

## ▶ DIRECT FROM CDC ENVIRONMENTAL PUBLIC HEALTH TRACKING NETWORK



Patrick A. Wall

## Together at Last: Exploring Health and Environmental Information on the National Environmental Health Tracking Network

**Editor's Note:** As part of our continuing effort to highlight innovative approaches and tools to improve the health and environment of communities, the *Journal* is pleased to publish a bimonthly column from the Centers for Disease Control and Prevention's (CDC's) Environmental Public Health Tracking Network (Tracking Network). The Tracking Network is a system of integrated health, exposure, and hazard information and data from a variety of national, state, and city sources. The Tracking Network brings together data concerning health and environmental problems with the goal of providing information to help improve where we live, work, and play.

Environmental causes of chronic diseases are hard to identify. Measuring amounts of hazardous substances in our environment in a standard way, tracing the spread of these over time and area, seeing how they show up in human tissues, and understanding how they may cause illness is critical. The Tracking Network is a tool that can help connect these efforts. Through these columns, readers will learn about the program and the resources, tools, and information available from CDC's Tracking Network.

The conclusions of this article are those of the author(s) and do not necessarily represent the views of CDC.

Patrick Wall joined the CDC's Environmental Health Tracking Branch in 2002 and currently works on informatics activities related to the development of the Tracking Network.

“The National Tracking Web site really looks nice, but I thought the whole idea behind Environmental Health Tracking was to be able to look at health and environmental information *together*. Why can't the system do that?”

It was a question that hung in the air like a thick fog nearly every time I gave briefings to management officials on the National Environmental Health Tracking Network Web site

since it was launched in 2009. The question was easy to answer, but I still hated having to answer it.

For those readers not familiar with Environmental Health Tracking, allow me to explain some history. The Centers for Disease Control and Prevention (CDC) established the Environmental Health Tracking Program in response to a September 2000 report by the Pew Environmental Health Commission,

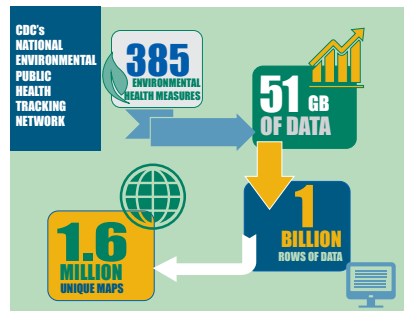
“America's Environmental Health Gap: Why the Country Needs a Nationwide Health Tracking Network.” The report stated that public health agencies lacked capacity to evaluate and conduct key investigations into the status of the health of their environment. The Pew Commission's report called for the establishment of an Environmental Public Health Tracking Network (Tracking Network) that would monitor the level of burden for environmentally related disease.

The vision for the Tracking Network called for federal, state, and local agencies and others to monitor and distribute information about environmental hazards and disease trends, as well as advance research on the possible linkages between environmental hazards and disease. After several years of planning and implementing with partners from around the country, CDC launched the National Tracking Network in 2009. Since that time, the system has grown not only in the functionality it provides but in the amount of data it contains. Currently, 385 (Figure 1) environment and health measures are accessible by a user-friendly query panel that returns query results in a customizable series of maps, charts, and tables (see <http://ephtracking.cdc.gov/showHome.action>).

Because of the way government organizations obligate funds, it is common for public health surveillance systems to be designed to focus on a single disease or category of health conditions. The result is a collection of independent surveillance systems that provide detailed material for their respective areas yet leaves users unable to access information for related topics. Requiring users to access

FIGURE 1

### Data Facts About the National Environmental Health Tracking Network



multiple single-category surveillance systems hinders data discovery and access. The Tracking Network, however, provides standardized environmental data and public health data together in a central location that are formatted consistently for easy comparison.

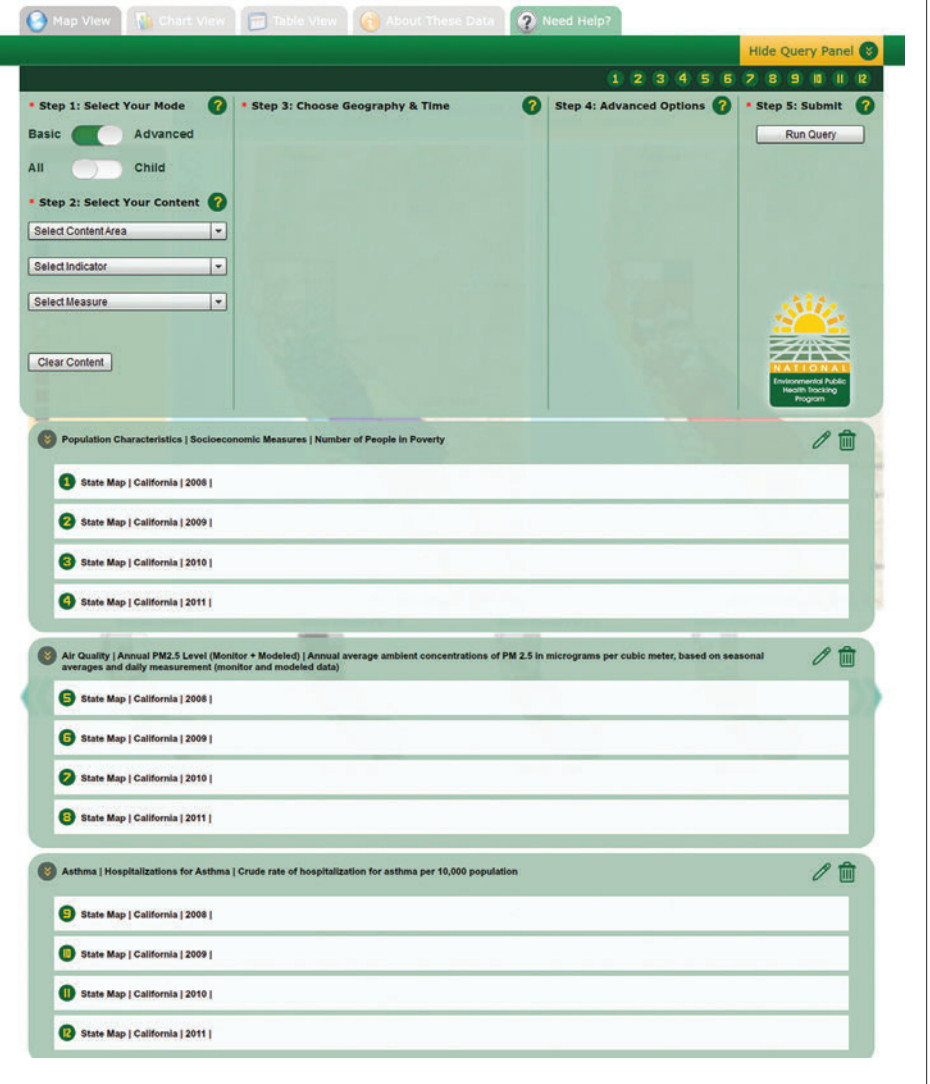
Initially, the Tracking Network users could perform separate queries and data downloads of available environmental and health measures. Data queries could include multiple years and multiple states or counties, but only for a single measure. Which brings us back to the question asked in so many of my Tracking Network briefings and demos: “Why can’t users see different environmental and health measures at the same time?”

Ideally, a user will be able to query data on, for example, air quality, hospitalizations, and socioeconomic and view outputs of all three measures on the same display. Before 2015, obstacles such as limited resources and concerns about generating inaccurate associations between environmental exposure and health outcomes hindered the Environmental Health Tracking Program’s progress in fulfilling our plans to show multiple measures at the same time on the Tracking Network. As of this year, however, the query and display of multiple measures are a reality.

Users can query and display multiple measures on the National Tracking Network by selecting the “Advanced” mode on the query panel. Turning on the “Advanced” mode toggle opens up a series of powerful features for data exploration. The “Advanced” mode is modeled after something we are all familiar

FIGURE 2

### Building a Query With Multiple Types of Data



with in the online world: the virtual shopping cart. To put it simply, the user picks from any of the environmental health measures across time and location, and then adds them to their shopping cart—or as we call it, a “query queue.” For example, users can fill their shopping carts with four years of their state’s annual county data for each of the following categories: air quality, asthma hospitalization, and poverty status (Figure 2).

Sticking with the shopping cart model, the next step is to “check out” by clicking the “Run Query” button. The system fetches the data and returns it as a series of thematic

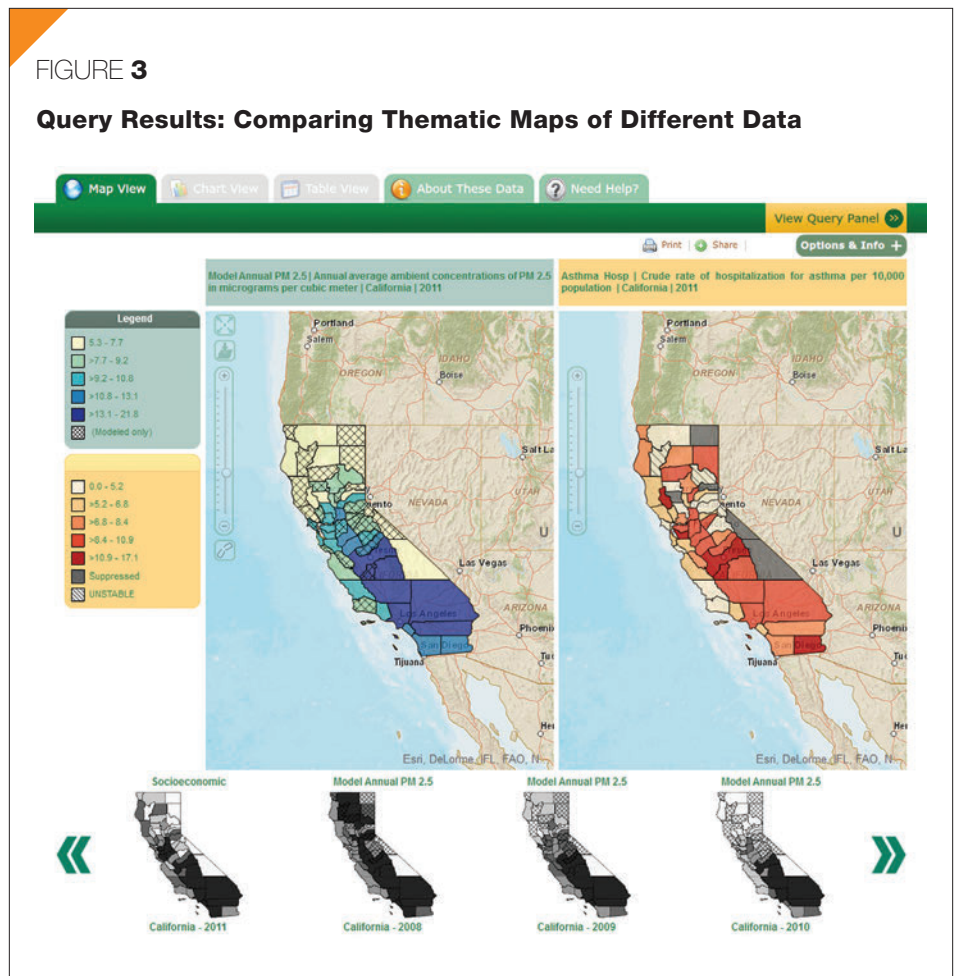
maps. The maps are presented in a dual-map interface that consists of interactive map panes and a series of thumbnail maps representing each of the queries that the user placed in the queue. Users can drag and drop any of the thumbnails to either one of the map panes, allowing an easy comparison of any two of the system’s environmental and health measures at the same time (Figure 3).

The decision to create a system where multiple measures are viewed in side-by-side maps rather than a combined single map was primarily due to (1) the complexities of reengineering the map display portion of

the original single measure system (it already contained the functionality for side-by-side maps), (2) displaying more than two variables as overlays on a single map results in busy and distracting visualizations, and (3) CDC partners, grantees, and stakeholders expressed concerns that the implementation of multiple measures enhances the risk of users creating invalid associations among environmental quality data, exposure data, and health conditions.

Understandably, Tracking Network data stewards have an obligation and interest in knowing that the data in their scope are not misused or misinterpreted. Even without having a multiple measures display option, however, system designers can do little to prevent data misuse on any publicly accessible health information system given the increased accessibility to both data and the tools to combine them. We have helped address this concern by adding a prominent pop-up message after a user hits the “Run Query” button. The statement warns users that valid scientific associations cannot be assumed by combining disparate data.

The addition of multiple measure query and display functionality provides an exciting new capability in the Tracking Network that increases a user’s ability to freely explore and analyze data on the Network. Now more than ever, public health practitioners and other users can formulate hypotheses, analyze trends, and explore possible relationships across a wide variety of health and environmental information. For example, users can now visually explore the relationships among air quality, asthma hospitalizations, and pov-



erty. Moving forward, this functionality will continue to be expanded and refined.

As a bonus for me, those demos and briefings to management officials about the National Tracking Network Web site just got a lot more fun! 🚗

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