

**ArcGIS MAPPING OF PRIVATE WATER WELL
TEST RESULTS IN WEST VIRGINIA**

**ENVIRONMENTAL PUBLIC HEALTH TRACKING
ASTHO FELLOWSHIP REPORT**

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I. Introduction

For decades, the United States has faced a major gap in understanding how environmental contaminants affect people's health. The Centers for Disease Control and Prevention (CDC) is working to close this gap by improving surveillance through the National Environmental Public Health Tracking (EPHT) Network (Tracking Network). The Tracking Network is a system of integrated information and data on environmental hazards, human exposures to environmental hazards, and health effects potentially related to hazard exposures. Health conditions found on the Tracking Network include asthma, birth defects, cancer, carbon monoxide poisoning, heart attacks, and reproductive and birth outcomes. Environmental data include air quality, climate change, community design, community water, and private well water. The Tracking Network is a dynamic Web-based tool that, for the first time, provides health and environment data in one easy to find location. The building blocks of the national network are state and local health departments around the country that are funded to build local tracking systems. These systems supply data to the Tracking Network and address local environmental public health concerns. The CDC provides funds to 26 state and local health departments to develop local tracking networks that feed into the Tracking Network.

On January 9, 2014, approximately 10,000 gallons of 4-methylcyclohexanemethanol (MCHM) spilled from an above-ground chemical storage tank into the Elk River in Charleston, West Virginia, contaminating the public water supply of approximately 300,000 residents. Water use was not restored to the entire affected community for 8 days and the state of emergency lasted 50 days. Both the acute and long-term health effects of exposure to MCHM were unknown. This incident underscored the critical need for environmental public health tracking in West Virginia to provide a comprehensive understanding of the linkages between environmental exposures and health effects.

In 2014, the West Virginia Bureau for Public Health (WVBPH) entered into an agreement with the CDC's EPHT Program to become an unfunded partner in the Tracking Network. To demonstrate its commitment to EPHT and to lay the foundation for a funded program, the WVBPH's Office of Environmental Health Services (OEHS) began submitting select data sets to

CDC on an annual basis. In time, West Virginia hopes to become a funded partner and establish a full-scale EPHT program in West Virginia. An EPHT program will enable communities, public health professionals, state agencies, policy makers and other stakeholders to access environmental health data in order to address West Virginia's diverse environmental health concerns.

ASTHO's EPHT Peer-to-Peer Fellowship Program, in partnership with CDC, offers non-funded health agencies the opportunity to conduct pilot projects on environmental health issues of importance to their communities, receive mentorship from current CDC grantees, and become familiar with CDC standards and resources for EPHT. In an effort to gain EPHT guidance and build capacity in West Virginia, the OEHS submitted a proposal to ASTHO's EPHT State-to-State Peer Fellowship Program in the fall of 2016. West Virginia was given the opportunity to participate in ASTHO's 2017 EPHT Peer-to-Peer Fellowship Program. West Virginia's main goal of fellowship participation was to learn more about the technical and resource requirements needed to build and sustain a successful EPHT program.

II. Site Visit

West Virginia was partnered with the Maine Center for Disease Control and Prevention's EPHT Program. The site visit was held on June 13-14, 2017, and included a meet and greet, tour of the EPHT program's facilities, program overview and attendance of a weekly EPHT meeting. Discussions with EPHT staff throughout the day included the following topics: laying a foundation for EPHT; lessons learned by Maine's Tracking Network about staff and resources; data and information technology models and costs; data access and quality; private water well legislative and policy context; development of private water well nationally consistent data measures; preparing private water well water data for the portal; private water well outreach; use of Behavioral Risk Factor Surveillance System (BRFSS) survey questions for procuring private water well usage and testing data; building a tracking portal, Cognos application, and information technology support; guidance for displaying data; and toxicology on-call support for private well water users. These topics were selected during several introductory conference calls between the Maine CDC and OEHS.

Participation in the site visit provided an essential, in-depth introduction to the steps involved in successfully developing and implementing a full-scale EPHT program. The site visit enabled OEHS to gain one-on-one mentorship and to understand best practices and lessons learned for fundamental tracking techniques and program infrastructure that can be modeled in West Virginia. The site visit provided detailed information regarding critical components of EPHT including network organization, web portal development, mapping applications, messaging, risk communication, and program outreach and strategies. Moreover, invaluable insight was given on how to avoid and overcome common pitfalls that new programs often face. Finally, participation in ASTHO's peer-to-peer fellowship has provided an invaluable networking structure for information sharing and future collaboration.

III. Pilot Project

Background

In West Virginia, 12% of the state's population, or approximately 217,436 residents, obtain their drinking water from private drinking water systems including private water wells and springs. This number is increasing as private water sources continue to be developed throughout the state. Private water wells are typically used by residents living in rural areas outside the infrastructure of a public drinking water distribution system. While the Environmental Protection Agency (EPA) regulates public drinking water systems, it does not regulate private water wells. Many states, including West Virginia, do not require sampling of private water wells after installation and homeowners are responsible for maintaining the safety of their water. This is concerning because a study by the U.S. Geological Survey (USGS) showed that more than 20% of private water wells nationwide contain at least one contaminant at levels of potential health concern¹. Unfortunately, private water wells are often only sampled when required as part of a real estate transaction. While the WVBPH encourages private well owners to regularly test and review their drinking water quality, testing is voluntary and minimal information on well water quality exists. Therefore, private well owners may be consuming water that does not meet safe drinking water standards. WVBPH's OEHS is concerned about the lack of awareness among private well owners about the condition of their drinking water and best practices for monitoring and protecting their drinking water source from contamination. Relatively little is known about the

locations of drinking water sources, the populations served by these sources, and potential contaminants that might be present. This lack of this information makes evaluating and mitigating the types and magnitude of existing and future health risks associated with private water supplies a challenge.

In an effort to begin to characterize the nature and extent of contamination in private water wells in West Virginia, OEHS participated in a three-month study with CDC's National Center for Environmental Health's Health Studies Branch in 2010. The goal of this study was to determine the levels of 20 contaminants currently monitored in public drinking water systems and frequently detected in private water wells including metals, bacteria and naturally occurring compounds. Of the 147 water samples collected, 36.1% had at least one or more primary contaminant exceeding the maximum contaminant limit (MCL) recommended by the EPA. Primary contaminants included arsenic, fluoride, lead, *E. Coli*/coliform bacteria, aluminum, iron, manganese, and radon-222. Radon concentrations were consistently above the recommended level in the majority (75.3%) of samples and *E. coli* or coliform bacteria was found in over one-third (34.9%) of samples. The results of this study demonstrated that a large percentage of private water wells tested in West Virginia contain concerning levels of contaminants. This study underscored the need for additional studies and data sources across West Virginia to assess private well water quality.

Specific Aims

Specific aims of the pilot project include geo-mapping counties in West Virginia with private water well sampling results using Esri's ArcGIS. Sampling results will be geo-mapped by zip code and census tract levels to represent private well water contaminant levels in the 10 represented counties and to determine if areas exist where people are at a greater risk. Additionally, maps will be analyzed and utilized to design risk communication materials targeted to affected areas to reduce or prevent exposure to contaminants. Communication materials will include information on contaminants, when to test a private well, how to interpret test results, and appropriate interventions to treat contaminated wells. The goal of developing communication materials is to provide an easy to use source of information for private water well owners that will be available on West Virginia's EPHT portal when it is developed.

Outcomes and Future Activities

The activities related to this pilot project are ongoing and plans are in place to complete all proposed activities. While the pilot project is not complete, OEHS gained crucial knowledge regarding private water well geo-mapping. Securing ArcGIS training opportunities has been problematic and identifying easier mapping solutions in the interim under consideration. Because West Virginia's current private water well data is limited, Maine's EPHT Program suggested identifying additional sources of data such as state lab sampling data. While this data represents a convenience sample, it will help populate maps to identify potential areas of concern for private well water contamination. OEHS has reached out to partners at the West Virginia Office of Laboratory Services to initiate the process of procuring data. OEHS has also contacted the Department of Environmental Protection in order to identify additional sources of private well water data. In addition, West Virginia is participating in CDC's Private Well Initiative to further characterize the nature and extent of contamination in private water wells in West Virginia by conducting sampling and analysis of an additional 96 wells across the state. Future plans include adding these data to the current database to create more accurate and comprehensive risk maps.

IV. Conclusions

Private water well data, along with other EPHT data such as lead poisoning, birth defects and public water systems, have never been geo-mapped for West Virginia. The long term goal of this EPHT pilot project is the development of crucial skills in geo-mapping that can be used to create risk maps of additional important environmental data in West Virginia, including radon and lead poisoning. These risk maps can be linked with health effect data to further explore relationships between exposure and disease.

The Office of Environmental Health Services recently submitted an application for funding in response to the Centers for Disease Control and Prevention's "Enhancing Innovation and Capabilities of the Environmental Public Health Tracking Network Funding Opportunity Announcement" (CDC-RFA-EH17-1702). OEHS's application received a priority score and the objective review determined that our program possesses the necessary tools and expertise to

successfully support the functions of a fully-funded EPHT program based on our track record of accomplishments and proposed activities. However, our program did not rank high enough to be funded at this time. While disappointing, West Virginia will continue to develop its EPHT Program with the long-term goal of becoming a funded partner in CDC's National Network and developing a sustainable full-scale EPHT program. The information gained during this fellowship was vital to enhancing OEHS's capacity to successfully conduct environmental public health tracking in West Virginia.