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DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH SERVICES

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September 10, 2019

Honorable Jeffrey Salloway, Acting Chair
Commission to Study Environmentally-triggered Chronic Illness
Legislative Office Building/Room 205
Concord, NH 03301

Re: *Report on Data Sharing between the New Hampshire Departments of Health and Human Services (DHHS) and Environmental Services (DES)* (RSA 126-A:76, III) Chapter 229:5, Laws of 2019

Dear Representative Salloway:

As required by SB 85 (2019), an act reestablishing the commission to study Environmentally-triggered chronic illness, please find attached a report (that represents the joint work of DHHS and DES) on data sharing practices and the results of a 2-way pilot project between the departments on arsenic in drinking water which provides environmental data and examines health impacts as required under paragraph I.

The following documents are enclosed:

- SB 85 DHHS/DES progress report (data sharing and arsenic pilot project)
- Memorandum of Agreement (DHHS/DES)
- HB 1356 (2018) – preliminary report

Department staff will be presenting the report to the Commission to Study Environmentally-triggered Chronic Illness during its initial meeting scheduled for September 17, 2019. Please let us know if you have any questions.

Respectfully Submitted,

Lisa Morris, Director
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Division of Public Health Services

Mike Wimsatt, Director
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**Progress Report for SB85
Building on Preliminary HB 1356 Legislative Report**

Submitted by:

New Hampshire Department of Health and Human Services
Division of Public Health Services
&
New Hampshire Department of Environmental Services

September 2019

Table of Contents

Introduction03
Background	03
Memorandum of Agreement04
Data Sharing Practices	04
Pilot Project: Arsenic and Bladder Cancer	06
Current Collaborations15
Recommendations.17
Appendices17

Introduction

This is the initial report related to Senate Bill (SB) 85 (2019), which directs the New Hampshire (NH) Department of Environmental Services (DES) and the Department of Health and Human Services (DHHS) to improve coordination and collaboration as it relates to environmental health, with a specific focus on data sharing.

This Report includes a summary of background information, the existing Memorandum of Agreement between DES and DHHS, current data sharing practices between the two agencies, the Pilot Project on arsenic and bladder cancer, current collaborations, and recommendations for future work.

Background

Senate Bill (SB) 85 (2019), re-established a legislative commission to study environmentally-triggered chronic illness. This builds on previous work related to House Bill (HB) 511 (2017) and HB 1356 (2018). This work is focused on conducting environmental health surveillance and improving coordination and collaboration between DES and DHHS in order to allocate resources efficiently to reduce exposure to environmental contaminants and prevent disease.

The SB 85 Statement of Intent reads as follows: “The general court recognizes that nearly half of adults in the United States have at least one chronic health condition and chronic diseases are responsible for increased health care costs. Seventy percent of health care costs in the United States are for chronic diseases. Some chronic diseases are known or thought to be associated with environmental causes. According to the Centers for Disease Control, the state of New Hampshire has the highest rates of people with bladder, breast, esophageal, and pediatric cancer in the country. In addition, a double pediatric cancer cluster was identified in the seacoast of New Hampshire in 2014. Therefore, the general court hereby establishes the commission to study environmentally-triggered chronic illness.”

HB 511 (2017) established a legislative commission to study environmentally-triggered chronic illness.

HB 1356 (2018), charged DES and DHHS to develop and implement a method by which the departments share certain health outcome and environmental data. The HB 1356 Preliminary Report submitted in August 2018 includes more information on the status of the activities listed below and is attached in the Appendix.

Specifically, the departments were tasked to:

- Update a memorandum of agreement related to data sharing;
- Sign a joint standard operating procedure on how data layers can be shared between the two departments to identify linkages between environmental contaminants and health outcomes;
- Hold a presentation on the departments' ongoing, joint efforts under the Centers for Disease Control and Prevention environmental public health tracking cooperative agreement; and

- Compile a report describing and estimating the cost to perform a 2-way pilot project between the departments on arsenic in drinking water, where both health effects and environmental data exist.

Memorandum of Agreement

The Memorandum of Agreement (MOA) directly aligns with the primary goals of DES and DHHS to protect, maintain, and improve the health of all New Hampshire citizens. Moreover, it supports data sharing and collaboration between the two agencies.

The MOA (signed in August 2018) focuses on environmental health data sharing activities agreed to by DES and DHHS and describes responsibilities of both agencies. Both agencies will review this MOA on an annual basis to ensure that it reflects current Department initiatives focused on data and information. The MOA is attached in the Appendix.

Data Sharing Practices

Accessing Public Health Data

State and federal regulations (e.g., HIPAA Privacy Rule) require appropriate safeguards to protect the privacy of personal health information (PHI), and sets limits and conditions on how such data are used and disclosed. Sharing health-related data must follow specific protocols such as data sharing agreements or information exchange agreements.

In order to access public health data administered by the Bureau of Public Health Statistics and Informatics (BPHSI) within DPHS DHHS, such as NH Cancer Registry Data or Vital Records Data, a formal Data Request must be submitted to the Health Statistics and Data Management (HSDM) Section (<https://www.dhhs.nh.gov/dphs/hsdm/requests.htm>).

The Data Request Process is overseen by the HSDM Section within BPHSI DPHS DHHS. The request process may include a Data Request Application, a Data Sharing Agreement, an Information Exchange Agreement, or official Institutional Review Board (IRB) Approval depending on who is requesting the data, what data format is being requested, and the purpose of the request. When summary or aggregate data are needed, such as Cancer Rates by County, the data request process is less complex. In fact, summary data is publicly available on the NH Health WISDOM Data Portal (<https://wisdom.dhhs.nh.gov/wisdom/>).

Accessing Environmental Data

Accessing data collected or administered by DES, such as air quality and hazardous waste site data, do not follow the same data request protocols because such data do not qualify as personal health information. Most DES data are publicly available on the DES OneStop Data Portal (<https://www.des.nh.gov/onestop/index.htm>). As DHHS and DES continue to work on Data and Information as a priority topic, the Data Sharing process will continue to evolve.

Separate from activities driven by SB 85 (2019), DHHS established a Business Intelligence and Analytics program. This program is part of a Department-wide initiative to increase transparency, consistency, and awareness of DHHS services for NH citizens, governing bodies, and funding sources as well as to provide an information rich environment that will guide strategic decisions to improve quality and performance. DHHS is currently organizing to implement a Department-wide Data Governance and Management Strategy to provide guidance on data access, security, maintenance, and dissemination. In addition, the Division of Public Health Services (DPHS) within DHHS is undergoing Operational Strategic Planning and identified Data and Information as a priority topic area. This work will inform future data sharing, data governance, and data stewardship policies and practices.

Summary of Datasets, Databases, and Data Systems

Many datasets, databases, and data systems exist within DES and DHHS that are relevant to environmental health.

Example datasets from DPHS include those from the: Behavioral Risk Factor Surveillance System Survey, Hospital Discharge Data, Cancer Registry, Vital Records (Births and Deaths), Childhood Lead Poisoning, and Youth Risk Behavior Surveillance System. The NH Health WISDOM Data Portal is a Business Intelligence data visualization application that integrates data from multiple sources. The NH Health WISDOM Data Portal is a public web-based clearinghouse of public health data and information touching on core topic areas and presenting over 100 data metrics. Data are available for several topic areas including, but not limited to: Asthma, Biomonitoring, Cancer, Childhood Lead Poisoning, Diabetes, Heart Disease, Oral Health, Injury, and Maternal and Child Health. The Laboratory Information Management System (LIMS) is another example of a data system, however, it is for internal data management and analysis. It allows for electronic laboratory reporting (ELR) for medical providers and also allows for submission of laboratory test results from the Public Health Laboratories (PHL). It includes data related to clinical and environmental laboratory testing done within the PHL (e.g., biomonitoring, radiation health data, well water quality).

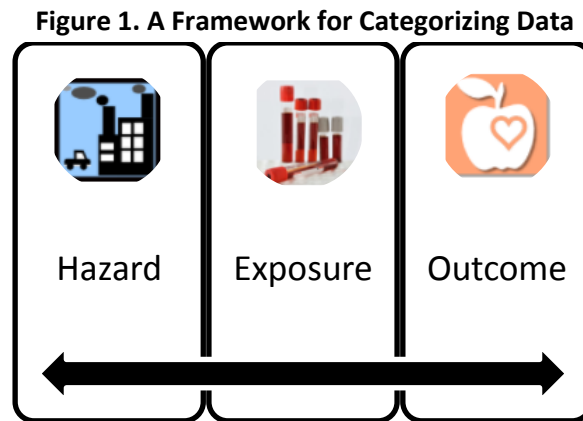
Examples from DES include the Environmental Monitoring Database (EMD), which is a database that contains data from observations and laboratory samples for various programs within the Department. The EMD includes two types of data: manually collected samples and automated samples, the difference is that manually collected samples are typically single samples collected in the field (e.g., beach water quality data), whereas an automated sample might be collected on a continuous basis from a data logger (e.g., air quality monitor data). Data are available for several topic areas including, but not limited to: beach water quality, outdoor air quality, public water quality, well water quality, and soil and groundwater quality at hazardous waste sites.

It is important to note that residential private well water quality data resides in both DHHS and DES. Data obtained from the analysis of private well water samples submitted to the Public Health Laboratories (PHL) within DPHS DHHS and paid for by the homeowner are considered confidential unless otherwise specified by signing a waiver, which allows for the summary and release of that information.

Pilot Project: Arsenic and Bladder Cancer

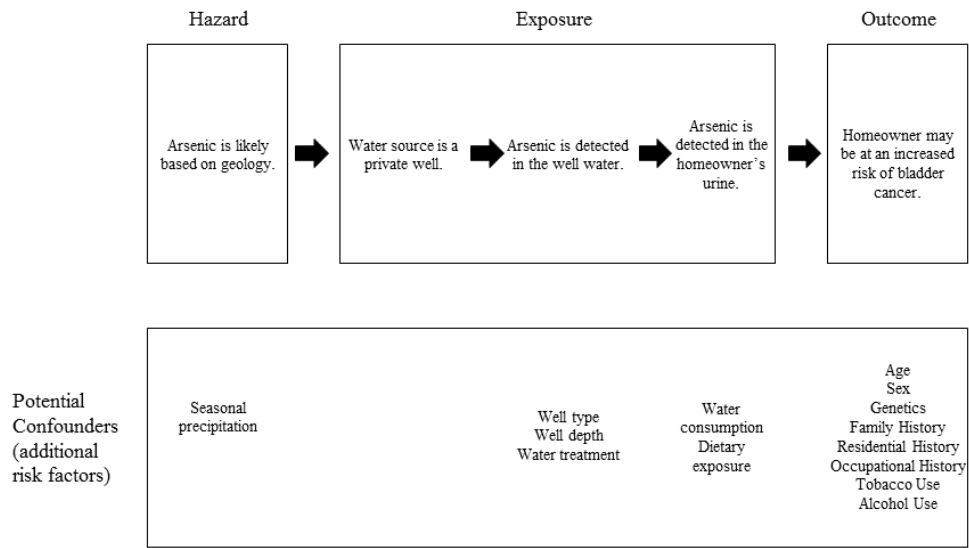
There is a growing interest in using geospatial and epidemiological methods to link environmental exposures and health outcomes. A pilot project on Arsenic and Bladder Cancer was proposed as an opportunity to showcase current data sharing practices between DES and DHHS and highlight current capacity to conduct small area analysis. In reviewing results from this pilot, it is important to consider the limitations of each dataset as well as the limitations of the methods used to link environmental exposure and health outcome data.

When evaluating potential environmental risks, it is helpful to classify data into three categories (Figure 1). The first is hazard data; this data represents the likelihood or probability that there is a contaminant in the environment. The second is exposure data; this data is a measure of the contaminant in the environment or human body such as the amount of arsenic in well water or the amount of arsenic in human urine. The third is outcome data; this data is related to measurable health outcomes, such as diagnosis of a specific disease.



It is also helpful to consider the exposure pathways that connect environmental hazards, exposures, and health outcomes (Figure 2). The primary routes of exposure for arsenic are via ingestion and inhalation. This pilot project focuses on exposure via ingestion of contaminated drinking water, however, individual level exposure was not assessed.

Figure 2. Exposure Pathway: Connecting Arsenic in Private Well Water to Human Health



In some cases, such as with arsenic and bladder cancer, there is an established association supported by scientific evidence. In other cases, the scientific evidence may be lacking so the link is less clear, or may not exist. In addition, correlation does not equal causation. This type of study where exposure data is not available at the individual level only allows for general associations to be made. Specific study designs, such as a Cohort Study or Case-Control Study, which were not utilized in this pilot, must be used to evaluate the specific relationship between Hazards, Exposures, and Outcomes. While linking data or overlaying data is useful to explore patterns and to generate questions, more sophisticated methods must be used to draw specific conclusions about cause and effect. The Centers for Disease Control and Prevention (CDC) define 10 Essential Public Health Services that outline core functions of the public health system. Several are relevant to this type of work including: monitoring health status to identify and solve community health problems, diagnosing and investigating health problems and health hazards in the community, and conducting research to gather new insights and develop innovative solutions to health problems. However, it is important to note that DES and DHHS rely on partners such as those from academia and the federal government to conduct more complex environmental epidemiological analysis.

Arsenic exists naturally in certain granitic and metamorphic bedrock formations in NH. Nearly 50% of NH residents rely on private wells as a drinking water source. Many of these wells are drilled deep into bedrock to access groundwater. Since arsenic exists in the bedrock in many places, it can be present in the groundwater, often at unsafe levels. The maximum contaminant level (MCL) set by the Environmental Protection Agency (EPA) for arsenic in drinking water is 10 ug/L (or 10 ppb). In 2019, the New Hampshire Legislature enacted HB 261, which directs NH DES to adopt an MCL no greater than 5 ug/L (or 5ppb). Groundwater may also contain arsenic from human activities, including but not limited to agricultural runoff, contamination from wood preservatives containing arsenic, improperly disposed arsenic containing materials, or mining.

Data Sources

Arsenic Probability (United States Geological Survey, 2012)

These data come from the United State Geological Survey (USGS). The USGS Report, *Estimated Probability of Arsenic in Groundwater from Bedrock Aquifers in New Hampshire, 2011* summarizes the probability of arsenic occurrence in groundwater at concentrations equal to or exceeding 10, 5, and 1 micrograms per liter (Ayotte et al. 2012).

This probability estimate can be used as a predictive tool to help identify potential areas at risk, however, it does not definitively identify areas of exposure. It does not mean that if you are in a high-risk area that you *will* have arsenic in your well water, nor does it mean definitively that if you are in a low-risk area that you *will not* have arsenic in your well water. However, the USGS data does indicate as the shading changes from white, to pink, to red, that the probability (or likelihood) of having arsenic in your groundwater at a concentration of 10, 5, or 1 ug/L goes up. If you live in one of these areas and have a private well, you may be at an increased risk of having arsenic present in your well water. Wells must be tested to determine Arsenic level. However, if you live in one of these areas and are on a Public Water Supply, then you are at a reduced risk because Public Water Systems monitored by DES must adhere to State and Federal drinking water standards.

Private Well Water Quality Data

(NH Public Health Laboratory and NH Department of Environmental Services, 2014-2018)

These data come from the Water Analysis Lab within the Public Health Laboratory at DPHS DHHS as well as data shared with the MtBE Remediation Bureau within NH DES by homeowners electing to pay for additional analyses while having their wells sampled for MtBE. These data represent all samples collected from 2014 to 2018.

Not all private well water samples in the state are analyzed at the Public Health Lab. There are several private labs that conduct water testing within the State and in neighboring States. Results from these private labs are not publicly accessible nor reported to PHL and therefore are not included in this analysis. Many factors can influence whether or not well water is contaminated with arsenic. Some important factors to consider include: well design and well depth. It is also important to keep in mind that the water quality test may be done on raw water collected before treatment or finished water collected after treatment, and it is important to know the difference since people should only be drinking water post-treatment. Since many factors can influence well water quality, the public health message is to test private wells for arsenic every 1-3 years. Furthermore, it is not safe to assume that well water quality in one location will be the same as nearby locations.

Bladder Cancer Data (NH Cancer Registry, 2006-2015)

Cancer data are collected by the NH State Cancer Registry (NHSCR). The Cancer Registry is operated through a contract with Dartmouth College, with oversight from DPHS DHHS. The NHSCR is a population-based cancer surveillance program that collects incidence data on all cancers diagnosed or treated in the State of New Hampshire. In addition, the NHSCR collects incidence data for NH residents who are treated in certain out-of-state facilities. For every diagnosed case of cancer, the registry collects

detailed information about the diagnosed case, including the date of diagnosis, type of cancer, stage at diagnosis, and patient demographic information including residence at the time of diagnosis, age, race, and gender.

While there is great utility in registry data, it has certain limitations. There is often the desire to use registry data to signal or identify potential cancer-related exposures in a geographic area. Lack of information on residential history in the registry presents a challenge in assessing exposure in a specific region. The registry captures only the residence at the time of diagnosis. Because populations are mobile, this means that a case attributed to a specific geography based on the residence at time of diagnosis does not necessarily indicate lifetime or even recent exposure in the same area.

Data Analysis and Summary of Results

Part I – Hazard Data – Arsenic Probability

This section presents data on arsenic probability, the likelihood that the arsenic concentration in groundwater is greater than or equal to 10 ug/L based on the USGS Probability Map (Figure 3). The map shows data as a continuous layer across the entire state. Probability of arsenic increases as the color changes from white to pink to red. This map indicates that the probability of arsenic in groundwater (≥ 10 ug/L) is highest in the south and southeast regions of the State, however, there are pockets of high risk scattered across the State.

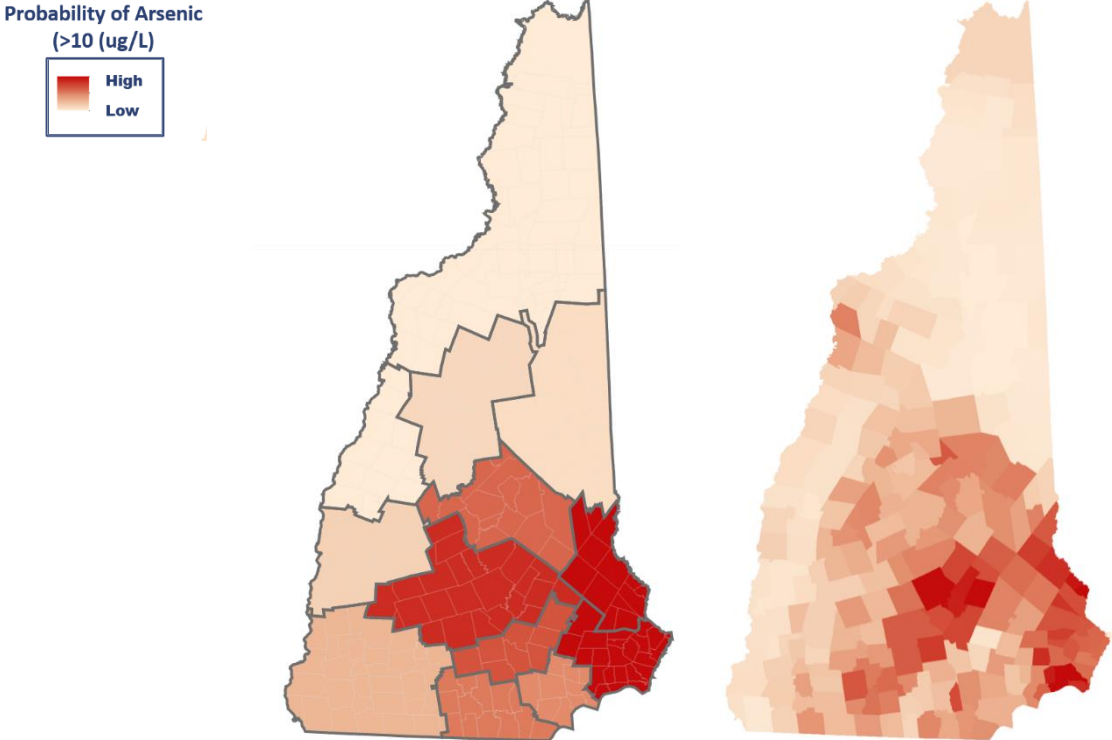
Since the goal of this pilot is to link hazard data to exposure or outcome data, it can be helpful to summarize the raster (or gridded) data by a certain geography. Arsenic probability data are summarized by Public Health Region and by town (Figure 4).

The borders in this case follow Public Health Regions and towns, however, the borders are arbitrary when dealing with an environmental contaminant. Averaging over an area like this can sometimes be misleading as it can “wash out” or “mask” extreme high or low values. Specifically, for individuals living on a border the average value might be misleading. In comparing the region map to the town map it is clear that results will vary based on the geographic boundary of interest, and this can have serious implications for the conclusions. For example, in the Northwest corner of Grafton County, near Haverhill and Bath, the increased probability shown on the original map gets “washed out” when the data are summarized by Region, but is maintained when the data are summarized by Town. One possible solution is to move away from summarizing data over specific geographic areas, and instead analyze data over a continuous gridded surface using other spatial analysis methods such as cluster analysis or heat map analysis. There are always tradeoffs. In some cases, this type of gridded data may be more difficult for local decision makers to interpret since it may cross municipal boundaries. Though more scientifically accurate, these methods may make the results less locally relevant. Future work will need to evaluate different methods to address various community concerns. It is important to note that any method used will need to uphold data suppression and data release guidance to protect privacy.

Figure 3. Estimated Probability of Arsenic in Groundwater (≥ 10 ug/L) (USGS, 2012)



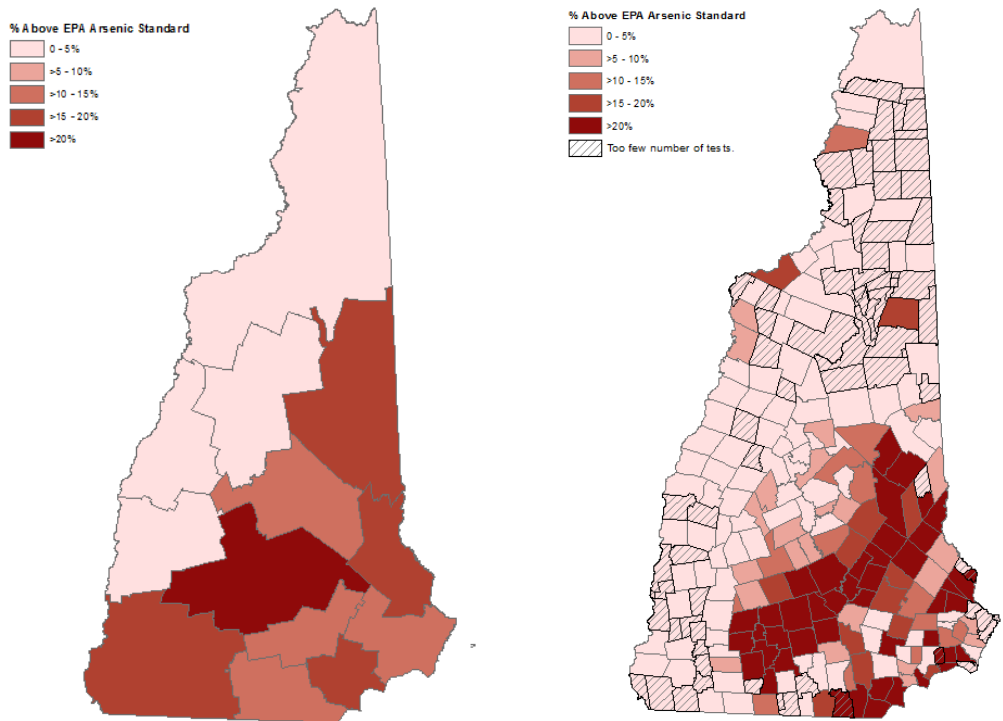
Figure 4. Estimated Probability of Arsenic in Groundwater (≥ 10 ug/L) by Public Health Region Compared to by Town (USGS, 2012)



Part II – Exposure Data – Private Well Water Quality

This section presents data on well water quality by Public Health Region and by Town. Recall that the EPA Arsenic Standard is 10 ug/L (or 10 ppb). The maps show the percent of well water tests that are above (exceed) the EPA Standard (Figure 5). These maps do not convey the proportion of residents served by private or public drinking water systems, nor does the data reflect whether a treatment system is installed in the home or whether the sample was collected pre- or post-treatment. Comparing the Region map to the Town map, it is clear that some high and low values are “washed out” or “masked” when rolled up to the region. It is extremely important to choose geographic boundaries carefully when doing this type of analysis, as it can influence the results and conclusions.

**Figure 5. Well Water Quality Data by Public Health Region Compared to by Town
(NH Public Health Laboratory, 2014-2018)**



Part III – Health Outcome Data –Bladder Cancer

This section presents three maps of age-adjusted bladder cancer rates per 10,000 people. According to the National Cancer Institute, an estimated 40% of people across the US will develop cancer during their lifetime. Recognizing that age is a major risk factor for cancer, rates are age-adjusted to allow for comparison of rates across geographic regions since the age distribution of the population may vary. The first map depicts data for 2015 (a 1-year period) by Public Health Region (Figure 6). The second map depicts data for 2006-2015 (a 10-year period) comparing Public Health Regions to Sub-County Regions (Figure 7). The Sub-County Regions break the State up into approximately 50 distinct areas.

One takeaway is that these rates are different when comparing 1-year rates to 10-year rates. It is important to note that the confidence intervals (or uncertainty around the estimates) is much greater for the 1-year estimate compared to the 10-year estimate. Another important takeaway is that these rates vary across Public Health Regions in the State. For this reason, it can be valuable to divide the state up into smaller geographic areas. However, when we do this we must also uphold data suppression and data release guidance to protect privacy. One way to accomplish this is to group multiple years of data or combine geographic areas to ensure data reliability and maintain confidentiality. The general rule is that counts, or rates, where there are between 1 and 5 cases must be suppressed for any geography or age/sex sub-category. In this case, based on the number of bladder cancer cases it was necessary to group 10 years of data together in order to present rates at the Sub-County Region scale.

Figure 6. Age-Adjusted Bladder Cancer Rates (per 10,000) by Public Health Region (NH Cancer Registry, 2015)

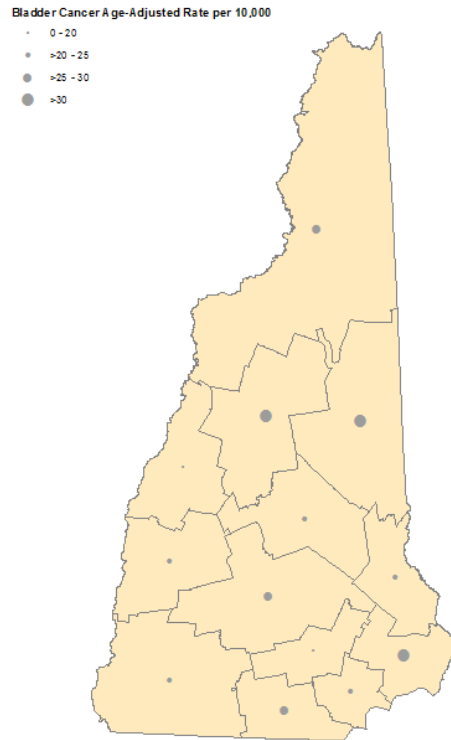
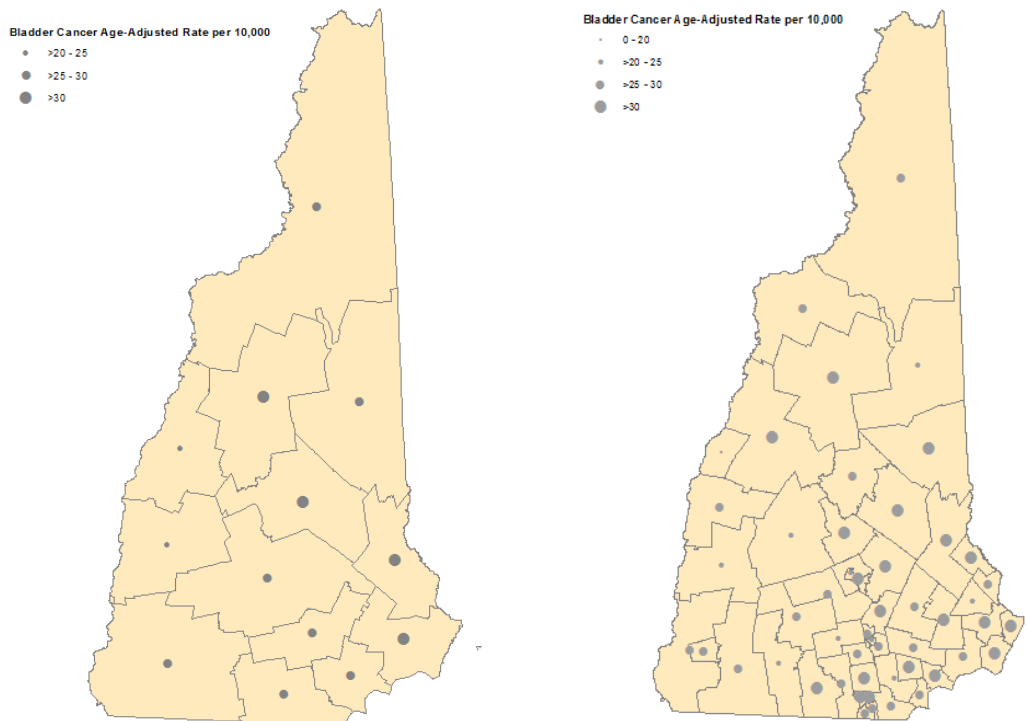


Figure 7. Age-Adjusted Bladder Cancer Rates (per 10,000) by Public Health Region and by Sub-County Region (NH Cancer Registry, 2006-2015)



Summary of Findings

This Arsenic and Bladder Cancer Pilot was a valuable exercise in that it helped DES and DHHS understand current capacity and identify priorities for future work including:

- Identify data sources that are available to support this type of investigation;
- Identify additional data sources that could be incorporated into future analyses if made available in an electronically stored format;
- Identify strategies to improve data sharing across programs and agencies;
- Understand that data from multiple sources can be summarized and compared, but due to limitations of the data and methods, it is challenging to draw definitive conclusions about cause and effect;
- Highlight the tradeoffs of small geographic area analysis, in most cases several years of data will need to be combined in order to maintain reliability and protect confidentiality;
- Refocus efforts on using data to drive action and to prioritize activities in a limited resource environment such as targeted outreach and education in high-risk areas; and
- Develop standard methods for summarizing environmental exposures and relevant health outcomes.

Key Messages to Reduce Exposure from Groundwater Contaminants:

Unhealthy levels of contaminants are common in many private wells in New Hampshire. Most have no taste, smell, or color. It is important to periodically test well water quality to ensure it is safe to drink.

The following key messages are aligned with ongoing initiatives at DES and DHHS:

- **When to Test?**
The recommendation is to conduct the standard and radiological analysis every 3-5 years. Bacteria and nitrate should be tested every year. Certain conditions call for more frequent testing, such as: heavy development associated with hazardous chemicals, recent well construction or repairs, previous elevated tests, noticeable changes in taste, smell or appearance. Future testing recommendations will address volatile organic compounds (VOCs) and per- and polyfluoroalkyl substances (PFAS).
- **How to Test?**
Order a test kit from an accredited laboratory.
- **How to Treat?**
If the lab report indicates there is a contaminant above recommended action levels, steps should be taken to fix it. The NHDES Be Well Informed web tool summarizes possible treatment options for common contaminants. A water treatment professional should be consulted.

Current Collaborations

Cancer is not a single disease, but instead a group of over one hundred diseases, each with different presentations and risk factors. While there are some inherent risk factors that cannot be modified, including age, race, gender, and genetics; modifiable risk factors such as those relating to lifestyle or the environment can be addressed to reduce the burden of disease. According to the CDC, the most important risk factor for bladder cancer is smoking. Within NH DHHS, the New Hampshire Tobacco Prevention and Cessation Program (TPCP) is dedicated to the implementation of a comprehensive program designed to reduce the prevalence of tobacco use in New Hampshire. The TPCP's primary goals are to prevent NH youth from beginning to use tobacco; to eliminate exposure to secondhand smoke; to promote quitting tobacco among users; and to prioritize efforts to reach those most affected by tobacco. Another modifiable risk factor for bladder cancer is exposure to arsenic through drinking water and diet. Several programs across DES and DHHS, in partnership with Dartmouth and other stakeholders, are working to implement strategies to reduce exposure to arsenic among NH residents. The following are examples of collaborative work focused on better understanding and reducing exposure:

NH Arsenic Consortium:

The primary mission of the NH Arsenic Consortium is to help the public, primarily private well users, become aware of (1) the presence and health implications of arsenic in the food and water supply, (2) the importance of testing private wells for arsenic and other common contaminants and (3) how to take the appropriate next steps to reduce their exposure to arsenic from their food and water supply. Composed of academic and agency experts, and representatives from health and environmental agencies, non-profit organizations and local municipalities, the Consortium seeks to provide the latest information to its members and the public, coordinate outreach and other intervention efforts, and prioritize tasks to have the greatest possible impact on reducing exposure to arsenic in food and drinking water and ultimately improving public health.

The [6th NH Arsenic Consortium meeting](#) was held on March 22, 2019 at the headquarters of NH Department of Environmental Services and NH Department of Health and Human Services in Concord. Along with hearing research, outreach, and legislative updates, about 70 stakeholders from the water industry, local, state and federal government, research and education and private well owners collaborated to develop a draft "Road Map to Reduce Arsenic Exposure in NH." Still in development, the Road Map will offer routes for reducing exposure by sector, including routes specific to private well owners, government representatives, health professionals, and environmental professionals.

Distribution of Filter Pitchers to Vulnerable Populations:

DES, in cooperation with DHHS and the state's network of Women, Infant, and Children (WIC) clinics, secured funding from the NH Drinking Water and Groundwater Trust fund to contract for and implement a 5-year project which will provide filter pitchers to an estimated 524 low-income pregnant women using private wells with elevated arsenic, and to provide follow-up support to program participants. The project is designed to (1) establish a sustained practice among those families of using filter pitchers and replacing filter cartridges as needed, (2) generate valuable information regarding the

effectiveness of this approach to reducing exposure to contaminated drinking water and (3) reinforce a public information initiative regarding the use of certain verified filter pitchers as an affordable means of treating drinking water from private wells, particularly for pregnant women. In addition, the project will seek to educate participants about the importance of continued well water testing. A Request for Proposals was released, and applications were received in early September 2019. Project implementation will begin as soon as partners are in place.

Well Testing Community Events:

DES, DHHS, and Dartmouth Toxic Metals Superfund Research Program partner to host community well testing events to provide education about testing and to make it easier for well users to get their water tested. Although outreach to communities is based on probability of elevated arsenic, prevalence of private wells, and socioeconomic factors that may serve as a barrier to testing, participating communities are ultimately self-selected. Twenty-two communities have hosted the workshops since 2016, some more than once.

Targeted Arsenic and Uranium Public Health Study:

The Targeted Arsenic and Uranium study was conducted by BiomonitoringNH to look at how much arsenic and uranium is found in private wells in NH and whether these two chemicals are getting into the body. This is a targeted public health study that was specific to areas of higher exposure to arsenic and uranium. Based on the 2012 USGS Report, NH towns with an increased probability of having arsenic above the Environmental Protection Agency (EPA) maximum contaminant level (MCL) of 10 ug/L (or 10 ppb) in the groundwater were selected to recruit participants. A small comparison population on municipal (or “public”) water from Concord was also involved. Invitation postcards and letters were mailed to several hundred randomly selected households in each town. Enrollment was open to all qualified residents. Qualified people were 5 years or older, lived in a selected town, and used a private well for their home (except for the comparison population). Participants spent about two hours over the course of a couple of days to (1) attend a meeting to answer survey questions and get their collection kit (2) keep a basic food log, and (3) collect a urine sample and two water samples from their home. The survey included questions about their demographics, occupational history, recreational activities, food and beverage consumption, and health. In return, participants received free arsenic and uranium testing of their urine and free water quality testing. All testing was performed by the State of New Hampshire Public Health Laboratories. A summary of results is available on the WISDOM Data Portal (<https://wisdom.dhhs.nh.gov/wisdom/>).

New Hampshire Tracking and Assessment of Chemical Exposures (TrACE) Study:

The 2019 NH Tracking and Assessment of Chemical Exposures (TrACE) Study is a statewide public health surveillance study looking at many different metals, pesticides, per- and polyfluoroalkyl substances (PFAS), and other chemicals such as tobacco smoke in NH residents. These are chemicals that individuals may come into contact with from the environment. The TrACE Study will evaluate whether these chemicals are getting into the human body. BiomonitoringNH will do this by testing blood and urine from 400 NH residents (6 years and older) as well as by testing the water from their homes. BiomonitoringNH is working with the NH Department of Environmental Services (NHDES) and the NH

Environmental Public Health Tracking Program to collect and test household water. This type of statewide surveillance study ensures that comprehensive data are collected for: (1) residential history, (2) exposure history, (3) environmental data, and (4) clinical data that allows for more in-depth analysis of potential associations.

Comprehensive Cancer Control Program (CCCP):

The CCCP is focused on promoting the use of cancer surveillance data to develop and implement the New Hampshire Comprehensive Control Plan through partnerships (<https://www.nhcancerplan.org/index.php/workgroups/93-task-forces/221-goals-objectives-strategies>). The current plan includes objectives around arsenic, tobacco use, bladder cancer, ensuring access to high quality cancer care including clinical trials, and improving the quality of life for cancer survivors. According to the National Cancer Institute, the general 10-year survival rate for people with bladder cancer is 65%. These bladder cancer survivors will need routine medical care dependent on the stage and grade of their cancer and can benefit from their provider developing a survivorship care plan. The CCCP is working in partnership with the Norris Cotton Cancer Center on improving our statewide data on cancer survivor needs, developing better systems of care for those navigating the treatment process, improving the survivorship care planning process, and increasing access to cancer survivor community programs and resources.

Recommendations

We look forward to continuing to engage in this work as we further refine our data sharing practices and find innovative ways to use data in order to drive decision making, while also recognizing the limitations of the data and resources available to support this work. In collaboration with the Commission, we will explore further opportunities to improve data sharing and analysis of environmental exposure and health outcome data.

Appendices

Memorandum of Agreement (specific to data sharing between DES and DHHS)
HB1356 Preliminary Report (August 2018)

References Used in this Report

USGS Report: Estimated Probability of Arsenic in Groundwater from Bedrock Aquifers in New Hampshire, 2011 (https://pubs.usgs.gov/sir/2012/5156/pdf/sir2012-5156_ayotte_508.pdf)
CDC 10 Essential Services of Public Health (<https://www.cdc.gov/publichealthgateway/publichealthservices/essentialhealthservices.html>)
National Cancer Institute: Cancer Stat Facts (<https://seer.cancer.gov/statfacts/html/all.html>)
Center for Disease Control and Prevention: Bladder Cancer (<https://www.cdc.gov/cancer/bladder/index.htm>)

MEMORANDUM OF AGREEMENT
between the
DEPARTMENT OF HEALTH AND HUMAN SERVICES/DIVISION OF PUBLIC HEALTH SERVICES
and the
DEPARTMENT OF ENVIRONMENTAL SERVICES

This Memorandum of Agreement (MOA) describes the environmental health data sharing activities that have been agreed to between the Department of Health and Human Services, Division of Public Health Services (DHHS/DPHS), and the Department of Environmental Services (DES). The goal of the MOA is to build on existing state capacity and expertise in environmental health surveillance to make information-driven decisions to protect public health. Through this MOA, DHHS/DPHS and DES are able to consistently design, implement, and evaluate environmental public health actions which are supported by environmental health data and information which are scientifically valid, useful, and meaningful.

This MOA covers the period July 1, 2018, through June 30, 2022. The MOA contains the option to renew for an undetermined period of time based on agreement of the parties. This MOA replaces any other agreements that have established between DHHS/DPHS and DES for a specific program.

For the purposes of this MOA, DHHS/DPHS and DES agree to cooperate as follows:

I. Department of Health and Human Services/Division of Public Health Services

The Department of Health and Human Services/Division of Public Health Services agrees to:

1. Assist DES with project planning and implementation when appropriate.
2. Assist DES staff with access to aggregated public health data via the NH Health WISDOM Data Portal.
3. Assist DES staff with access to data within the DHHS Enterprise Data Warehouse.
4. Share technical expertise on data interpretation.

II. Department of Environmental Services

The Department of Environmental Services, agrees to:

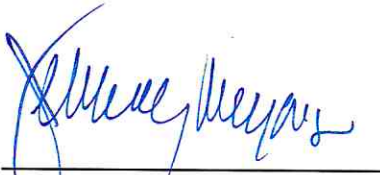
1. Assist DHHS/DPHS with project planning and implementation when appropriate.
2. Assist DHHS/DPHS staff with access to environmental monitoring data via DES OneStop and explore opportunities for direct access to database systems as deemed appropriate by DES staff.
3. Abide by the confidentiality rules defined by DHHS/DPHS to protect the identity of all personal information within health records as outlined in 'Guidelines for Public Release of Public Health Data'.
<http://www.dhhs.nh.gov/dphs/hsdm/documents/publichealthdata.pdf>
4. Share technical expertise on data interpretation.

III. Mutual Agreements of the Parties

It is further understood and agreed between DPHS and DES:

1. The parties will maintain communication via regular meetings between program staff to ensure collaboration on work that is being conducted.
2. The parties agree to facilitate the exchange of information and appropriate data sets to support work in the field of Environmental Health.
3. That this MOA may be modified in writing at any time by mutual consent of both parties.
4. In the event that changes in either State or Federal laws or regulations occur which render the performance of the activities set forth in this MOA illegal, void, impractical or impossible, this MOA shall terminate immediately.
5. The parties will review this MOA at least once each year to determine whether it should be revised, renewed, or terminated.

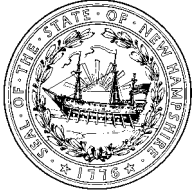
IN WITNESS WHEREOF, the respective parties have hereunto set their hands on the dates indicated.



Jeffrey A. Meyers
Commissioner
Department of Health and Human Services



Robert R. Scott
Commissioner
Department of Environmental Services



STATE OF NEW HAMPSHIRE
DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH SERVICES

Jeffrey A. Meyers
Commissioner

Lisa M. Morris
Director

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August 31, 2018

Honorable Representative Mark Pearson, Chairman
Commission to Study Environmentally-triggered Chronic Illness
Legislative Office Building/Room 205
Concord, NH 03301

Re: HB 1356 (RSA 126-A:76, III, Chapter 296:1, Laws of 2018)
*Report on Data Sharing between the New Hampshire Departments of Health and Human Services
and Environmental Services.*

Dear Chairman Pearson:

As required by HB 1356 (RSA 126-A:76, III, Chapter 296:1, Laws of 2018), please find the attached preliminary report on data sharing practices between the Departments of Health and Human Services and Environmental Services. The following documents are enclosed:

- HB 1356-Final Version
- Preliminary Report
- Appendix C-Inventory Arsenic Data
- Memorandum of Agreement

A presentation of the report to your Commission to Study Environmentally-Triggered Chronic Illness will be held at the next regular meeting scheduled for September 28, 2018. Please let me know if you have any questions by contacting me.

Respectfully submitted,

A handwritten signature in black ink that reads "Lisa Morris".

Lisa Morris
Director

ENCLOSURES

CC: House Speaker Gene Chandler
Senate President Chuck Morse
Honorable Michael York, New Hampshire State Librarian

MEMORANDUM OF AGREEMENT
between the
DEPARTMENT OF HEALTH AND HUMAN SERVICES/DIVISION OF PUBLIC HEALTH SERVICES
and the
DEPARTMENT OF ENVIRONMENTAL SERVICES

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Jeffrey A. Meyers
Commissioner
Department of Health and Human Services

Robert R. Scott
Commissioner
Department of Environmental Services

Preliminary HB 1356 Legislative Report

New Hampshire Department of Health and Human Services/Division of
Public Health Services and New Hampshire Department of
Environmental Services

August 30, 2018

Table of Content

Introduction	3
Background	3
Memorandum of Agreement.....	3
Standard Operating Procedure	4
Pilot Project.....	4
Current Collaborations.....	5
Targeted Arsenic and Uranium Public Health Study.....	5
Arsenic Related Data: Assets and Limitations.....	7
Proposed Pilot.....	8
Appendices.....	8

Introduction

The following is a preliminary report on deliverables related to House Bill (HB)1356, which directs the Department of Environmental Services (DES) and the Department of Health and Human Services (DHHS) to improve the data sharing and usability of health and environmental data.

Data are an important tool that can help build common understanding, allow for more informed decision making, and improve efficiency and effectiveness. This preliminary report includes background information on communication and engagement processes across DES and DHHS, a memorandum of agreement, an update on standard operating protocol, and arsenic-related data assets. The next report will include final standard operating protocols, description of a pilot project, and cost estimates of the pilot.

Background

HB1356 charged the DES and DHHS to establish a data sharing protocol for health and environmental information collected by each agency. Under HB 1356 (attached as Appendix A), DES and DHHS were asked to provide a report on or before September 1, 2018 to the Speaker of the House of Representatives, the Senate President, the State Library, and the commission to study environmentally-triggered chronic illness to include the following items:

- a. An updated memorandum of agreement (MOA) regarding data sharing between the DES and DHHS.
- b. A standard operating procedure on how data can be shared between the two departments to identify linkages between environmental contaminants and health outcomes.
- c. A description and estimate of the cost to perform a two-way pilot project on arsenic in drinking water, a contaminant where both health effects and environmental data exist.

This preliminary report reflects on an approach that is intended to foster the relationship and build the investment necessary to accomplish this task within both agencies and among stakeholders in order to assure that HB1356 and the larger data-sharing vision will be sustainable over time. Multiple interagency meetings have taken place in order to respond to the requests as outlined by the bill. This process ensured that careful consideration was given to the resources across both agencies while also considering the feasibility and public health importance of the environmental issues at hand.

Memorandum of Agreement

The mission of DHHS is to join communities and families in providing opportunities for citizens to achieve health and independence. Promoting and protecting health and preventing disease are key functions of DHHS through the work of the Division of Public Health Services (DPHS).

The mission of DES is to help sustain a high quality of life for all citizens by protecting and restoring the environment and public health in New Hampshire. The preservation and wise management of New

Hampshire's environment are the important goals of the DES.

Environmental health and welfare for all citizens of the state are responsibilities shared by DHHS and DES. These organizations have a long history of working together to address environmental health concerns, and have focused on the accountability of public agencies, quality and efficiency in addressing the needs of citizens, improving health outcomes, and consistency in messaging. In recent years, DES and DHHS officials have faced community concerns over higher-than-expected rates of cancer and chronic diseases and existing and emerging environmental issues. To proactively address these ongoing concerns, DHHS and DES have worked to update the existing MOA to be more inclusive of DES and DHHS programs. This will allow the agencies to collect health data and information that are scientifically valid, useful, and meaningful and, as a result, will improve consistency of design, implementation, and evaluation of environmental public health actions which are supported by environmental data.

The MOA directly aligns with the primary goals of DES and DHHS which are to protect, maintain, and improve the health of all New Hampshire citizens. Moreover, it integrates data and expertise from DES and DHHS into public health practice. The updated MOA is attached under Appendix B.

Standard Operating Procedure

An interagency team of technical staff are working to establish the standard operating procedure (SOP) for data sharing. The workgroup has been making advancements towards identifying and establishing the purpose, key principles, responsibilities, staff leads, and the processes and procedures necessary for data sharing. This process will ensure that careful consideration is given to the existing data sources, legislation, and rules surrounding privacy protections.

The process to finalize the SOP has been delayed due to vacancies/absence of key staff including bureau chiefs for the Bureau of Public Health Protection and Bureau of Public Health Statistics and Informatics. Once finalized, the interagency team will provide regular updates and a final standard operating procedure on data sharing across agencies.

Pilot Project

In recent years, DHHS and DES staff have faced community concerns over higher-than-expected rates of cancer and chronic diseases as well as other emerging and existing environmentally-related concerns. Approximately 450 substances are known or reasonably anticipated to be carcinogenic, but there are substantial practical challenges in attributing individual cancers or chronic diseases to specific chemical exposures. The existing public health data or environmental data sources and conventional statistical approaches can be labor-intensive and may not be sufficient at determining whether an increase in a health outcome (including cancer or chronic disease) are real or due to random variation. These data sets don't provide conclusive answers about causes of disease. Whether an individual develops a disease or condition depends on the type, dose, and timing of the environmental exposure, whether they have also been exposed to other toxic compounds (such as radon or tobacco), and many personal factors such as genetics, nutrition status, and overall health.

The situation in New Hampshire reflects the current state nationally and illustrates a clear need for new methods to assess and investigate cancer and chronic disease links to environmental contaminants including arsenic. To address the common underlying concern that environmental pollutants may be causing cancer or chronic diseases and to fulfill the deliverable under HB1356, DES and DHHS are proposing a pilot project between the departments on arsenic in drinking water.

The interagency team and academic researchers from Dartmouth Toxic Metals Superfund Research Program developed a pilot project between the departments on arsenic in drinking water. The team proposed evaluating current collaborations across the agencies, current data assets, limitations relating to linking health and environmental data, and the scientific feasibility and public health importance of the proposed pilot to assure resources are used wisely. At this point in time, due to absence of key staff, the interagency team could not complete the work on the pilot proposal. A subsequent report is forthcoming that will include details of the pilot.

Current Collaborations

DHHS and DES have had various collaborations over the years around addressing public health concerns. The following highlights two projects in particular. The New Hampshire Public Health Laboratories (PHL), NH Biomonitoring Program (located within DHHS) has received a five year cooperative agreement from the Centers for Disease Control and Prevention to conduct two biomonitoring studies: 1) a targeted study assessing arsenic and uranium exposure from private well water and 2) a statewide surveillance study assessing exposure to a panel of metals (including arsenic and arsenic species), pesticide metabolites, per- and polyfluoroalkyl substances (PFAS), and cotinine (a nicotine metabolite). The Biomonitoring Program is about to enter Year 5, the final year of the agreement. Both projects are leveraging interdepartmental relationships and resources. The following will describe one of these efforts.

Collaboration Example: The Targeted Arsenic and Uranium Public Health Study

The Targeted Study aims to assess the relationship between arsenic and uranium in private well water and body burden by testing both household drinking (well) water and individuals' urine for those metals. The PHL worked with the Environmental Public Health Tracking (EPHT) Program to identify twenty-five (25) towns at increased risk for having arsenic above the Environmental Protection Agency's (EPA's) maximum contaminant level (MCL) in their groundwater. Modeling produced by the US Geological Survey was utilized and each data point (within a town) was given an estimate of arsenic risk. The town estimates were averaged and towns in southern and southeastern NH that had an estimated risk of arsenic above the MCL of $\geq 35\%$ were selected for this study.

NH PHL staff worked with DES to use the OneStop Well Database for well location identification. DES has a memorandum of understanding (MOU) with the NH Department of Revenue Administration for tax parcel data. The MOU allows for sharing of tax data with NH DES which includes owner name, tax number, property information, and address. This is the most accurate way for DES to find ownership of

the well/property from OneStop information. NH DES was able to share de-identified well, line, and public parcel data with the NH Biomonitoring Program to identify well locations within the targeted towns.

The NH Biomonitoring Program worked to overlay the MOSAIC tax data with the GPS coordinates from OneStop. Wells in public water systems were removed from the study, as public water systems must treat their water to meet the EPA MCLs for all contaminants, including arsenic and uranium. Parcels that contained no wells or more than one well were also removed, as well as parcels without complete address information. The remaining addresses were run through the NH Department of Safety's E9-1-1 address locator to verify accuracy and correct any obvious errors. What remained was an inventory of property addresses with a well registered in OneStop.

These addresses were randomized and some households were selected for invitation into the study. The households were mailed recruitment postcards and letters. Those interested contacted the Biomonitoring Program and people who were at least 5 years old were enrolled, and an in-person meeting was scheduled. Informed consent/assent was given at the meeting followed by administration of the exposure survey. This survey collected demographic, occupational, and recreational information as well as a limited health history (self-reported) and food intake assessment. Participants then self-collected urine and water at their homes on a pre-determined date. Water and urine samples were packaged into a cooler, picked up by a contracted courier, and delivered to the NH PHL for testing by the Water Analysis Laboratory and the Biomonitoring Laboratory. As previously mentioned, water was tested for arsenic, uranium, and VOCs. As part of the incentive for participation in this study, water was also tested for cadmium, iron, manganese, copper (stagnant/flushed), lead (stagnant/flushed), hardness, and pH. The Biomonitoring Program also worked with the NH DES Methyl-tertiary-butyl-ether Remediation Bureau to coordinate free volatile organic compound (VOC) testing of private well water for participants who consented to this process. Water reports were mailed to the participants upon testing completion and, urine reports will be mailed at the conclusion of the study (this study is ongoing).

Throughout this process, the NH Biomonitoring Program has consulted with the Biomonitoring Technical Advisory Committee (TAC) for feedback on study design and methods. The TAC consists of members of academia, the DES Drinking Water & Ground Water Bureau, the Dartmouth Toxic Metals Superfund Research Program, the New England Poison Control Center, DHHS epidemiologists/statisticians, local town administration, health departments, and hospitals. Data collected from this study will be shared on EPHT's WISDOM health data portal as well as with members of the NH Arsenic Consortium, of which DES and DHHS work very closely together.

The NH Biomonitoring Program hopes to secure future funding from the CDC to continue this testing, as well as receive State funding to augment the program. Continuation of this program is critical for assuring the public's health in NH. First, the Biomonitoring Program hopes to evaluate how NH

addresses the environmental contaminants that were tested in the current project and to determine whether the programs in place are successful in reducing levels of these chemicals in NH residents. Second, the Biomonitoring Program is working closely with the DES to determine what new contaminants of concern are emerging and then incorporating them into the NH Public Health Laboratories' test panel. The Biomonitoring Program will reapply for federal funding through a competitive process in 2019. This competitive application is strengthened if the applying state has State funding available to enhance or expand the Biomonitoring Program.

The interagency team has presented The Targeted Arsenic and Uranium Public Health Study as one example of collaboration across agencies to collect public health data related to environmental exposures.

Arsenic Related Data: Assets and Limitations

There are numerous data sets which include measures relevant to the topic of arsenic and associated health outcomes. While many of the data sets are owned or stewarded by the DES and DHHS, some data sets belong to other agencies or organizations or are not maintained in one central location (e.g. private well water test results which are housed by DHHS and many private businesses). As organized in Appendix C, the identified arsenic-related data sets can be divided into three categories: health outcome data for conditions associated with arsenic exposure or potential exposure data, and behavioral data such as water testing, treatment, and consumption.

Appendix C provides detail about each of the identified data sets, including relevant data and indicators, the data steward, the available years and geographic granularity, and limitations and, additional notes for context. In addition to the limitations noted for the individual data sets, there are overarching limitations such as the fact that data is presented in different formats with limited or no ability to make linkages or, that the data sets are not centralized. Additionally, the inclusion of protected and identifiable health information within certain data sets restricts the sharing of data at the record level.

While a memorandum of agreement can facilitate collaboration and data sharing, in particular among State agencies, the State is limited in its regulatory authority to compel certain organizations such as private labs to share data. This poses a significant limitation on the ability to receive water test results for environmental contaminants. These limitations in addition to those noted in the table, impact the ability to produce analyses from which meaningful conclusions can be drawn. Nonetheless, improved sharing practices may help us to come closer to being able to quantify and visualize the potential association between certain environmental factors and health outcomes. Further, outlining the data assets and limitations helps us to better understand the gaps and factors that prevent more meaningful analysis. This understanding can guide efforts to improve and expand upon data collection practices and to formalize partnerships and/or develop legislation to maximize data sharing across entities.

Proposed Pilot Arsenic in Drinking Water

As mentioned in a previous section, due to the absence of key staff, this process is delayed. Additional information will be provided at a later date to include updates on next steps, a final proposed pilot project, and cost estimates.

Appendices

Table 1. Inventory of arsenic related data by type

Data Type	Data Set	Relevant Data Included in Set	Steward	Relevant Indicators	Geographic Granularity	Years Available	Limitations and Additional Notes
Health outcome: note that these health outcomes are not linked to arsenic alone, but to a number of contributing factors	NH State Cancer Registry	Cancer incidence	DPHS (HSDM)/Dartmouth	By type/age/year/geography: case counts, incidence rates	Address-aggregated to town	1990-2015	No residential history, no exposure information (behavioral, occupational, etc.), screening data not collected, data less reliable from 1990-1994; data are good from 1995 onward To calculate rates or standardized incidence ratios, population data is needed (Claritas, US Census, etc.); statistics can be calculated based on cancer type, age at diagnosis, year of diagnosis, stage, and geography
	NH Vital Statistics	Cancer related deaths	DPHS (HSDM)	By type/age/year/geography: mortality counts, mortality rates	Address-aggregated to town	1999-2016	Inconsistent coding of cause of death; ICD coding of cause of death began in 1999 2017 data not yet available due to delays in out of state reporting To calculate rates, population data is needed
Exposure/ potential exposure: note that the presence of arsenic in water does not necessarily indicate exposure	NH Public Health Lab Well Water Quality	Well water test results	DPHS (PHL)	Private well water quality- Arsenic level	Address		There is no requirement for private well owners to test their water quality, and only a portion of those who test do so through the PHL; cannot draw conclusions about a geographic area based on results at one address (results can vary even between next door neighbors); the presence of arsenic does not necessarily mean exposure as people may obtain drinking water from another source Approximately 46% of NH residents receive water from private wells
	Private Lab Well Water Quality	Well water test results	Accredited private labs throughout NH and neighboring states	Private well water quality- Arsenic level	Address	NA- historically this data has not been shared/ made available	Same limitations as PHL well water quality results; RDL limit may vary between labs (a “no detect” reading may be based on a different minimum limit, ex. 5ppb vs 0); MCL changed in 2001 from 50 ppb to 10 ppb Private labs are not compelled to share data, DES and DPHS have not been successful in obtaining data from private labs
	DPHS Biomonitoring	Well water test results, exposure data (based on blood and urine)	DPHS (PHL)	Private well water quality- Arsenic level, arsenic exposure	Address- limited to towns targeted by study	2017	For well water quality- same limitations as PHL well water quality results; for exposure, sources other than water are not controlled for Biomonitoring study is targeted to specific towns, data is not representative of the State
	NHDES MtBE Remediation Bureau Results	Well water test results	DES	Private well water quality- Arsenic level	Georeferenced points		Same limitations as PHL and Private Lab well water quality results Program funding covers MtBE VOC related testing, but participants are given the option to pay for additional analysis (approximately 20% opt to have a test that includes arsenic), those who opt-in sign a waiver granting access to results to DES. Results from optional tests are not submitted to the EMD, but the Bureau has used the results that they receive to populate a separate database to track participation and exceedances (not all concentrations). Effective 7/1/2018, all data will be submitted to the EMD, including optional tests.
	DES Public Water System Monitoring Data	Water test results of PWSs - Arsenic	DES	PWS water quality- Arsenic level	PWS (population served), can be associated with approximate PWS service area	1994-Present	Prior to 2011, data was collected via paper- only results that exceeded 50% of the MCL were recorded electronically; MCL changed in 2001 from 50 ppb to 10 ppb; RDL may vary between labs; results are not constant (results are collected quarterly and may vary over time based on natural variation and treatment) PWS definition- a system that serves 25+ people, or 15+ service connections, for 60 or more days/year. Arsenic reporting is required for community PWSs (residential/year round), and non-transient/non-community systems (workplaces, schools, etc.) that serve the same 25+ people for at least 180 days/year. Transient systems (restaurants, motels, etc.) do not monitor for arsenic.
	USGS Arsenic Probability	Arsenic presence in groundwater	USGS	Probability of arsenic in groundwater at >1 ppb, >5 ppb, >10 ppb	Georeferenced points	2011	Data is modeled- it indicates a high probability of the presence of arsenic, based on a limited number of factors (excluding regional groundwater redox information, groundwater pH, well depth, fracture location and depth, and other groundwater chemistry measures) and on a limited number of samples, as such, it cannot be used to determine which individual wells will be at risk; presence of arsenic in groundwater does not necessarily translate to exposure Data most relevant when considering potential exposure among residents with private wells, a high probability of

							arsenic in bedrock where there is a PWS would not likely translate to exposure
	USGS	Arsenic presence in groundwater	USGS	Point in time level of arsenic in specific well locations	Georeferenced points/ well location	2006	Wells are located statewide, samples were drawn in 2006 and analyzed in 2015 (tested and proven to be sound) 3 new wells on the seacoast monitored bi-monthly from 2014-2018 for arsenic (and uranium) to show arsenic trends and seasonal variation
Behavioral Data: water source and consumption, testing, and treatment	NH BRFSS	Behavioral data around testing and consumption	DPHS (HSDM)	Drinking water source, water consumption, well water testing (ever/when), mitigation (avoidance or testing), awareness of health impacts from water contaminants, source of information/guidance about testing and treatment	Record level-aggregated to county (ability to look at Manchester and Nashua exclusive of Hillsborough County) or PHN	2014, 2017	Sample size may be too small to draw conclusions at the county level or to stratify by other factors (such as income, education, etc.), questions have not remained consistent year-to-year 2017 sub-state data will be released in the fall of 2018; 2018 data is in process of being collected, no timeline yet for data release
	NH PRAMS	Behavioral data around testing	DPHS (HSDM & MCH)	Drinking water source, well water testing (in 12 months prior to delivery), health care worker advisement on testing	State	2013-2016	Data limited to women who have recently given birth; no information about results or treatment
	Private Well Owner Survey	Behavioral data around testing, consumption, and treatment	Dartmouth Toxic Metals Superfund Research Program	Well water testing, well water treatment, concern about arsenic, water consumption, demographic data	State/regions within the State	2014	Not a representative random sample, results may not be generalizable7991

Acronym Key:

BRFSS: Behavioral Risk Factor Surveillance System

DES: Department of Environmental Services

DPHS: Department of Health and Human Services, Division of Public Health Services

EMD: Environmental Monitoring Database

HSDM: Bureau of Health Statistics and Data Management

MCL: Maximum Contaminant Level

MtBE: Methyl tert-butyl ether

PHL: Public Health Lab

PHN: Public Health Network

ppb: parts per billion

PRAMS: Pregnancy Risk Assessment Monitoring System

PWS: Public Water System

RDL: Reporting Detection Limit

USGS: United States Geological Survey

voc: volatile organic compound