# Report

## Data Partnerships to Improve Health Project – Phase 2 Report

**Intended Audience**

The purpose of this report is to provide a more detailed look at the uses of data in Electronic Health Records (EHRs) for environmental health surveillance. This subject may be of interest to healthcare providers, IT professionals working in healthcare or public health settings, and environmental public health professionals. A summary of pilot studies and use cases related to EHR use in environmental health surveillance is included. This report represents a summary of the second phase of a multi-phase ASTHO project that will continue to get more detailed as it progresses. Links to sources are found at the end of the document if more information is sought on the topics covered.

**Introduction**

ASTHO supports national efforts focused on EHRs and health information exchanges (HIEs), and has launched Data Partnerships to Improve Health in recognition of the value of engaging national partners and state health agencies in meaningful use and standard reporting of environmental health data. This report is intended to summarize Phase 2 of the Data Partnerships to Improve Health project within ASTHO's Environmental Health Program. The aim of this project is "to enhance state capacity to access high quality and relevant environmental data and further environmental health involvement in meaningful use (MU) and other national initiatives which impact the integration, implementation and capacity around environmental health data exchange effort."[1] It addresses electronic health data, health data systems, and surveillance systems as they relate to environmental health.

**Background**

The Data Partnerships to Improve Health project is directed by ASTHO and funded by the Centers for Disease Control and Prevention (CDC). ASTHO has coordinated a team of professionals with representation from states, non-governmental associations and academia to work on this project. The team is often referred to as the "Collaborative" or the "Collaborative Team." The project consists of four phases. Phase 1, completed in June of 2015, examined potential uses for information in EHRs in environmental health surveillance. A primer entitled, "Electronic Health Records: A Source for Environmental Public Health Surveillance," was produced as a result of Phase 1. The conclusion of the Year 1 Primer was that EHRs contain a lot of data and information that could be readily used in environmental public health surveillance. In order to put this data and information to work requires a continuing collaborative effort among many disciplines, including medical providers, public health professionals and IT.[2]

Phase 2 of the Data Partnerships to Improve Health project, which began in August 2015, was intended to develop Environmental Health Common Data Elements, provide a summary of some use case pilot studies that have been conducted, and identify and define a pilot study or use case scenario where information from EHRs could be used in environmental health surveillance. During the course of Phase 2, the Collaborative Team reviewed several pilot studies and use case scenarios where data from EHRs was used by public health entities. Those projects are summarized in this report. It will require continued collaboration between healthcare providers, IT professionals (including EHR vendors), and environmental health professionals to identify opportunities and make better use of EHRs as data sources.


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Phase 3 will conduct a pilot use case that will involve pulling relevant data from an EHR and using it in environmental public health surveillance. Phase 4 will include additional projects that demonstrate putting EHR data to use for environmental health surveillance. Please note that Phase 4 depends on the availability of funding.

**From Data to Action - Putting Data to Use**

Environmental health surveillance programs rely on three methods to acquire data: 1) reportable condition regulations requiring certain health conditions be reported to a state agency; 2) traditional active and passive data collection via medical case records (for example, as used in most state cancer registries); and 3) active, targeted biomonitoring programs. The Collaborative feels that the ability to access data and information contained in EHRs has the potential to revolutionize health surveillance programs, making data available in a more complete, timely, and accurate manner. It was concluded that these advances will enable environmental health as well as medical clinicians to better identify environmental risks and prevent or reduce exposure far more quickly than has been possible in the past.

Data related to disease, as well as context (i.e., when, where, and under what conditions), are necessary for the development of targeted, timely interventions. The main challenge identified by our Collaborative facing projects like this one is motivating clinicians to include more environmental health data in EHRs, as well as access to that data so that it can be used for disease prevention.

**The Tracking Program: A Platform for Disseminating National Environmental Health Data**

The Collaborative Team discussed the fact that data stewardship is often fragmented, with one state agency having part of the environmental health puzzle and another agency having other pieces. CDC's Environmental Public Health Tracking Program (Tracking) provides an important national platform for both environmental and health data. The Tracking Program brings together data from the monitoring and surveillance of environmental hazards, human exposures, and population health. End users range from citizen groups to politicians. The data can be used to inform decision-makers addressing environmental risks.

It is a tremendous benefit to this project that a platform from which environmental health data retrieved from EHRs already exists. The following are examples of Tracking data in action.

*Wisconsin*

In Wisconsin, the Tracking program bridges the lead data gap by using the tracking surveillance reporting platform and tracking program staff to respond to requests from the public for lead data in a quick and comprehensive fashion. For example, Tracking data were used by the Menomonee Valley Benchmarking Initiative "to help track how well the community was doing in the areas of environmental preservation, community well-being, and economic development." Lead poisoning data from the tracking program informed this initiative. The data were ultimately used by the City of Milwaukee, neighborhood advocates and property developers to determine where to distribute resources for lessening the effects of exposure to lead.[3]

*New Mexico*
In New Mexico, the Tracking program helped protect residents from wildfire smoke. New Mexico Tracking developed educational materials for the public about the health hazards of smoke exposure, as well as a method for citizens to protect themselves. Called the 5-3-1 Visibility Method, it teaches people what they should do if they see smoke five miles away, three miles away, or one mile away.[4]

**Summary of Tracking EHR Initiatives**
Following a recent round of pilot studies, researchers concluded that "EHRs have the potential to enhance public health surveillance by providing more comprehensive and timely data at finer geographic levels." Tracking provides a foundation and platform for EHR data to be used. Tracking has funded several EHR-related pilot projects demonstrating the ability to calculate population-level estimates of specific outcomes using EHRs and electronic lab data for public health surveillance.

**Tools and Challenges Related to EHRs as a Source of Environmental Health Data**
EHRs are another source of data that have the potential to enable environmental health professionals to look for important relationships between environmental health hazards and disease outcomes. IT professionals play an increasingly important role in environmental public health surveillance. Sophisticated tools, such as geographic information systems software, are available to display data in more visual ways than in the past. Potential future uses of these tools include:

- Blood lead data overlaid spatially with lead drinking water action level exceedances under the EPA's Lead and Copper Rule; and
- The ability to generate a map showing cancer incidence, known groundwater contamination and environmental clean-up sites.

Certain healthcare providers are incentivized under meaningful use to use EHRs. This has greatly increased the demand for IT professionals who are familiar with the workflows of various types of healthcare facilities, from hospitals to private practices to free clinics. At the same time, demand for IT support in environmental public health has increased. Environmental health professionals engage in IT-heavy activities such as electronically transferring reportable conditions data as well as using map layers or spatial datasets to assess the relationship between various health and environmental conditions. The challenge now is to look for opportunities for clinical records to communicate with public health records. "Because of the automation of clinical data—inpatient and increasingly outpatient—via EHRs, public health programs stand at the threshold of changing the way they can gather programmatic data," writes environmental health specialist A.O. Orlova. "The EHR is a pivotal instrument in integrating clinical and public health data systems—EHR-Public Health (EHR-PH), so public health authorities will have reliable, real-time data to support health policy decisions for better and safer care."[5]

**Challenges Associated with Use of EHR Data**
Identifying what EHR data can be used to reduce the risk of diseases or illnesses associated with environmental exposure is a challenge for environmental health professionals and healthcare practitioners. The question evaluated in Phase 2 of the Data Partnerships project was how can environmental health tap into the data-rich EHRs in order to better respond to environmental public health-associated diseases and illnesses?

The Phase 1 Primer looked at some of the technical and legal challenges associated with the use of EHR data in environmental health surveillance. From a legal perspective, there are privacy concerns that must always be kept in mind and addressed, especially when clinical data is shared with public health professionals. According to Eric Roberts, an expert on public health surveillance: "De-identified case-based EHR data will be the gold standard for diagnosing community health, crafting targeted interventions and evaluating the impact of public health program."[6]

From a technical perspective, there is the challenge associated with the fact that there is no nationally standardized format in which EHR data are collected and stored. Another challenge not specifically included in the Phase 1 Primer is that in order for environmental health professionals to make full use of EHR data, there needs to be an incentive on the front end for practitioners to include questions related to patients' environment. "Physicians have a central role in the use of the EHRs, as they are who provide much of the information that the systems handle in their automated processes,"[7] says Bagheri-Tadi , who conducted a systematic review into the adoption of EHRs in 2013. Meaningful se gives medical practices an incentive to adopt some form of EHRs, even penalizing them if they don't do so.[8] According to Bagheri-Tadi, "The adoption and meaningful use of electronic health records is a major U.S. national policy priority for improving the quality and efficiency of the healthcare system."[9]

In addition to the legal and technical challenges associated with using EHR data, there is the challenge of incentivizing it. The benefits of using EHR data are for the most part well understood by public health practitioners; however, the challenge is to develop a business case for the inclusion of environmental health data in EHRs, or the use of existing EHR data in environmental health surveillance. The challenge may be best framed as: what incentive do healthcare providers, EHR vendors, and patients have to include environmental health data and information in EHRs or to share data from EHRs with environmental health professionals? While legal and technical challenges such as these have been successfully addressed in small-scale pilot studies, larger scale efforts will face additional challenges. However, as Eric Roberts, with California's Environmental Health Tracking points out, "[t]he greatest barriers to utilizing EHR data continue to be administrative and political, not technical."[10]

**Lessons Learned from Pilot Projects/Use Cases**

While there are relatively few published projects involving the use of EHRs in environmental health surveillance, Appendix 1 contains a list of studies that have been located as of the date of this publication. The lessons learned from projects using EHR data demonstrate the importance of collaborative partnerships to their success. Study results represent encouraging uses of EHR data in improving the accuracy and timeliness of chronic disease surveillance, as well as in syndromic surveillance. In one project, opportunities have been identified to use data contained within EHRs to evaluate and improve disease reporting requirements. Lastly, there is also the opportunity for environmental health to provide information to healthcare providers when there is a cluster of symptoms that points to a common environmental source warranting specific medical tests (e.g. Legionnaires' disease, which is often not differentiated from other types of pneumonia, allowing the source of the bacteria to continue to expose others).

More accurate and timely data lead to the potential for identifying associations between the environment and diseases more quickly, and therefore to the potential for targeted health interventions.

*Lesson Learned: The Importance of Partnerships*

Each use case of EHR data involves partnerships. The utility of such partnerships is demonstrated by the EHR-related activity occurring at the National Institute for Occupational Safety and Health (NIOSH). In a webinar to the Data Partnership Collaborative entitled, "NIOSH Efforts to Improve Worker Health through the Use of EHRs,"[11] Genevieve Luensman, Ph.D., stressed the importance of forming partnerships. The initial step of the NIOSH effort was garnering support for working on an EHR and occupational health project. Letters of support were provided by the American College of Occupational and Environmental Medicine, the Council of State and Territorial Epidemiologists (CSTE), APHA, the National Center for Vital and Health Statistics, and HHS's Environmental Justice Strategy.

Using EHRs to capture occupational information can be useful to both environmental health and clinicians. As NIOSH states on their website: "Information on a patient's occupation and the industry in which a person works can be used by healthcare providers to protect a patient's health."[12] That same data, de-identified, can be used in public health surveillance to identify trends within occupation or geography.

EHRs can also be used to generate lists of patients who have certain health conditions and need additional care, as well as to identify patients who work in a particular industry (e.g. construction or house painting). This list can then be used to determine patients who might benefit from a blood lead test.[13]

In the planning phase of looking at the potential for EHR use in occupational surveillance, NIOSH first considered which partner may want to use the data, how they would use the data, what data were desired, when the data would be used, and where the end user would be accessing the data.[14] The logistics of who enters data, what data will be collected, when the data will be collected, where the data will be collected, and how the data will be collected and managed came after the initial set of questions were asked. A use case project using EHRs and Clinical Decision Support to enhance worker health was completed with the goal of demonstrating the feasibility, value and use of occupational data for health purposes.

Collecting an occupational history can prove informative to healthcare providers. The data can be provided directly by patients or through interviews and subsequent documentation by healthcare providers. When possible, it is important to utilize existing data classification systems. There are, for example, over 31,000 occupation titles in the U.S. Census occupational classification. Simplifying the categories on the front end strengthens the ability to generate accurate reports on the back end.[15]

*Lesson Learned: The Advantage of Active Surveillance for Chronic Diseases*

The California Environmental Health Tracking Program conducted a pilot use case scenario using glycohemoglobin (A1c) testing and diabetes surveillance.[6] The study was conducted in two California counties using test results from Kaiser Permanente Northern California (KPNC) EHR data with the intent of exploring "the quality and usability of laboratory glycohemoglobin reports" and examining "the

potential utility of this data for the more timely surveillance of diabetes that could inform community-level prevention efforts, as well as the evaluation of these interventions."[16] This project demonstrates the advantage of using EHR data for chronic disease surveillance. The methodology used may be as informative as the results.

Proactively mining EHR data has many advantages compared to customary surveillance done using reportable conditions. "Current data used for chronic disease surveillance often lack clinical metrics and diagnoses, are released several years after data collection, and may survey only a small portion of the population of interest. By contrast, the use of EHR may offer state and local agencies timely, broad-based, accurate, and actionable information on the health of their communities."[17] The use of EHR data to evaluate the effectiveness of reportable conditions is later demonstrated in the Maine carbon monoxide surveillance work.

In this report, the California Tracking Program lists the instances in which EHRs have been used for public health surveillance of non-reportable conditions in the United States. They found that state and local governments have used meaningful use incentives to encourage healthcare providers to report aggregated or individual patient data on: outbreaks of herpes zoster/shingles, body mass index (BMI) and its relationship to the built environment, and that of childhood obesity to dental disease.[18] These efforts, which took place between 2008 and 2012, found that data collected from EHRs could be used to craft community-tailored interventions, as well as to evaluate the effectiveness of interventions over time. Some additional limitations were also seen in these efforts, including limitations on using insurance data as source data where there are differences in insurance status and coverage.[19]

Insurance companies have a vested interest in identifying and evaluating potential interventions for diabetes, both because of its prevalence (21 million Americans or 6.6% of the U.S. population) and the huge costs ($245 billion in 2012) associated with managing it. While it is generally understood that consumption of too many calories combined with too little exercise are risk factors, environmental risk factors for contracting diabetes have yet to be identified. The use of EHR data in public health surveillance may lead to a better understanding of environmental risk factors of diabetes and other related health issues, such as high blood pressure and high cholesterol levels.

Repeated testing of patient A1c (glycohemoglobin) is used to monitor the status and control of diabetes. A1c values in hemoglobin are found in patient EHRs and can be used to evaluate changes in diabetes control and management over time. "These data can be used by researchers and local health agencies to understand population health for those diagnosed with diabetes, track changes in disease control over time and monitor the ongoing incidence of new diagnoses."[20] De-identified, these data can be used to identify high-risk populations, develop community-level interventions, and evaluate the effectiveness of interventions.

Lab test results are generally easier to obtain from EHRs than are diagnoses, but the California study promotes the use of diagnoses to validate lab result data. California Tracking considered this pilot study to be "a first step in this validation process (in terms of understanding what data variables may be needed to conduct such a validation)."[21] A decision was made by the Tracking staff to receive the data quarterly, as it was noted by potential users of the data that collecting too much data could reduce its utility.[22]

The study concluded that A1c test results "were a practical and valid candidate for ongoing public health surveillance efforts of diabetes and diabetes control."[23] The KPNC data source included both lab results and clinical diagnoses, which may not be the case in a larger study using different sources of data and information. "EHR data may present opportunities for public health surveillance to improve the timeliness of data reporting, the geographic specificity of data, as well as the ability to assess the data by various socioeconomic measures."[24] Identifying the costs associated with acute and chronic diseases, along with the benefits of active surveillance using data contained in EHRs, will be valuable in incentivizing other use cases for this data.

*Lesson Learned: Syndromic Surveillance*

Following two chemical spills in Atlantic City high schools, New Jersey added a chemical exposure field to Epi-Center, their syndromic surveillance program.[25] As reported in January at the 2016 Summit on Environmental Hazards and Health Effects, 90 percent of state Emergency Department facilities use Epi-Center to collect real-time key words in chief complaint field found on the program's forms. The health department receives automated alert e-mails from Epi-Center when patterns of key words are detected, allowing them to immediately investigate the source of chemical exposure, especially when multiple patients present to the Emergency Department. This system successfully picked up the following chemical exposures, leading to interventions:

- Two children sickened by acute chlorine exposure in an apartment complex pool;
- Occupational exposure to toluene at a nail polish manufacturing plant;
- Six cases of pesticide exposure at a produce repackaging facility;
- Carbon monoxide poisoning of two police officers in their patrol car.

*Lesson Learned: Potential Use in Evaluating Reportable Condition Programs*

EHR data can be used to evaluate the effectiveness of surveillance for reportable conditions. For instance, Maine has a carbon monoxide (CO) poisoning surveillance system. It is a case-based system that retrieves data from vital statistics, healthcare facilities, providers, labs, and poison centers. Cases of CO poisoning must be reported if there are clinical signs or symptoms, or if carboxy-hemoglobin values reach a greater than five percent threshold. In a recent evaluation, administrative billing data was matched against reported cases. Medical records were required missing cases. The Maine Health Department (confirm) found that 70 percent of inpatient and outpatient cases had not been reported. Of that 70 percent, 47.4 percent were deemed to have been reportable under the state's reporting regulation. This is an example of a situation that could have been resolved had EHR data been available as a data source. Using EHR data, from diagnosis or lab test result fields, would allow CO poisoning data to be actively retrieved.[26]

All of these projects provide valuable information to Data Partnerships effort. The addition of pilot- or use-case efforts involving EHR data being put to work in environmental health surveillance is beneficial. The hope is that the successes and incentives identified in small-scale projects will pave the way for larger-scale use of data in informative and meaningful ways.

**Proposed Use Case for Phase 3**

The primary objective of Phase 2 was to identify a use case or pilot project that uses EHR data for environmental health surveillance. The best way to accomplish this objective is to identify a pilot study or use case. The proposed pilot use case for Phase 3 involves Legionnaires' disease.

*Background: Legionnaire's Disease*

Legionnaires' disease is a type of pneumonia caused by the *Legionella pneumophila* bacterium. It was first identified during the 1976 American Legion Annual Convention in Philadelphia, when a bacterium in the reservoirs of heated water in the hotel's air conditioning system was distributed and led to the sudden deaths of several participants. (Lasky, 1995) It is commonly found in fresh water and grows best in warm water like that found in hot tubs, cooling towers, hot water tanks, larger plumbing systems, and decorative fountains. *Legionella* bacterium are not spread from person to person. Exposure occurs when people breathe in a mist or water vapor that contains the bacteria.[27]

Strong links have been established between confirmed cases and environmental exposures. Therefore, when an outbreak is reported, it is relatively common to identify environmental causes. In a hospital environment, sources might include "cooling towers, whirlpools, and building water systems, where warm water (25-40 degrees Celsius) and biofilms support growth and survival."[28] Symptoms of the disease include coughing, shortness of breath, high fever, muscle aches, and headaches. The fact that the symptoms are similar to other types of lung infections make diagnosis difficult. "Two highly specific tests, urinary antigen detection and sputum culture, are available for diagnosis during illness."[29] Accurate diagnoses are imperative to the identification of the cause and targeted intervention.

Legionella bacteria are not completely eliminated from drinking water by standard water treatment practices. A significant source of exposure is aspiration of contaminated water via heating, ventilation, and air-conditioning units or large hot water systems. There are unique opportunities for exposure in hospital settings. A 2015 review by a multidisciplinary panel of experts sponsored by the Water Research Foundation concluded that "Aspiration of contaminated water or oropharyngeal secretions appears to be the major mode of transmission in the hospital setting."[30] In addition, the frequent use of tap water by healthcare personnel to rinse apparatus used to treat respiratory conditions (including ventilator tubing) could transmit *L.pneumophila* directly into a patient's lung if the tap water contains the bacterium.

There are significant incentives for hospitals to prevent infection caused by Legionella. In 2012, direct costs of Legionnaires' disease were $38,363 per case. Annually, there were more than 2,700 cases.[31] The cost per case has no doubt increased since 2012. The CDC reports that the number of cases has continued to increase over the last decade.[32]

*Specific Proposal for Phase 3*

The proposed activity for Phase 3 is a pilot project that demonstrates the value of integrating environmental health data as it relates to Legionnaires' disease into hospital EHRs for environmental health surveillance. The incorporation of environmental health information into EHRs would likely require the addition of only one or two fields, significantly less than diseases such as asthma, which can be traced to multiple causes such as indoor or outdoor air quality, physical activity, and smoking. CDC estimates that between 8,000 and 18,000 hospitalizations for Legionnaire's disease occur each year in the United States—which means hospitals are not overburdened by the number of cases, making Legionnaire's disease suitable for a pilot investigation. As referenced above, there is also a financial incentive for hospitals to catch early potential sources of Legionella to prevent hospital-acquired infections from occurring.

For this project, an optimal system would be capable of integrating resources and facilitating free data exchange with public health practitioners and the medical provider or insurer on a common platform. The pilot project seeks to use the Public Health Community Platform (PHCP), in which providers would not be required to send medical data directly to the system, but instead match and direct PHCP-provided resources when symptoms are identified in a patient. The resources might include public health relevant sources that are available to a particular community and data analysis tools to conduct an investigation. ASTHO, in partnership with state and community partners, would redirect resources to where they are most effective—i.e., where they have the greatest health impact and healthcare cost savings. "Providers and hospitals traditionally report diseases manually to public health agencies. The PHCP would enable providers and hospitals to automatically report diseases from the EHR to public health agencies. Public health agencies then also notify CDC of cases of certain conditions to contribute to a national picture of disease incidence." In the event of an outbreak, the PHCP could notify medical providers via the Health Alert Network if a patient reports symptoms. If the PHCP is still in development when the pilot project is launched, ASTHO will explore collaborations with an IT provider to identify and develop a similar system that can be used on a project scale.

Discussions have begun with ASTHO's Informatics Directors Peer Network (IDPN), as well as the Integration Forum, to identify informatics directors, medical directors, and EHR vendors who can guide and inform the pilot project. The IDPN consists of statewide public health informatics leads and functions as a venue for collaboration around informatics-related issues. Similarly, the Integration Forum consists of statewide partners from over 60 organizations focused on exploring partnerships between primary care and public health. Both groups will provide valuable expertise, and each have invited the partnership to present at their monthly calls. It is anticipated that piloting the project with Legionnaire's disease will provide a strong case to EHR vendors to support the inclusion of environmental health data for larger issues like asthma and lead poisoning.

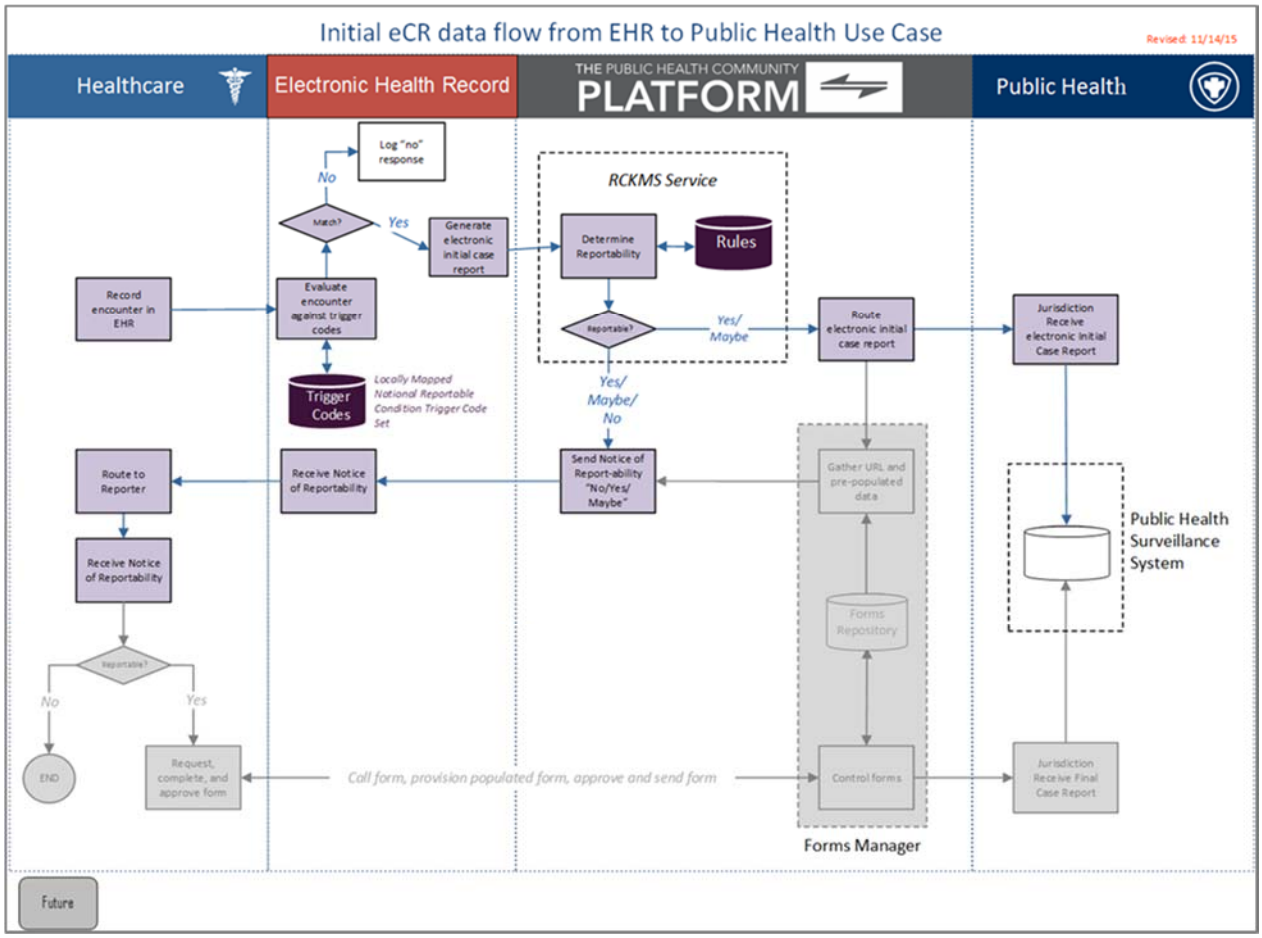
*Description of the Technical Aspects of Pilot/Use Case Project*

For this project an optimal system would be capable of integrating resources and facilitating data exchange with the medical provider or insurer on a common platform. The pilot project seeks to use PHCP's existing electronic case reporting (eCR) framework. The current initial implementations of eCR involve matching a patient encounter to a set of trigger codes in the EHR, sending a standardized electronic initial case report (eICR) to a public health decision support engine, and routing the evaluated eICR to the correct public health agency. An example of this decision support engine is CSTE's Reportable Conditions Knowledge Management System (RCKMS). Trigger codes are designed to represent lab orders, lab results, and diagnosis relevant to all nationally notifiable diseases; RCKMS provides jurisdiction-specific reporting rules. The trigger codes could be expanded to include Legionella-related codes in coordination with CSTE and CDC.

Providers would not send medical data to the PHCP, but instead use their own data systems to match and direct resources to those with the greatest need, dealing with Legionnaires' or other health conditions. Data could be sent to or retrieved by public health agencies, who would then begin examining the potential causes of the disease. This could result in individual referrals or targeted community interventions, in which environmental justice communities would be identified using valid health data. ASTHO, in partnership with state and community partners, would then redirect resources to

where they will be most effective—i.e., where they have the greatest health impact and healthcare cost savings. Public health agencies could then notify CDC of certain diseases or conditions, thus allowing CDC to have a better understanding of the national picture related to disease prevalence.

PHCP is working with CDC to evaluate the possibility of expanding to an additional phase of development. This secondary phase would allow for additional jurisdiction and disease-specific information to be collected. This is proposed in order to utilize Structured Data Capture, whereby a form is delivered directly to the report's workflow queue. Additional information could include data relevant to condition-specific exposures. Data received by public health entities would ultimately be more timely, complete, and reliant on an automated process to trigger the sending of a potential public health case. This work requires close coordination with the CSTE RCKMS team to provide subject matter expert input into rule classification and trigger codes. If the PHCP is still in development at the time of the pilot project launch, ASTHO will explore collaborations with an IT provider to identify and develop a similar system that can be used on a project scale.




(Marcus Rennick, 2015)

**Figure 1: Initial eCR Data Flow from EHR to Public Health Use Case**

*Communication from EH to Clinicians*

Historically, Health Alert Network reports have been triggered by a diagnosis of Legionnaires' disease. In New York, for instance, "[t]he alert was triggered by chief complaints of cough OR chest pain OR fever OR chest congestion OR cold symptoms and included orders for sputum culture, Legionella urine antigen, chest x-ray and complete blood count, as well as outpatient antibiotic prescriptions appropriate for community acquired pneumonia."[33] These alerts are important because the symptoms of Legionnaires' disease are similar to other pneumonias and an accurate diagnosis requires specific medical tests that may not otherwise be run.

**Conclusion**

EHR data provides environmental health professionals with an opportunity to:

- Identify disease patterns and associate them with environmental hazard;
- Develop community-based, targeted interventions;
- Inform and educate healthcare providers;
- Inform and educate the general public;
- Evaluate the effectiveness of reportable condition processes;
- Improve the accuracy and timeliness of health surveillance activities; and
- Allow for data-driven decisions to be made in a timely manner.

EHR surveillance also benefits healthcare providers and patients by identifying patterns of health conditions so that information sharing and interventions can occur. There are real financial benefits to early identification of disease outbreaks by active surveillance systems that use data from EHRs. Savings result from earlier recognition of disease patterns and interventions, as well as from identifying trends (such as A1c levels) and targeting health education to at risk populations.[34]

Important lessons have been learned in the pilot use cases that have been conducted to date. Collaborative partnerships between environmental public health agencies, healthcare providers, IT vendors, and other entities are imperative to successfully mining data-rich EHRs. Data needs must be anticipated prior to the determination of how the data will be collected, stored, and retrieved.
The proposed pilot study/use case will demonstrate the usefulness of:

- Putting EHR data to use when identifying trends in a disease such as Legionnaire's disease;
- Communicating with and informing healthcare providers of the need to conduct specific diagnostic tests to accurately diagnose;
- Identifying and eliminating the source of exposure causing the disease; and
- Presenting a business case to healthcare providers that demonstrates the benefits of including environmental health as a partner in EHRs.

Important work has been done that will inform this project as well as others, moving beyond the theoretical and conceptual to applying EHRs as sources for environmental health surveillance. A key to this project's success moving forward is presenting a detailed business case for healthcare providers and payees that outlines the benefits of using public health data from EHRs, clearly demonstrating that it is cost reductive on their end and a rich data source for public health.

There remain challenges to large-scale use, but with each successful application a step is taken towards revolutionizing environmental public health surveillance.

**Data Partnerships: Moving Forward**

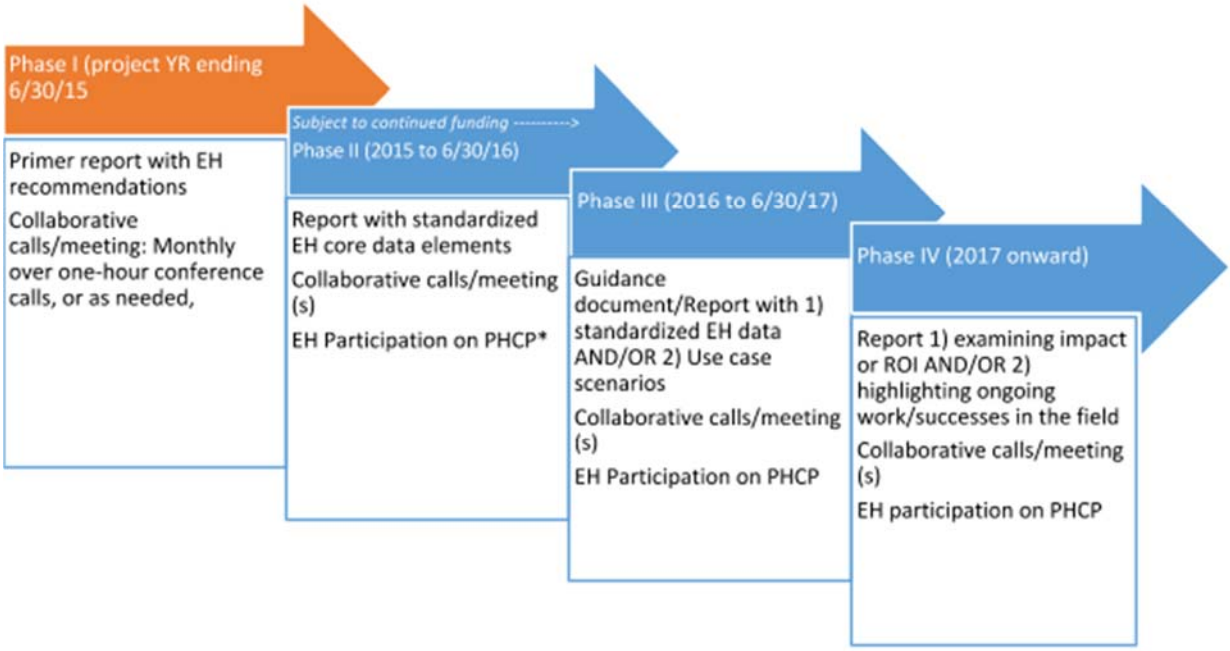
*Future Steps*

The Environmental Health Data Partnerships Collaborative, formed by ASTHO as part of Data Partnerships to Improve Health, aims to guide and advise ASTHO in building state and territorial health agency capacity to address public health informatics and data systems issues, as well as explore opportunities for the integration of environmental health information with EHRs. The Collaborative is multidisciplinary in membership and function and comprised of professionals from a range of specialties dedicated to improving public health, healthcare delivery, and related health informatics and data system needs at the state and territorial level.

*Work Products:*

Data Partnerships to Improve Health aims to demonstrate the benefits of including environmental health information in EHRs; to include tracking data in national health information systems, and enhancing data partnerships and communication between health agencies and their respective data stewards.

This is envisioned as a multi-year, collaborative project spanning many cycles and building on product deliverables at each phase to achieve the long-term goals pictured below.




*Timeline: Phases and Outputs*

Phase I

Phase I (project year ending 06/30/2015) - Primer Report that makes the case for inclusion of environmental and occupational health data in EHRs, with environmental health recommendations; collaborative calls and meetings; enhanced online data stewards package.

Phase II (2015 to 06/30/2016) – Report environmental core data elements in standardized format, if available; collaborative calls and meetings; environmental health participation on the Public Health Community Platform (PHCP)*; CDC-funded, ASTHO-led initiative to develop a cloud for common information exchange, as well as the development of innovative and interoperable systems for the public health community.

*Future Project Cycles (subject to continued funding)*
Phase III (2016 to 06/30/2017) – Report and guidance document with standardized environmental health data for EHRs or use case scenarios; collaborative meetings; environmental participation in PHCP.

Phase IV (2017 onward) – Report examining the impact or Return on Investment (ROI) for incorporating environmental health information into EHRs; collection of ongoing work and success stories in the field; collaborative calls and meetings; environmental health participation on PHCP.

*Please Note: As tasks become more defined, outputs may be developed in an earlier phase or spill over into the next.*

[1] ASTHO. (2015). Electronic Heatlh Records: A Source for Environmental Public Health Suveillance. Washington D.C.

[2] ASTHO. (2015, February). Tracking Environmental Health Hazards - Data Partnerships to Improve Health. Retrieved from http://www.astho.org/Environmental-Health/Tracking-Environmental-Health-Hazards/Data-Partnerships-to-Improve-Health/?terms=ehr Accessed April 12, 2017.

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**Appendix 1: A list of the EHR Use Case Studies as of the Date of this Publication.**


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