



Building Synergy between Academic and State Agency Partners to Promote Environmental Health

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Disclosures

I have no conflicts of interest to disclose.



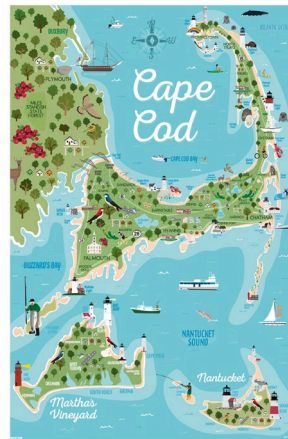
Outline

- Introduction
- Academic and state agency partnerships
- Where do challenges arise?
- What are the opportunities for synergy?
- What do academic-state agency partnerships look like?
- Key Opportunities

A bit about me...



ALLEGHENY
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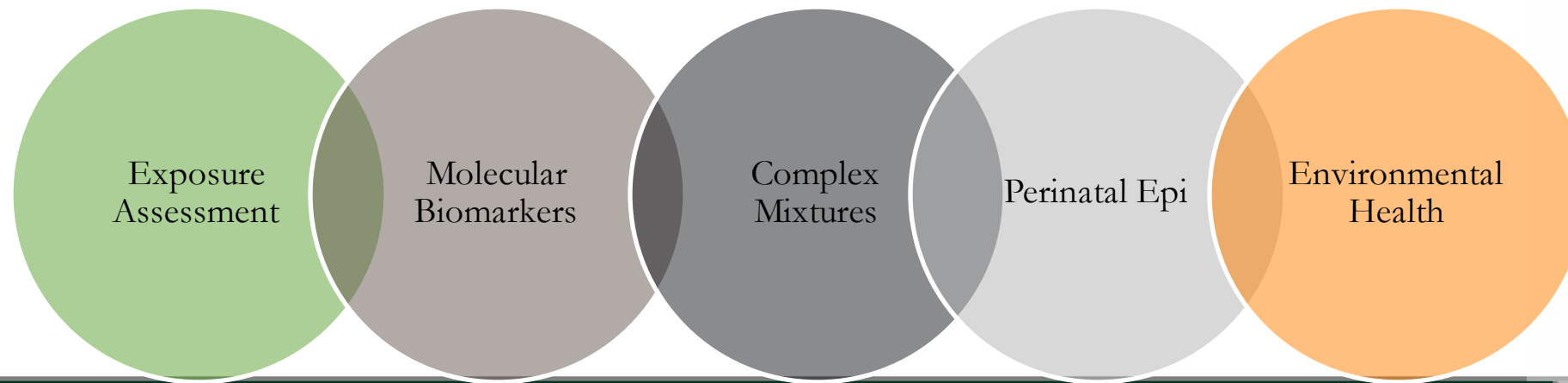
School of
Public Health
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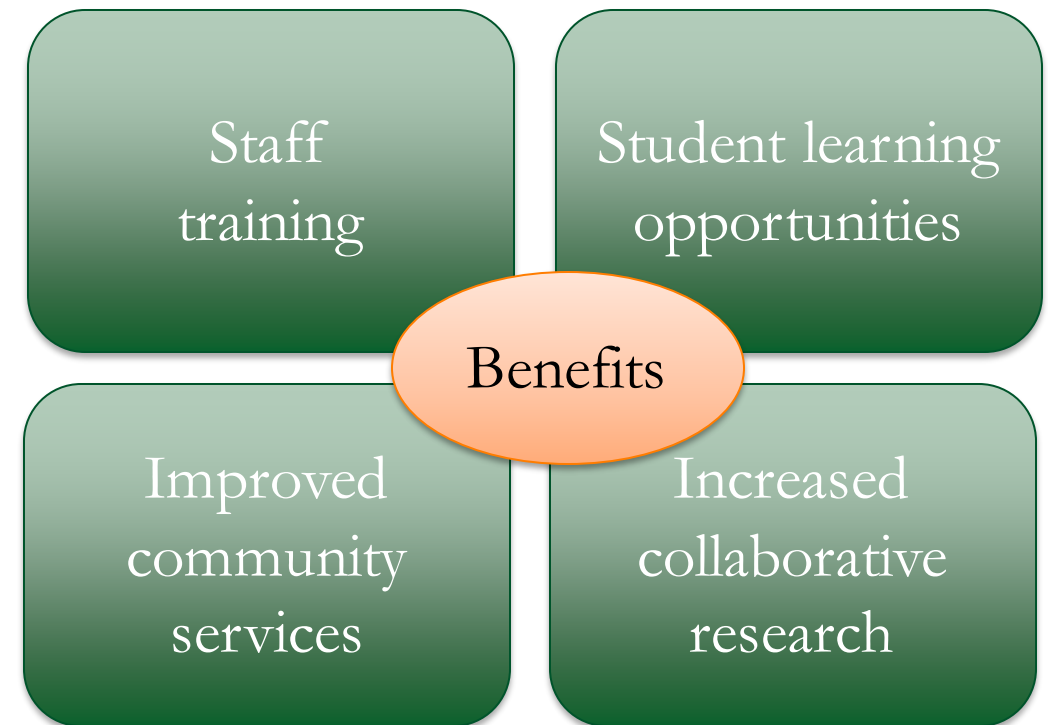
Romano Lab Mission

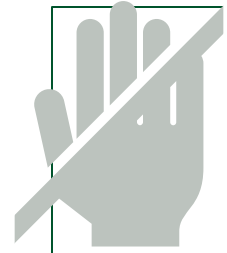
- Understand the patterns, determinants, and health consequences of environmental exposures for pregnant people and children.
- Identify windows of vulnerability to environmental exposures and delineate biological mechanisms related to altered growth and development
- Investigate the short and long term cardiometabolic health effects of environmental exposures during pregnancy/gestation
- Foster an inclusive learning space within our research group



Academic and State Agency Partnerships

- Work together to advance and promote environmental health
- Build on respective strengths in each institution and organization
- Successful partnerships
 - Shared decision making
 - Agreements that clarify expectations
 - Shared contributions (expertise/financial)
 - Collaboration on program evaluation

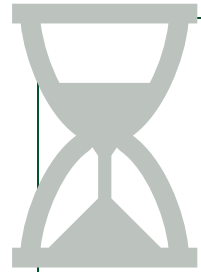




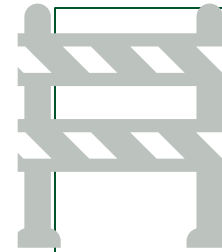
Limitations of epidemiology



Communication / differing expectations



Time and funding required for research



Logistical barriers

Where do challenges arise?



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What is environmental epidemiology?

- Epidemiologists are “disease detectives”
- Environmental epidemiologists apply the principle of environmental health science to understand how risk factors in our environment influence health
- Limitations of epidemiology



Community Partners and Research

- Collaborations among communities, state agencies, and academic partners lead to stronger research
- Community needs and expectations may not always align with funder rules, regulations, and schedules
- Communication among stakeholders is key



Large National Institutes of Health Grants

- The Research Project Grant (R01)
 - Original and historically oldest grant mechanism used by the U.S. National Institutes of Health (NIH)
 - Provide support for health-related research based on the mission of the NIH
 - Typically provide 5-years of funding
- R01 applications
 - Require preliminary data (some other funding mechanisms do not have this requirement)
 - Have a success rate of ~21% at NIH (~13% for first submission and ~33% for resubmission)



NIH R01 Submission Timeline

	Cycle 1	Cycle 2	Cycle 3
Application Due	February 5	June 5	October 5
Scientific Merit Review	June-July	October-November	February-March
<u>Earliest</u> Project Start Date	September or December	April	July

What happens after an application is Funded?

- R01 and equivalent grants typically provide 5 years of funding
- During Year 1
 - NIH and Institutional requirements for the protection of human subjects must be met
 - Piloting/refining study protocols
 - Data collection begins
- Data are frequently collected during the first 3-4 years of a grant
- Efforts to share research findings usually begin in the final two years of an R01

Logistical Barriers



- Consent process for human subjects
- Data management agreements
- How do we even share files?
- Willingness to work through these challenges while respecting institutional policies is key!





What are the opportunities for synergy?



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Overlapping missions



Strengthen the links between public health practice and academia



Bridge the separation between the education of public health professionals and the practice of public health



Partnerships increase capacity for performing core public health functions and meeting community health needs



Pipeline of interns and student researchers



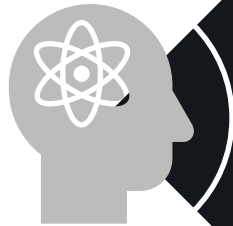
Extension of expertise and reach



Exchange of fresh ideas and perspectives



Broader and more cohesive communication network for disseminating information relevant to public health



Advances in the science of public health and an expansion of the knowledgebase for public health decisions and policies



Training and Funding



Opportunities for students to engage with state agencies early in their careers / motivated workforce to support state programs



Expanded team and enhanced opportunities for grant funding





What do academic-state partnerships look like?

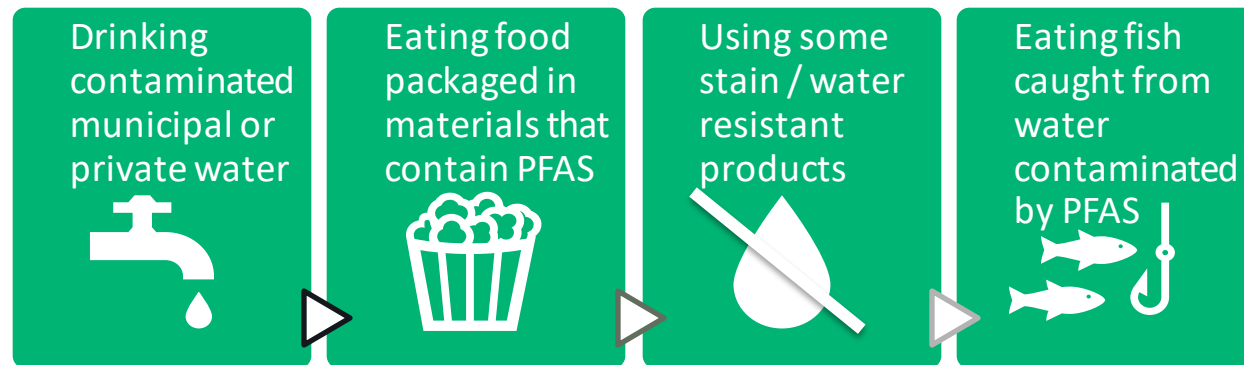
Examples of PFAS partnerships



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Per- and Polyfluoroalkyl Substances (PFAS)

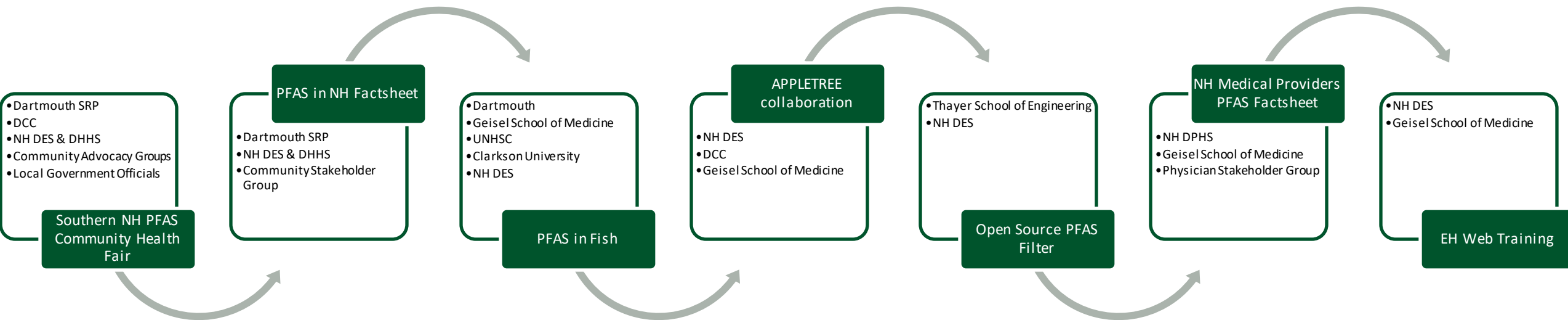
- Persistent and synthetic chemicals used to give stain/water repellent properties to consumer products
- General population primarily exposed by:



- PFAS adversely affect the thyroid, kidney, and liver, and increase cancer risk



Past and ongoing partnerships



Southern NH PFAS Community Health Fair

- Community partners provided information to address community concerns about the potential health impacts of Per- and Polyfluoroalkyl Substances (PFAS) and other community health issues.
- Participating partners included government agencies, academic institutions, non-profit organizations and others

PFAS in NH factsheet

PFAS IN NEW HAMPSHIRE: What you need to know

Per- and poly-fluoroalkyl substances are a group of human-made chemicals (of which there are thousands) **known as PFAS**. These chemicals were developed in the 1940s to repel water or make a surface slippery. Since then, PFAS have been adapted for many consumer products and are now common drinking water contaminants throughout the United States.

HOW ARE WE EXPOSED TO PFAS IN NEW HAMPSHIRE?



Water & Diet

Over many years, PFAS have been discharged to fresh water and ocean water, which contaminates drinking water for people and results in PFAS contamination in fish. Food packaging, such as microwave popcorn bags, also contains PFAS, leading to food contamination.



Air

PFAS outdoor air concentrations are found to be highest near industrial facilities that discharge PFAS emissions. These emissions are transported by wind and deposited in soil and in oceans, lakes, rivers and streams.



Soil

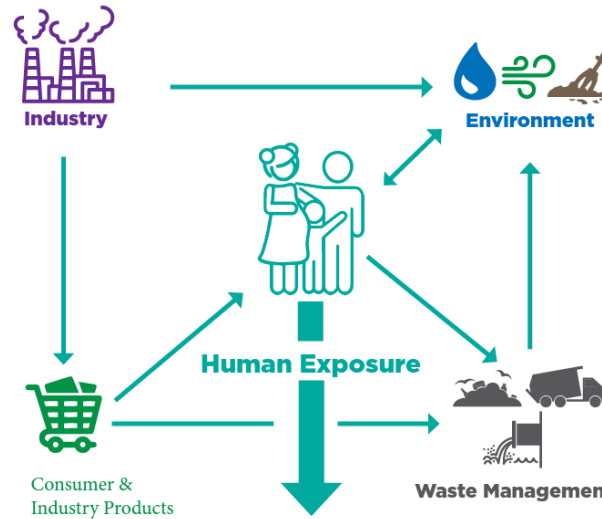
PFAS make their way into soil due to discharge from industry, deposits from the air, leaching from a landfill or sludge from wastewater treatment plants placed on the land. PFAS in soil then enter the water.



Consumer & Industry Products

PFAS are used in industrial processes and are incorporated into many water, stain and grease-resistant products, including clothing, carpet, furniture, non-stick cookware, food packaging, takeout containers, personal care products and ski waxes. PFAS have also been used historically in firefighting foam.

HOW DOES PFAS REACH PEOPLE IN NH?



WHO IS AT RISK FROM PFAS EXPOSURE?

EVERYONE! BUT IN PARTICULAR:



Residents living near areas with higher levels of PFAS in the water, air and soil



Anyone drinking water from contaminated water sources including **private wells**



Pregnant women, babies and children who are especially sensitive to PFAS



People who regularly use or produce products containing PFAS



People who eat certain packaged foods or fish that contain PFAS

[Click Here for an FAQ with more information!](#)

PFAS interfere with:

- the body's hormones
- the ability to fight infection
- growth and development in children

PFAS increase risk of:

- high cholesterol
- thyroid disorders
- certain types of cancer



Survey of Seafood Consumption by NH Residents



Collaboration between academic institutions and NHDES



Launched online in June 2021 with 1,829 respondents



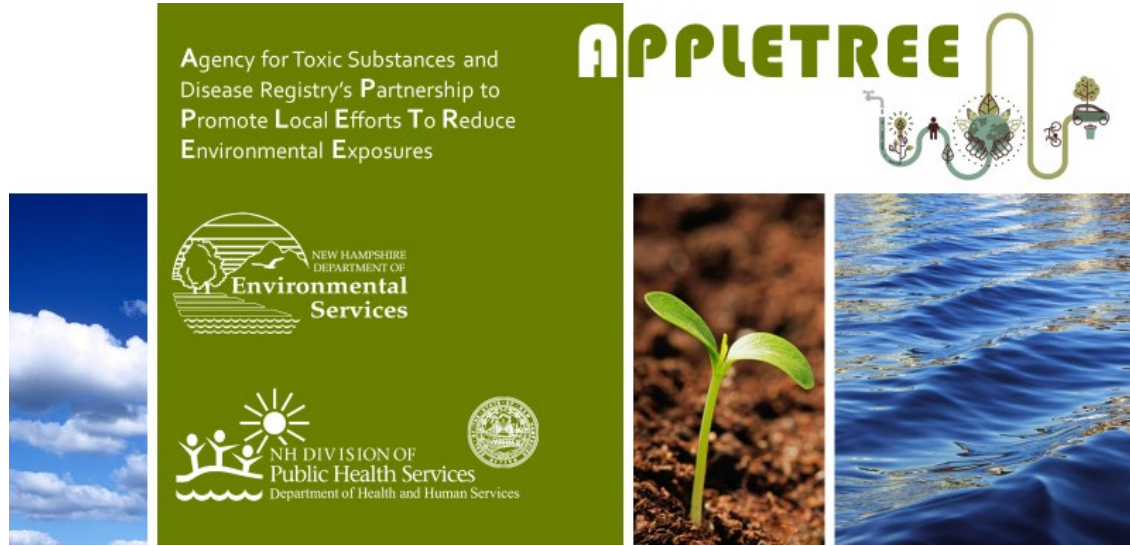
In May 2022, sampled local market seafood and analyzed for PFAS concentrations



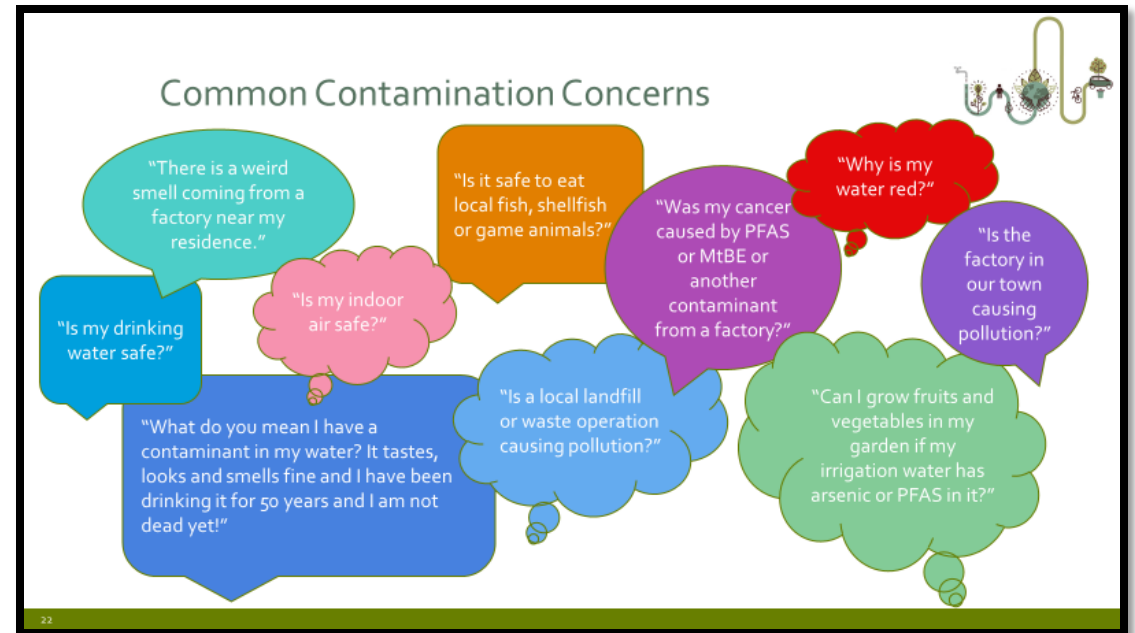
Combined consumption patterns with PFAS concentrations to estimate potential exposure and evaluate health risk



APPLETREE Partnership



- NH Environmental Health Guide
- Online Trainings
 - Introduction to the NH Environmental Health Guide
 - Cancer Concerns in the Community
 - Understanding Environmental Contamination and Risk



Low cost, open source, PFAS filter design

- Need for small business owners to be able to remove PFAS from wastewater before disposal was identified by NH DES scientist, Dr. Jen Harfmann
- Engineering Design Methodology and Project Initiation (ENGS 89/90 – Sol Diamond)
 - Faculty advisors – Vicki May and Megan Romano
 - National Council of Examiners for Engineering and Surveying Engineering Education Award



Medical Providers Factsheet



Per- and Polyfluoroalkyl Substances (PFAS): Guidance for New Hampshire Clinicians



Introduction

This fact sheet is intended to provide information to clinicians to help address patient concerns. **The PFAS family of chemicals can contaminate air, water and soil across the United States (U.S.), and have been found at elevated concentrations in certain areas in New Hampshire (NH), including the former Pease Air Force Base and specific towns in southern New Hampshire.** The recommendations in this fact sheet are consistent with those provided in the Centers for Disease Control and Prevention (CDC)'s [Agency for Toxic Substances and Disease Registry \(ATSDR\) clinical guidance](#), however, they include New Hampshire-specific information wherever possible. **Updates** to this information will be made when guidance changes or new data is available.

Clinicians should review [ATSDR's clinical guidance](#) to determine how to address health concerns in a person who has an identified PFAS exposure. **ATSDR is currently reviewing and updating this guidance** based on the July 2022 National Academies of Sciences, Engineering, and Medicine (NASEM) report, [Guidance on PFAS Exposure, Testing and Clinical Follow-Up](#).

ATSDR asked NASEM to form a committee to advise on PFAS testing and clinical care for patients exposed to PFAS. Based on their review of epidemiological studies that have evaluated health impacts from population-level PFAS exposures, the NASEM committee found strong or moderate evidence for a connection between PFAS exposure and a number of health conditions or biomarkers. However, because of uncertainty about how PFAS exposure translates to individual health risk, the NASEM committee recommended providers offer and discuss the risks and benefits of certain medical screening practices with patients exposed to PFAS, through a process of shared decision making.

- Stakeholders identified further need for clinician educational materials
- Created in partnership with NH DPHS
- Led to seed funding from the Dartmouth Cancer Center to evaluate a mammography decision aid among women living with per- and polyfluoroalkyl substance exposure in Merrimack, New Hampshire with Dr. Christine Gunn

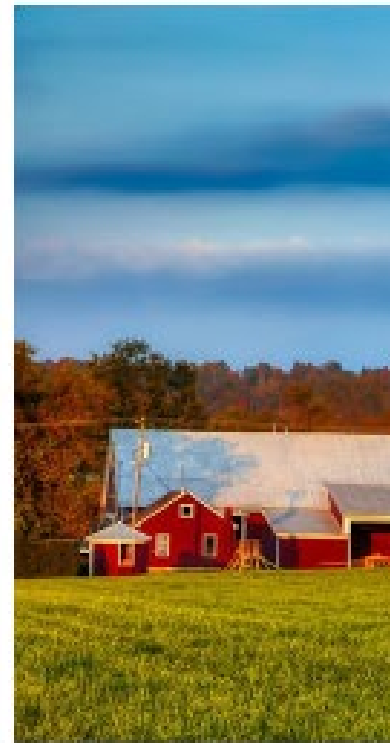


Reducing Environmental Exposures [web training and resource guide]



Environmental Services

Reducing chemical exposures in your daily life



Breast cancer screening in a PFAS-contaminated community

- PFAS are suggestively associated with breast cancer
- Mammography initiation and interval guidelines are evolving
- Women living in PFAS-contaminated communities have special concerns about breast cancer
- This community-engaged research aims to adapt a breast cancer screening decision aid (<https://mymammogram.org/>) to better serve women living in environmentally contaminated communities



Key Opportunities



Synergize efforts where goals align and overlap



Communicate, communicate, communicate!



Increase sharing of expertise and resources



Connect trainees with opportunities for experiential learning



Resources

- PFAS in NH: What you need to know:
<https://www.pfas.des.nh.gov/sites/g/files/ehbemt586/files/inline-documents/2022-09/pfas-in-nh.pdf>
- NH APPLETREE resource guide and web trainings: <https://www.des.nh.gov/home-and-recreation/your-health-and-environment/new-hampshire-appletree>
 - Environmental Health Resource Guide
 - Cancer Concerns in the Community
 - Understanding Environmental Contamination Risk
- PFAS Guidance for NH Clinicians:
https://www.dhhs.nh.gov/sites/g/files/ehbemt476/files/inline-documents/sonh/medical-provider-pfas-factsheet-final_3.pdf
- MyMammogram.Org
- Web trainings, factsheet, and resource guide on *Routes of Exposure to Environmental Chemicals* and *Reducing Chemical Exposures in your Daily Lives* (launching soon on NH DES website)

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 - Dartmouth Cancer Center
 - Undergraduate Research Assistantships at Dartmouth
 - Dartmouth Women in Science Program
 - Graduate Women in Science and Engineering
- P20 GM104416
- R21 ES032180
- R03 ES035149
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PFAS IN NEW HAMPSHIRE: What you need to know

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HOW ARE WE EXPOSED TO PFAS IN NEW HAMPSHIRE?



Water & Diet

Over many years, PFAS have been discharged to fresh water and ocean water, which contaminates drinking water for people and results in PFAS contamination in fish. Food packaging, such as microwave popcorn bags, also contains PFAS, leading to food contamination.



Air

PFAS outdoor air concentrations are found to be highest near industrial facilities that discharge PFAS emissions. These emissions are transported by wind and deposited in soil and in oceans, lakes, rivers and streams.



Soil

PFAS make their way into soil due to discharge from industry, deposits from the air, leaching from a landfill or sludge from wastewater treatment plants placed on the land. PFAS in soil then enter the water.



Consumer & Industry Products

PFAS are used in industrial processes and are incorporated into many water, stain and grease-resistant products, including clothing, carpet, furniture, non-stick cookware, food packaging, takeout containers, personal care products and ski waxes. PFAS have also been used historically in firefighting foam.



HOW DOES PFAS REACH PEOPLE IN NH?



Industry



Environment



Consumer & Industry Products



Human Exposure



Waste Management

WHO IS AT RISK FROM PFAS EXPOSURE?

EVERYONE! BUT IN PARTICULAR:



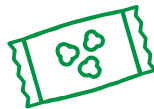
Residents living near areas with higher levels of PFAS in the water, air and soil



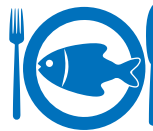
Anyone drinking water from contaminated water sources including **private wells**



Pregnant women, babies and children who are especially sensitive to PFAS



People who regularly use or produce products containing PFAS



People who eat certain packaged foods or fish that contain PFAS



PFAS interfere with:

- the body's hormones
- the ability to fight infection
- growth and development in children

PFAS increase risk of:

- high cholesterol
- thyroid disorders
- certain types of cancer



PFAS IN NEW HAMPSHIRE: What you need to know



WHY ARE WE CONCERNED ABOUT PFAS?

- PFAS are in humans and wildlife around the world and stay in our bodies for years. PFAS do not degrade in the environment and are found in some of the [food, water and consumer products](#) we use every day.
- Our state has several areas impacted by PFAS, including groundwater contamination at Pease Air Force Base in Portsmouth and water and soil contamination, and air emissions from industrial facilities in southern New Hampshire (NH). [Follow this link](#) to see if the New Hampshire Department of Environmental Services (NHDES) has detected PFAS in water in your community.



HOW CAN YOU REDUCE YOUR FAMILY'S PFAS EXPOSURE?

- **Check** with your public water supplier for PFAS levels. Homeowners with private wells are solely responsible for testing and treating their water. The only way for private well users to know if you have PFAS in your water is to **TEST IT**. See recommended water tests for NH private wells [here](#).
- **Consider** [in-home water filtration options](#).
- **Use a wet mop** instead of sweeping with a broom to reduce exposure to dust, which can harbor PFAS and other toxic chemicals.
- **Check out** [consumer product information](#) from Environmental Working Group to avoid PFAS in common products like cookware, rain jackets, makeup, and certain types of dental floss.
- **Visit** [PFAS Central](#) for a list of PFAS-Free products.
- **Avoid** eating foods packaged in material containing PFAS, such as microwave popcorn and fast-food.
- **Avoid** stain resistant coatings on carpets, furniture and other upholstery.

Questions? Email: PFAS.questions@dartmouth.edu



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Revised: June 2023



WHAT IS ALREADY BEING DONE ABOUT PFAS?

• Communities are taking action:

[Merrimack Citizens for Clean Water](#), was formed in 2016 when NHDES ordered the closing of two of the six Merrimack, NH public water wells as they tested over the state regulatory limit for PFAS at that time.

[Testing for Pease](#) is a community action group founded in 2015 in response to PFAS contamination at the Pease Tradeport.

- **Protective PFAS Regulations are in place in New Hampshire**
- **State and federal legislators are working to pass additional protective policies**
- **Research is ongoing to better understand the effects of PFAS on human health and wildlife**

[Click Here for an FAQ with more information!](#)



WHERE CAN YOU FIND MORE INFORMATION?

- [NH Department of Health and Human Services \(NHDHHS\)](#)
- [NH Department of Environmental Services PFAS Response](#)
- [Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry \(ATSDR\) PFAS](#)
- [ATSDR Community Stress Resource Center](#)
- [NH Insurance Department \(insurance coverage for PFAS blood testing FAQ\)](#)
- [Silent Spring Institute's PFAS Exchange](#)

[Click Here for an FAQ with more information!](#)



Per- and Polyfluoroalkyl Substances (PFAS): Guidance for New Hampshire Clinicians



Introduction

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ATSDR asked NASEM to form a committee to advise on PFAS testing and clinical care for patients exposed to PFAS. Based on their review of epidemiological studies that have evaluated health impacts from population-level PFAS exposures, the NASEM committee found strong or moderate evidence for a connection between PFAS exposure and a number of health conditions or biomarkers. However, because of uncertainty about how PFAS exposure translates to individual health risk, the NASEM committee recommended providers offer and discuss the risks and benefits of certain medical screening practices with patients exposed to PFAS, through a process of shared decision making.

PFAS Basics

PFAS are a family of thousands of synthetic chemicals characterized by a fully or partially fluorinated carbon chain. PFAS can persist in the environment for many years to decades, and certain PFAS can bioaccumulate in humans and animals.

PFAS have been widely used in **many** consumer products since the 1940s, **including but not limited to:** • non-stick cookware • food packaging • stain-repellant and water-repellant treatments for clothing, carpet, and furniture • certain firefighting foams (e.g., aqueous film forming foam (AFFF)).

Who Is at Risk from PFAS Exposure?

Oral ingestion of PFAS is the primary route of exposure in adults and children. Most people have been exposed to some PFAS, but people who may have the highest levels of exposure include those who:

- Drink contaminated water, or beverages made with contaminated water (e.g., baby formula, coffee) as well as foods prepared with contaminated drinking water (boiling water does not remove PFAS)

- Eat foods grown or raised in PFAS contaminated areas (e.g., produce, fish, wild game)
- Eat food packaged in materials containing PFAS (e.g., microwave popcorn bags, fast food containers, pizza boxes)
- Put hands and objects in their mouth that contain PFAS (e.g., certain toys, household dusts, treated fabrics) or that have been contaminated with PFAS
- Work in industries that manufacture, manipulate, or use PFAS
- Live in a community near industrial or waste-related sources of PFAS

The New Hampshire [Tracking and Assessment of Chemical Exposures Study \(2019\)](#) provides information on PFAS concentrations from a statewide study (average and 95th percentile values are included). In addition, New Hampshire has several PFAS contamination sites where investigations are ongoing. More detailed information is available on the New Hampshire Department of Environmental Services (NHDES) [PFAS website](#) and in these reports: [Merrimack Village District Community Exposure Assessment Summary Report \(2017\)](#), [Pease PFC Blood Testing Program \(2015\)](#).

Does New Hampshire Regulate PFAS?

Regulation of PFAS in consumer products and in our environment is changing at the regional and national level. To address the most common source of exposure, New Hampshire currently regulates certain PFAS in drinking water from public water systems and bottled water vendors.

The regulated limits for drinking water are provided in the table below. **These limits may change as new scientific information emerges or changes occur in how the U.S. Environmental Protection Agency (U.S. EPA) or U.S. Food and Drug Administration regulate PFAS at the national level.** In addition to drinking water, New Hampshire provides guidance about exposure to PFAS from fish consumption and contact with other sources in the environment (e.g., soil). Local regulations for PFAS may also change in response to New Hampshire legislation. For more information about these sources and potential regulatory changes, see the [NHDES PFAS Response website](#).

Per- and Polyfluoroalkyl Substance (PFAS)	NH Drinking Water Limits (nanograms/liter or parts/trillion)	Type of Drinking Water Limit*
Perfluorooctanoic acid (PFOA)	12	Required for public water utilities (enforced since 2020)
Perfluorooctane sulfonic acid (PFOS)	15	Required for public water utilities (enforced since 2020)
Perfluorohexane sulfonic acid (PFHxS)	18	Required for public water utilities (enforced since 2020)
Perfluorononanoic acid (PFNA)	11	Required for public water utilities (enforced since 2020)
Perfluorobutane sulfonic acid (PFBS)	2,000	Health Advisory from the U.S. EPA (non-enforceable)
GenX Chemicals	10	Health Advisory from the U.S. EPA (non-enforceable)

*Drinking water regulations are enforced for public water utilities, but not for private well owners. These enforceable regulatory limits are known as Maximum Contaminant Levels or “MCLs.” Private well owners are strongly encouraged to test their well and pursue treatment options to meet these same health protective standards. See the [NHDES Private Wells webpage](#).

How Can PFAS Potentially Affect Human Health?

Many studies have examined possible relationships between levels of PFAS in a person's blood and health effects. However, the types of studies vary significantly, making it difficult to draw firm conclusions as the studies evaluated different populations, exposure types, and different PFAS. Based on the totality of scientific research, PFAS exposure has been associated with:

- Increased cholesterol levels
- Elevation in liver enzymes in adults
- Changes in markers of immune system function
- Increased risk of pregnancy-induced hypertension or preeclampsia
- Small decreases in infant birth weights
- Increased risk of kidney and testicular cancer

Scientists are still learning about the possible health effects from PFAS exposure, and how exposure to different mixtures of PFAS might impact a person's health.

Will a Blood Test for PFAS Provide Useful Information?

- Review [ATSDR Guidance on blood testing](#) for PFAS
- Most people in the U.S. have measurable amounts of PFAS in their blood
- Blood testing can show a person how the levels of PFAS in their body compare to average levels in people's bodies across the U.S. and in New Hampshire
- Finding PFAS in a person's body does not mean they will have any specific health impact from PFAS, but could indicate they may be at an increased risk for certain health effects; therefore, if a person has high PFAS levels, providers should address health concerns and discuss how a person can reduce their exposure (as discussed on page 4)
- There are no recommended treatments for removing PFAS from a person's body, and blood levels will decrease over time when sources of exposure are removed

Blood Level Estimation Tools can be used for adults, for PFAS exposure through water (not recommended for children). The estimation tool is intended to help clinicians and patients determine whether a blood test is advisable. It is not meant to replace an actual blood test.

- [ATSDR Blood Level Estimation Tool](#)
- [Serum PFAS Calculator, UC Irvine](#)
- [What's My Exposure? PFAS Exchange](#)

How Can I Order PFAS Blood Testing for My Patient?

- If you and your patient decide to test serum or blood for PFAS levels, tests are commercially available. More information is available through this [PFAS REACH fact sheet](#)
- Review the [Frequently Asked Questions](#) document created by the New Hampshire Insurance Department about insurance coverage for PFAS blood testing

~Continue to next page~



How can clinicians approach patient care for PFAS-exposed individuals?

When addressing patient concerns about PFAS exposure, clinicians can do the following:

- Listen and discuss health concerns with your patient
- Recommend patients identify and reduce current potential sources of environmental exposure
- Evaluate other health risk factors based on family history or lifestyle
- Promote age-appropriate preventive care clinical recommendations (e.g., [U.S. Preventive Services Prevention Taskforce](#), [American Heart Association](#), [American Academy of Pediatrics](#))
- Review and implement other recommendations outlined in [ATSDR's clinical guidance](#)

In addition, it is suggested that you:

Assess potential sources of PFAS exposure and recommend steps to reduce exposure:

1. Ask about your patient's source of home drinking water:
 - ✓ If your patient has a **private well**, assess whether it been tested for PFAS and other contaminants
 - ✓ See [NHDES list of contaminants](#) that should be tested for routinely
 - ✓ See [NHDES PFAS webpage](#) for information on PFAS water testing
 - ✓ See [information on funding support for water treatment systems](#) to remove PFAS

Note: Public water systems are required to ensure PFAS and other contaminants are below maximum contaminant levels
2. Ask if your patient knows, or is worried about, potential sources of PFAS in their community:
 - ✓ Refer patient to the [New Hampshire DES PFAS Occurrences webpage](#) if concerns exist, for details on known PFAS sites
3. Ask if your patient works in an occupation that might expose them to PFAS:
 - ✓ See information on the [National Institute for Occupational Safety and Health webpage](#)
 - ✓ Use this information to help evaluate level of exposure, especially if other sources (drinking water, community, consumer product use, fish and shellfish consumption) are factors
4. Ask if your patient eats a lot of pre-packaged foods (i.e., microwave popcorn, fast food) or other foods that might have high levels of PFAS, and ask if your patient uses products that might contain PFAS:
 - ✓ Recommend your patient read consumer product labels and avoid using those with ingredients that include the words “fluoro” or “polyfluoro” or “perfluoro” or the initials “PTFE,” (polytetrafluoroethylene)
 - ✓ Refer to [PFAS Central](#) for a list of PFAS-free products
 - ✓ Review New Hampshire's [fish consumption guidelines](#)

Discuss breastfeeding concerns (if appropriate):

- ✓ Review information on the [ATSDR webpage on PFAS and breastfeeding](#)
- ✓ Because of the many benefits of breastfeeding, the CDC and the American Academy of Pediatrics recommend¹ that nursing mothers continue to breastfeed their babies despite the potential presence of environmental contaminants in breast milk
- ✓ Caregivers should avoid using PFAS-contaminated water for mixing infant formula

How to handle the stress of community exposures

Feeling stress is a normal reaction to environmental contamination in a community. If a patient is worried about PFAS exposure, review the [ATSDR “Coping with Stress” fact sheet](#) with them, refer to the [ATSDR Community Stress Resource Center](#) and treat accordingly.

For More Information:

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References:

¹American Academy of Pediatrics, Council on Environmental Health. Breast Milk. In: Etzel, RA, ed. Pediatric Environmental Health, 4th Edition; Itasca, IL: American Academy of Pediatrics; 2019: P. 238

Additional Resources:

- [*PFAS in New Hampshire: What you need to know*](#). Dartmouth College, 2021
- [ATSDR: PFAS Overview](#)
 - [ATSDR Toxicological Profiles](#)
 - [Toxic Substance Portal \(Tox FAQs\)](#)
 - [PFAS in the U.S. Population - Biomonitoring Studies](#)
- [PEHSU](#) - The Pediatric Environmental Health Specialty Units (PEHSU) are a national network of experts available to provide consultation and education to clinicians and communities wishing to learn more about PFAS and other hazardous substances. These units are staffed by clinicians with environmental health expertise in pediatrics, reproductive health, occupational and environmental medicine, medical toxicology, and other related areas of medicine.
- [U.S. EPA: PFAS](#)
- [Interstate Technology Regulatory Council \(ITRC\) Fact sheets](#)
- [National Toxicology Program \(NTP\) Monograph](#)
- [National Institute of Environmental Health Sciences: PFAS](#)
- Uncertainty Resources:
 - [Uncertainty and Stress in the Clinical Setting. Helping Patient and Clinician Manage Uncertainty During Clinical Care](#)
 - [Navigating the Unknown: Shared Decision-Making in the Face of Uncertainty](#)

