leveraging partnerships and cross-agency collaborations with regard to applied research can maximize resources. For example, using tracking data across agencies, such as the Food and Drug Administration and U.S. Department of Agriculture with regards to food safety practices and policies could streamline efforts and enhance outcomes. Furthermore, additional resources and opportunities for tracking might be available through partnerships related to community health improvement efforts undertaken by healthcare organizations.

Assessment Activity: Next Steps

Tracking data will be instrumental in addressing the changing world, including climate

change and understanding the health impacts of economic growth and globalization. A key to addressing such issues is sustaining and growing the tracking infrastructure and ensuring data availability to meet information needs of emerging public health challenges. Data enhancements must incorporate timely, accurate, community-level data (i.e., census tract level data, geocoded data, and potentially other data sources such as citizen science or crowdsourcing).

Additionally, collaborating with various stakeholders will help the Tracking Program identify data expansion opportunities both upstream and downstream. Moving beyond the traditionally studied exposure and outcome relationships to the incorporation of biomonitoring and other emerging sciences such as epigenetics to these relationships would further increase the value of the data linkages. There is a need to build broader partnerships with academic entities to facilitate development of hypotheses and research implementation related to the inclusion of emerging sciences into tracking.

The expectation of flat or potentially reduced funding for tracking is a major concern, as it likely prohibits the addition of new capabilities without trimming others. Evaluation mechanisms are needed to determine if or when to stop a particular activity to allow for a new initiative. These funding concerns go beyond whether a particular program can take on new activities; it affects the ultimate goal of the commission, which is to develop and maintain a nationwide network of tracking programs in all 50 states.

The panel discussed the potential of using tracking data to establish an understanding of baseline measurements for preparedness responses to events such as hurricanes or oil spills. For example, tracking data can allow for the analysis of spikes in adverse health effects related to disaster situations.

To date, tracking has emphasized traditional environmental health approaches focused on the ambient environment. The next steps include expanding to issues such as the built environment and understanding the social environment or socioeconomic context from which the hazard and health data arise to add further depth to exposure-adverse health effect relationships.

Tracking Enhancements and Implementation

The panelists then considered how to take advantage of the various opportunities identified in the context of the ongoing challenges. Four topics were addressed in the discussion of enhancements and implementation:

1. program vision and leadership;
2. new opportunities;
3. data, methods, or partners needed to move the program into the future; and
4. communication about tracking and its value.

Renewing the Scientific Vision

Tracking will benefit from a two-pronged strategy including both scientific and operational components. There should be a scientific foundation including an aim to build the environmental health evidence base. A priority activity will be to identify shared scientific goals within CDC and among partner agencies at the national level—and among grantees at the state and local levels—to develop environmental public health questions to address. The scientific goals must be clearly linked to practice to serve as the base for program operations.

Tracking will benefit from a high-level leadership group to provide input and help the program articulate the scientific vision, achieve a higher profile, and continue to grow. This leadership needs to determine the key players in setting the long-term agenda for the future. As it stands, state tracking programs have good partnerships with each other, federal agencies, academia, and nongovernmental organizations; however, to sustain and build on these existing partnerships, support from a core group of CDC and other federal agency leaders is needed. Partnerships with the private sector can also be enhanced.

The scientific agenda must be fleshed out and aligned with the practice-based mission and balanced with the capacity of the Tracking Program. Workshop participants suggested climate change and social determinants of health as priority scientific areas for tracking. The Tracking Program is primed to develop an approach to understanding the changing environment, but it will likely need additional exposure and outcome datasets. Additionally, the field of environmental public health is leaving the old paradigm of contaminant-by-contaminant prevention and entering a new paradigm with multifactorial exposures and determinants of health; this approach must be incorporated into the Tracking Program.

New Opportunities and Applications

Incorporating data from the Tracking Network into HIAs is one way to add value and build capacity into the Tracking Program. HIAs allow health departments to model the impact of a community's action and set priorities. For example, the Massachusetts Department of Transportation incorporated tracking data into its HIA for a highway project and was able to demonstrate that the project alternatives offered improved health over the status quo (NACDD, 2015). Moreover, because HIAs address the multifactorial nature of decision making, contributing to an HIA can showcase the breadth of data available through tracking programs and additionally could spur development of expanded tracking datasets, where needed. The increasing prevalence of HIAs as a policy-development approach at local, state, and national levels makes it a priority opportunity for tracking.

Strengthening tracking for community health was a core component of the commission's vision for the Tracking Program and thus will be important in moving forward. Using tracking to support community needs assessments is one way to accomplish this aim. There is potential to link with healthcare organizations in this area. Of course, there needs to be adequate capacity to follow up and to conduct the necessary interventions and education activities in response to the community needs and interests identified by these assessment efforts.

Working with the Association of Schools and Programs of Public Health to improve the link between academia and tracking allows for better support for research and training of students. Students can utilize data from the Tracking Network to develop manuscripts and research proposals, conditioning them to use this data in environmental public health research.

Moving Tracking Into the Future

Data scale, both in space and time, was identified as the biggest challenge in moving the Tracking Program into the future. The first priority is to identify holes and fill in the surveillance map; all states need to be included,

as this will better facilitate data completeness and linkages. Tracking need not create new surveillance systems, but rather should leverage existing systems when feasible. For example, the Tracking Program should work with U.S. EPA and the Agency for Toxic Substances and Disease Registry to incorporate available datasets, building on already ongoing activities. Enhancing the granularity of tracking data, e.g., to the census tract level, will be key for future improved utility of the data to allow for "drilling down" on exposure and health effect data. Strategies to overcome obstacles to obtaining this granular level of data are needed.

Additionally, data on chronic conditions and exposures at smaller time-scales allows for data users to examine specific time frames, which can prove useful for extreme events and disaster interventions. From an information technology perspective, tracking needs to incorporate both aspects of scale into the continued development of the portal. End users should be able to define the scale of time and space. Data sharing rules need to be established and enforced, and users must look at the right scale of data to answer their intended questions in order to best inform policy and program decisions.

Tracking can also benefit from nontraditional sources of data, such as healthcare utilization and crowdsourced disease information via mobile technology. Pharmaceutical scripts reported to national databases could be combined with tracking data for a better understanding of health needs on a local level. Public–private partnerships might be a feasible avenue in order to capitalize on these sources of data. As with any new source of information, however, tracking must invest in validating such data and then communicating the data's limitations. Applying socioeconomic factors then adds another layer to this data for the purpose of targeted interventions.

New Ways to Articulate and Communicate the Value of Tracking

HIAs were highlighted as an important instance of users outside of public health programs capitalizing on the potential of tracking programs. From a political perspective, the incorporation of tracking data into HIAs allow policy makers to examine interventions and outcomes with direct relevance for their constituents. Reframing tracking stories to analyze the return on investment for more strategic allocation of resources is another approach to exhibit its value to policy makers. For example, data from tracking have been used to demonstrate that community cancer rates were no higher than expected, thus avoiding a disease cluster investigation that would likely have been very costly and taken years to complete. Having multiple sectors of a community, both governmental and nongovernmental, use the tracking portal will inevitably create demand as well. It is essential that tracking programs communicate with a wide variety of stakeholders to assure that the program meets their needs, as well as communicating the value of tracking to them.

In terms of marketing the utility of tracking, the program needs to develop user statistics that are easily understood and shared to broad audiences, such as how the tracking data are/were used, i.e., individual or organization decision making, informing a public policy, or research, etc. Coupling this transparency with success stories will be integral to effective communication.

Concern about ecological fallacy with tracking data leads to caution in communicating the results of linkage projects. Focusing on examples where the exposure and outcome association is strong can help alleviate this concern. For areas where there is no known connection, the value of the Tracking Program lies in its ability to clarify the landscape, inform the debate, and suggest necessary research. Essentially, messaging must fall into three categories: known associations, no association, and unknown associations.

Tracking could benefit from a National Academy of Medicine report to establish it in the field as a valuable tool for scientific use. It is imperative that research conducted through the use of tracking data be published, as publication is one of the strongest ways to demonstrate and communicate tracking's value to the broader research community. Timing of publications and communication of the value of tracking through coordinated efforts between academia and government could prove powerful for translating the data into practice.

Recommendations

During the final session of the workshop, 12 recommendations were articulated under three categories: leadership, opportunities, and communication. Workshop participants ranked the recommendations. The recommendations are listed in priority order below.

Leadership

Engage program and agency leadership, build and maintain partnerships, create an agenda promoting science and practice

1. Develop and enhance strategic partnerships with
   a. Healthcare delivery systems
   b. Private sector, technology companies
   c. Federal agency partners in transportation, defense, emergency management, agriculture
   d. American Public Health Association
2. Foster multilevel leadership buy-in
   a. Leverage current CDC, U.S. EPA, and other agency leadership
   a. Institutionalize collaboration
3. Build and promote a shared agenda
   a. Strengthen the environmental public health evidence base
   b. Inform environmental public health practice actions and measure outcomes

Opportunities

Identify new data, linkages, and funding sources; develop disaster response capacity; provide training; and build toward a 50-state network

1. Explore new health topics and data linkages
   a. Promote and develop EPHT for use in HIAs, community health needs assessments, and other multidisciplinary assessment approaches
   b. Enhance data to address environmental justice, climate change, food, built environment, and community design
   c. Develop data linkage projects to include internal markers of exposure and health effects
2. Expand datasets to include other existing or emerging data, such as
   a. Healthcare-related data sources
   b. Other environmental data and models, such as those at U.S. EPA and other agencies
3. Develop tracking capacity to add value to disaster preparedness and response
4. Leverage resources, build internal efficiencies, and secure external support
5. Provide tracking training for health professionals and the general public
   a. Conduct massive online open courses

   b. Build EPHT into curriculum at public health schools/programs
   c. Establish research internships and fellowships
6. Expand to a 50-state network

Communication

Enhance data availability, branding, and coordinated communications

1. Disseminate timely data in user-friendly formats
2. Build brand identity and "traction for tracking," particularly among decision makers
3. Conduct effective communication and outreach
   a. Engage partners for coordinated communication activities
   b. Highlight outcomes and impacts
   c. Promote success stories to acknowledge and build on EPHT progress

Discussion and Conclusions: Building the Future of Tracking

This project gathered a diverse group of experts to assess and guide the work of the Tracking Program. The expert panelists noted that, since its inception in 2002, the Tracking Program has developed impressive networks of agency partnerships and environmental health professionals; created an infrastructure capable of sharing data and information for many important environmental public health topics; and built the corresponding analytical and response capacity for making informed public health actions through fellowships, trainings, and the 26-grantee programs housed in 25 states. As the Tracking Program considers the emerging issues and potential for growth, the workshop recommendations offer a way forward built on leadership and engagement of decision makers, collaborations, and new opportunities.

Several important limitations must be noted. The workshop did not include participants from the healthcare community or health economists. Outreach to these partners will be critical in establishing productive collaborations and will facilitate the development of new indicators for tracking, as well as the development of new assessment tools for the healthcare community. Project resources were such that only one in-person meeting could be held. Johns Hopkins investigators conducted outreach to environmental public health partners such as Association of State and Territorial Health Officials and the National Association of City and County Health Officials to extend the reach of the project. Finally, the extent to which the Tracking Program can implement the recommendations will depend on program resources.

The recommendations of the workshop direct the Tracking Program toward efforts that will maintain its influential role as part of the nation's environmental public health infrastructure, as well as build toward the original vision of the commission. The top priority next steps include developing a science-based, practice-linked agenda that leverages new sources of data down to the community and individual levels; enhancing the visibility of tracking as a decision-making resource not just within public health, but also for healthcare organizations; and coordinated communication efforts around the outcomes and successes of tracking work. While the Tracking Program is well positioned for these initiatives, the most effective way forward requires engagement across the spectrum of public and private environmental, health, and healthcare organizations to ensure success.

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Did You Know?

NEHA offers several different health tracking resources that can be found at www.neha.org/eh-topics/health-tracking-0. One of the resources available through NEHA's e-Learning program, Tracking 101, provides an overview of the major components of environmental public health tracking. Topics covered include the National Tracking Network and Program, surveillance and epidemiology, types of tracking data, GIS policies, and communication.