

# ATSDR 2021 ANNUAL REPORT

## Listening, Responding, & Taking Action

---



**U.S. Department of  
Health and Human Services**  
Agency for Toxic Substances  
and Disease Registry



# TABLE OF CONTENTS

<b>WHO WE ARE</b>	<b>4</b>
<b>LETTER FROM OUR ATSDR DIRECTOR AND ASSOCIATE DIRECTOR</b>	<b>7</b>
<b>LISTENING, RESPONDING, AND TAKING ACTION</b>	<b>8</b>
ATSDR Petition Process: Giving Communities a Voice	9
The Who, What, Why, and How of ATSDR's Petition Process	12
PEHSU Network: Protecting Children and Families from Environmental Hazards	15
Applying Simulation Science to Estimate Potential Health Effects of Ingesting Copper Naphthenate	18
Helping the Penobscot Indian Nation: Review of Anadromous Fish for Consumption	20
<b>2021 YEAR IN REVIEW</b>	<b>22</b>
APPLETREE: Addressing Concerns about Odors in a New Jersey Shopping Center	23
Mapping the Success of the Choose Safe Places Program	25
National ALS Registry Expands Research	27
ATSDR PFAS Activities and Research: Building on Lessons of the Past to Advance the Future	30
GRASP Supports Environmental Exposure Work to Protect Community Health	34
<b>EMERGENCY RESPONSE COLLABORATION</b>	<b>36</b>
ATSDR Support to COVID-19, Natural Disasters, and Other Responses	37
The Race Against COVID-19 at the Talladega Superspeedway	42
Helping Health Departments Manage Concurrent Disasters	45
Responding to Chemical Emergencies: Rockton, IL, Case Study	48
<b>WHAT'S NEXT</b>	<b>52</b>
Strengthening ATSDR's Environmental Justice and Core Health Equity Strategies	53
Preparing for the Future: PFAS Exposure Assessments and Multi-site Study	56
Advancing ATSDR's Data Strategy: Data Modernization	59
Conducting One of the Nation's Largest Cancer Incidence Studies: Camp Lejeune	60
<b>2021 PUBLICATIONS</b>	<b>62</b>
General ATSDR Peer-Reviewed Publications	62
ALS-specific Peer-Reviewed Publications	65
GRASP-specific Peer Reviewed Publications	66
Book Chapters	67
2021 Draft & Final Completed Tox Profiles	67
Public Health Assessment and Exposure Assessment Reports	68
Educational Products	68

## | WHO WE ARE



***ATSDR works in, with, and for communities to protect them from potential harmful health effects related to exposure to natural and man-made hazardous substances found in the environment.***

The Agency for Toxic Substances and Disease Registry (ATSDR) serves as a science-based public health agency working to address community concerns about hazardous substances. For more than three decades, ATSDR has worked with communities across the United States to identify and reduce community exposures that might lead to harmful health effects. To date, we have taken action to keep people safe from environmental hazards in more than 6,000 communities.

## ATSDR's Longstanding Commitment to Environmental Justice and Health Equity

ATSDR works in communities to assess human exposure to potentially harmful contaminants in the environment and their effect on health. We also provide expertise to educate and train communities so they can take action to protect their health.

ATSDR has a long history of working with environmental justice communities to address environmental concerns and upholds its commitment to environmental justice and health equity by *listening, responding, and taking action* alongside economically and socially marginalized communities to assess and address their environmental health concerns.



ATSDR develops tools that will help communities address environmental health inequities and incorporate health equity into public health assessment processes.



ATSDR guides health professionals on how to evaluate health equity during the public health assessment process.



ATSDR empowers communities to address environmental concerns and related health concerns in their area by offering the petition process and engaging and involving communities in the process.

### ATSDR additionally partners with federal, state, and local governments to

- Identify environmental hazards
- Respond to environmental health emergencies
- Recommend actions to reduce environmental exposures and respond to questions about exposures
- Provide guidance to healthcare providers
- Conduct research on the health effects of hazardous substances in the environment and build capacity of state, tribal, and local health partners

## New ATSDR Offices

In 2021, ATSDR completed its reorganization and created three new offices:

ATSDR **Office of Community Health Hazard Assessment (OCHHA)** conducts public health assessments, health consultations, and other related public health activities to determine the health implications of releases or threatened releases of toxic substances into the environment. OCHHA provides scientific expertise in environmental epidemiology and designs and conducts human health studies — including epidemiologic studies — to evaluate the association between exposure to hazardous substances and adverse health effects.

ATSDR **Office of Capacity Development and Applied Prevention Science (OCDAPS)** works with communities, partners, and professional organizations to build their capacity to address issues related to environmental contamination. OCDAPS supports this by translating science into educational materials, tools, and actions that can be used to prevent exposure to hazardous materials and protect health. OCDAPS also trains health professionals on how to address concerns and questions from their patients about environmental exposures.

ATSDR **Office of Innovation and Analytics (OIA)** collects, analyzes, and interprets data and provides scientific information to enable internal and external partners to make actionable decisions about exposure to hazardous substances. OIA provides analytical and modeling expertise, develops new analytical tools, and integrates the use of geospatial science in public health activities. OIA also interprets the complex science describing exposures, toxicology, and population dynamics, and creates tools to interpret public health effects associated with exposures.

## ATSDR At-A-Glance



ATSDR's staff of expert scientists (in areas such as environmental health, epidemiology, toxicology, geospatial science, engineering, geology, health physics, and medicine), public health researchers, community engagement and health communication specialists, health educators, emergency responders, and others work tirelessly to prevent and address ongoing environmental exposures and unexpected disasters and to protect the public from related harmful health effects.



Headquartered in Atlanta, with 10 regional offices across the United States, ATSDR partners with local communities, taking a science-based, community-first approach to public health.



ATSDR is available 24/7 to respond to environmental health threats from natural disasters, chemical spills, and other emergencies.



# LETTER FROM OUR ATSDR DIRECTOR AND ASSOCIATE DIRECTOR

Greetings,

The Agency for Toxic Substances and Disease Registry (ATSDR) is pleased to announce the release of its 2021 annual report. The report's theme, *Listening, Responding, & Taking Action*, mirrors ATSDR's commitment to protecting communities from harmful health effects related to exposure to natural and man-made hazardous substances.

This report features stories of collaboration to show how ATSDR *listens* to our communities. For

instance, we worked with South Dakota Pediatric Environmental Health Specialty Unit (PEHSU) partners to protect children from various environmental hazards. You'll learn how ATSDR *responds* to communities with its petition process, which gives communities a voice in addressing environmental health concerns.

Then, there's our story about how the National Amyotrophic Lateral Sclerosis (ALS) Registry is expanding its reach. The report's section on emergency response collaboration shows ATSDR *taking action* with stories about a unique initiative for COVID-19 testing at Alabama's historic Talladega Superspeedway and training state partners to conduct an Assessment of Chemical Exposures (ACE) investigation in response to a chemical fire emergency in Illinois. This year, we also finalized our [PFAS Toxicological Profile](#) and fully launched our [Community Engagement Playbook](#).

In 2021, we fully stood up the three new offices that now make up ATSDR, including a new community engagement section. We are looking to the future with emerging initiatives such as data modernization and deepening our longtime environmental justice and health equity work.

Lastly, we must thank our ATSDR staff. We are proud of our staff and appreciate their steadfastness.

We hope you take the time to learn more about our achievements in this ATSDR 2021 annual report. ATSDR is, and will always be, committed to protecting the health of the American public.

Sincerely,

**Patrick Breyse, PhD, CIH**  
Director  
Agency for Toxic Substances and Disease Registry



Patrick Breyse, PhD, CIH  
Director of NCEH/ATSDR



Christopher M. Reh, PhD  
Associate Director of ATSDR

**Christopher M. Reh, PhD**  
Associate Director  
Agency for Toxic Substances and Disease Registry

## ATSDR 2021 ANNUAL REPORT

# LISTENING, RESPONDING, & TAKING ACTION

Involving the community and collaborating with its members are cornerstones of work to improve public health. ATSDR values the voices and participation of community members as part of the process of addressing their environmental health concerns. We actively listen to communities to receive firsthand knowledge for understanding their concerns. We then identify environmental hazards, recommend actions to reduce environmental exposures, respond to questions about exposures, and build capacity of state, tribal, and local health partners to continue the work forward.

ATSDR works to collect and analyze data to deliver evidence-based findings that address communities' concerns and offers tools and recommendations the community can use to reduce their exposure and protect their health.

In the stories below, witness how ATSDR supports PEHSUs to safeguard the health and well-being of children and families; how we collaborated with the Penobscot Indian Nation to understand the levels of hazardous substance exposure in one of their significant food sources and offered recommendations for reducing exposure; and how we use science and the petition process to empower and protect communities.

### In this section:

ATSDR Petition Process: Giving Communities a Voice	9
The Who, What, Why, and How of ATSDR's Petition Process	12
PEHSU Network: Protecting Children and Families from Environmental Hazards	15
Applying Simulation Science to Estimate Potential Health Effects of Ingesting Copper Naphthenate	18
Helping the Penobscot Indian Nation: Review of Anadromous Fish for Consumption	20



## ATSDR PETITION PROCESS: GIVING COMMUNITIES A VOICE



**“When communities and individuals don’t know who can help with their environmental health concerns, the petition process opens up ATSDR, with its regional knowledge and unique scientific expertise, to help them. Petitions are a big part of what we do.”**

— Bob Helverson, MS, ATSDR Region 3 director

*A concerned student used ATSDR’s petition process to investigate an environmental health concern across two cities that share an odorous landfill. This is an example of how petitions can help address environmental health concerns in communities.*

Thousands of facilities across the United States use or produce chemicals or chemical waste each day. When community members are concerned about exposure to chemicals, they can ask or “petition” ATSDR to investigate the potential environmental exposure and related health effects.

*Note: Names were changed to protect the identity of individuals in this story.*

The city of Bristol spans two states — Virginia and Tennessee. As expected, there are two of everything, including mayors, police departments, and health departments. However, there is one thing residents on both sides of Bristol share: a landfill that releases strong odors. The Bristol Landfill is in an old quarry where water continues to collect, causing ongoing leachate collection and disposal issues. The landfill has a gas collection and removal system in place, but elevated levels of some contaminants in the leachate and in the air continue to occur.

The landfill is also located near a university, juvenile detention center, and two elementary schools. Approximately 5 years ago, the landfill started to produce stronger odors that spread across Bristol in Tennessee and Virginia. The odors began disrupting residents’ quality of life; many suspected the landfill was causing health issues. Seeing and hearing community members’ concerns prompted Joshua Allen to petition ATSDR to investigate these odors.

A graduate student in the area, Joshua saw firsthand how the Bristol Landfill’s odors affected concerned residents. He used the “Smell My City” app to review more than 6,000 entries describing community members’ frustrations and stories about the landfill’s odor. He also reviewed formal complaint logs to the City of Bristol and the Virginia Department of Environmental Quality, where more than 2,500 complaints were recorded. After gathering these insights, Joshua asked ATSDR, the Environmental Protection Agency (EPA), and other local organizations for help.

Joshua contacted the [ATSDR Region 3 office](#) to describe his and the community’s concerns about the odors and potentially unsafe gas releases from the landfill. An ATSDR regional representative met with Joshua and provided information about the petition process and how it could help address the concerns about the landfill.

At the time ATSDR received the request, limited exposure data were available to evaluate Joshua’s concerns. However, because of ATSDR’s past experiences at other landfill sites, ATSDR was able to determine that it had enough resources and information to accept the petition. Since then, ATSDR has collaborated with federal, state, and local organizations in Tennessee and Virginia on the multi-agency response.

Joshua’s story showcases the uniqueness of ATSDR’s petition process and how community members and agencies can collaborate to assess and address environmental exposure concerns. Some key takeaways from this process include the following:



**Strong relationships are paramount.** ATSDR relied on relationships cultivated over time in ATSDR’s regional offices to provide critical technical input to address Joshua’s concerns. ATSDR provided input to partner agencies that led to the rapid development of a sampling and monitoring plan that assessed air quality in the most affected areas of Bristol, both in Virginia and Tennessee. Strong relationships built on long-term collaborations with local, state, and federal partners helped to quickly move the process from petition review to in-the-field activities. Relationships were strengthened by consistent collaboration on the site and meaningful connections with affected community members.



**Collaborate with the community.** Shortly after ATSDR was notified of the community's concerns, regional staff in ATSDR's Region 3 and 4 offices mapped out a plan to gather the information needed to evaluate the petition request and communicate with residents in Virginia and Tennessee. ATSDR worked with community groups who had already begun working to secure resources to lessen the effects of the environmental exposure. Collaborating with the community and listening to their concerns early in the process helped expedite the process and focus the petition on addressing their health concerns.

---



**Understand the uniqueness of each community ATSDR serves.** ATSDR understood the importance of navigating Bristol's unique situation across state lines and leveraging the help of agencies in both states and ATSDR's regional offices. This understanding showcased the value of collaboration for the betterment of all residents.

---

ATSDR's [petition process](#) is notable in that many federal agencies do not offer this resource. The process gives people a way to take action to understand and address environmental exposures that might harm their health. Petitions also connect communities to ATSDR for technical assistance in understanding and investigating environmental exposures.

# THE WHO, WHAT, WHY, AND HOW OF ATSDR'S PETITION PROCESS



Petitions connect communities to ATSDR resources — such as ATSDR environmental scientists, physicians, toxicologists, and other specialists — to assess and to help residents understand environmental exposures in the community that might harm their health. When communities are concerned about potential exposure to chemicals, ATSDR can bring tools and expertise to investigate.

To understand how to file a petition, we need to understand the basics:

## What is an ATSDR petition?



A petition is a request, written as a letter or email, that asks ATSDR to investigate specific environmental health concerns in a community.

## What is not an ATSDR petition?



A list of signatures of concerned community members is not the same thing as an ATSDR petition.

## Who can file a petition?



Any person or community group can file a petition.

## What can ATSDR do in response to a petition?



Assess whether your community is being exposed to hazardous substances in the environment



Determine how people in your community are being exposed to these substances



Determine if these chemicals can enter your body and possibly harm your health



Write a report and recommend actions you can take to reduce your exposure and protect your health



Educate your community about hazardous substances and how to avoid exposure to them



Collaborate with local and state health departments to help address your community's concerns about possible environmental exposures

## What *can't* ATSDR do in response to a petition?



Change how a facility operates



Clean up chemicals in your community



Make medical diagnoses



Tell you why there is a lot of illness in your community



Change zoning codes



Resolve issues between organizations and people

## Now that you know the basics, how do you file a petition?



Submit a letter or email to your ATSDR regional office requesting that ATSDR investigate specific environmental health concerns in your community.



Be sure to share any relevant environmental data or evidence you have that might help ATSDR in evaluating your request.

Find your regional office information here: [Office Map](#) | [Regional Offices](#) | [ATSDR \(cdc.gov\)](#)



# What will ATSDR do after receiving your petition request?

**Seek to clearly understand the potential problem by gathering information**



Listen to community members to understand their concerns



Search for formal complaints with the city or local health organizations



Review previous reports, health assessments, or related research on the problem



**Engage and involve the community, as needed, throughout the petition process**



**Evaluate available information and environmental data to determine if there is enough information to initiate a detailed evaluation of your concern**

## What happens next?



**Wait for ATSDR to gather any needed environmental data to evaluate your request**



**Receive an approval or denial of your petition, usually within 6-12 months**

## Interested in learning more about ATSDR's petition process?

Visit <https://www.atsdr.cdc.gov/faq.html> or call toll free 1-800-232-4636; TTY: (888) 232-6348 and ask to be connected to your ATSDR regional office.



## PEHSU NETWORK: PROTECTING CHILDREN AND FAMILIES FROM ENVIRONMENTAL HAZARDS



**“Every time a PEHSU interacts with someone, the impact ripples out to many other children. The beauty of PEHSUs is that they empower community members, health professionals, and families to take steps that really decrease environmental health risks.”**

— Linda Hansen, MD, MPH, chief, Environmental Medicine and Health Systems Intervention Section, ATSDR Office of Capacity Development and Applied Prevention Science (OCDAPS)

***ATSDR supports the Pediatric Environmental Health Specialty Units, or PEHSUs, to help protect the health and well-being of children and families who live or work in settings that put them at higher risk for hazardous environmental exposures.***

The [Pediatric Environmental Health Specialty Units \(PEHSU\)](#), supported by ATSDR, are a national network of specialists that provide expert medical information and consultations on reproductive and pediatric health issues associated with environmental exposures. These environmental exposures can disproportionately affect persons who live and work in economically and socially marginalized settings that increase their risk for exposure. These disproportionate exposures frequently affect communities with higher proportions of low-income households, persons of color, American Indians, and Alaska Natives.

PEHSUs serve healthcare professionals, parents, childcare providers, schools, community groups, and agencies at the local, tribal, state, and federal levels. They are located across 10 federal regions and are supported through a cooperative agreement between ATSDR and a national program office, the American Academy of Pediatrics (AAP). The Environmental Protection Agency (EPA) provides funding for this program as well. As regional experts in environmental exposures, PEHSU specialists can tailor their work to the communities they serve; as a national network, they also share best practices across regions to improve children's environmental health.

Throughout 2021, the accomplishments of the PEHSU program were widespread. From helping individuals navigate lead exposure testing and treatment to addressing heavy metal exposure on a national scale, PEHSUs powered their vision of creating healthy environments for all children. Because they are regional, PEHSUs can be nimble and responsive to urgent needs in their communities. Their expert advice empowers individuals and families to make choices that can decrease their exposure to hazardous environmental substances.

The following story is an example of PEHSUs in action:

*Note: Names were changed to protect the identity of the individuals in this story.*



In the spring of 2021, Melissa, a nurse practitioner, was evaluating Micah, who was found to have high blood lead levels. Melissa knew there were no safe blood lead levels for children and that lead exposure could be associated with serious health effects. Given this, she requested a consultation with the Region 8 PEHSU team in Colorado to determine next steps.



A PEHSU specialist investigated and learned that Micah's family had recently moved into a house built in 1918 and that he attended a home-based childcare facility. Both were places where he could have been exposed to lead. Unfortunately, there were no local resources to send an environmental health expert to Micah's home. Also, his childcare facility was unlicensed and therefore not required to meet regulated health and safety standards.



Fortunately, the Region 8 PEHSU team was able to equip Melissa with the knowledge and resources to increase her capacity to assess and treat the populations she serves. Melissa shared guidance with Micah's family and the childcare facility on how to reduce Micah's blood lead levels, protect him from further lead exposure, receive blood lead level testing, and seek follow-up care as needed. With this consultation, Melissa could provide better care for Micah and all her patients and was able to share resources to protect other children in the childcare facility.

## Local and National PEHSU Impact

PEHSUs are dynamic in their approach to issues at the local and national levels. They are equipped to address community issues, such as lead exposures in a single childcare facility, and issues with national impact, such as heavy metals found in baby food. In this latter effort, the Region 2 PEHSU team in New York were able to quickly respond to a large increase of public concerns about heavy metals found in baby food prompted by national media coverage. The PEHSU team used previous research on this topic to rapidly update an existing factsheet and other guidance documents. In collaboration with AAP, they posted the revised factsheet to [HealthyChildren.org](https://www.healthychildren.org), a website of the American Academy of Pediatrics, that received more than 17,000 website visits in response. These resources enabled PEHSUs to quickly address the needs of families through education and empower them to make choices to protect their children's health.

PEHSUs work from the local to the national level, respond to hundreds of calls per year, and consistently help people who are disproportionately affected to further environmental justice. The program empowers people to take action for themselves, their families, and their communities, to protect one another from negative health effects related to environmental exposures.

## APPLYING SIMULATION SCIENCE TO ESTIMATE POTENTIAL HEALTH EFFECTS OF INGESTING COPPER NAPHTHENATE



*ATSDR helped the Vermont Department of Agriculture’s state veterinarian make a more informed decision on how to respond to dairy goats’ exposure to unknown quantities of copper naphthenate — an oil-based wood preservative — by using simulation science.*

The Simulation Science Section in ATSDR Office of Innovation and Analytics (OIA) designs and applies computer simulation models to evaluate and reduce environmental exposure to toxic chemicals. This innovative approach provides ATSDR’s scientists with information about environmental exposures and

estimates of toxicity to protect communities. This work helps ATSDR understand how the human body processes and eliminates chemicals after exposure to a hazardous substance. It can even be used instead of animal testing to assess possible health risks from new chemicals.

In 2021, the Vermont Department of Agriculture's state veterinarian sought ATSDR's technical assistance regarding exposure of dairy goats to unknown quantities of copper naphthenate. ATSDR had no toxicological profile or minimal risk level (MRL) for copper naphthenate. Building on available knowledge for metallic copper, ATSDR scientists reviewed published toxicokinetic and toxicological information and used established computational approaches to fill gaps in knowledge about the toxicokinetic properties of copper naphthenate. ATSDR was then able to estimate the time required for copper naphthenate to be removed from the goat's body by natural processes, as well as other toxicokinetic properties of copper naphthenate.



ATSDR's work helped the state make a more informed decision on the proper response to the exposure incident. ATSDR plans to use the knowledge and lessons learned from this work to

- Demonstrate how complex mixtures, such as copper naphthenate, can be generated into its constituents, copper, and naphthenate, to assess the chemical as a whole
- Offer more technical assistance to predict toxicity endpoints for similar hazardous chemical incidents
- Develop a manuscript addressing how approaches such as read-across, trend analysis, or quantitative structure-activity relationship modeling can be applied to fill data gaps and estimate residence times

In the years to come, ATSDR looks forward to using this process to

- Enhance the toxicokinetic database of copper naphthenate
- Better understand animal and human biological processes
- Decrease response time for similar incidents in the future



# HELPING THE PENOBSCOT INDIAN NATION: REVIEW OF ANADROMOUS FISH FOR CONSUMPTION



**“Each time we do a health consultation or health assessment we determine the very specific environmental exposures to a community with input from the community members. This project demonstrates the impact of a strong collaboration between Penobscot Indian Nation and ATSDR in addressing specific exposures and health concerns.”**

— Tarah Somers, MSN, MPH, BN, ATSDR Region 1 director

*The Penobscot Indian Nation used ATSDR’s health consultation on anadromous (migratory) fish in the nearby river to learn about possible health risks — such as cancer — from eating fish contaminated with per- and polyfluoroalkyl substances (PFAS), dioxin, and methylmercury.*



[Health consultations](#) are one of the many ways ATSDR analyzes environmental data to determine possible harm to a person's health. Consultations can be either a verbal or written response — from ATSDR or one of their health department partners — to a specific question about health risks related to a specific site, chemical release, or the presence of hazardous material. A consultation may lead to site restrictions, repairs, clean-up, environmental sampling, or other environmental public health actions related to surveillance, evaluation, or education. In 2021, ATSDR released [a health consultation focused on anadromous fish consumption from the Penobscot River](#).

Generations of Penobscot Indian Nation (PIN) members have eaten fish and other aquatic species from the Penobscot River as a significant source of food. However, the food source and health of the PIN were at risk, due to contaminated discharge from a nearby paper and pulp mill into the Penobscot River. In 2004, the PIN tribal chief asked ATSDR to evaluate potential health effects of contaminants released into the Penobscot River. It was imperative to understand the level of environmental exposure from eating fish and other food from the river — which many relied on — and any related harmful health effects.

ATSDR reviewed available fish sampling data, calculated recommended fish consumption limits, and published a health consultation on its findings in 2006. In this consultation, ATSDR found concerning levels of contaminants such as dioxins, chlorinated dibenzofurans (furans), polychlorinated biphenyls (PCBs), and methylmercury. The potential health effects of exposure included various cancers, reproductive issues, pregnancy complications, and immune system weakening that threatened all PIN members, regardless of age.

After the initial report, ATSDR partnered with the Environmental Protection Agency (EPA) to build on this research in 2014 as a part of a Regional Applied Research Effort (RARE) project. For this project, ATSDR reviewed contaminants in fish tissue and other edible aquatic species and plants. The findings from this research and additional tissue data from more than 75 composite samples from 2017–2018 provided ATSDR with the information to release the second health consultation in 2021.

This report focuses on the health implications of eating contaminated anadromous (migratory) fish collected from the Penobscot river and demonstrates how federal agencies can work with Tribal Indian Nations to address environmental concerns. The PIN identified fish commonly eaten and used the information to identify potential environmental exposures. Tribal leadership appreciated the collaborative effort and took action to share the report as soon as it was released.

ATSDR identified anadromous fish species in the river that had high levels of dioxin, methylmercury, and per- and polyfluoroalkyl substances (PFAS). These contaminants represented a health hazard for the PIN members who ate any quantity of the sampled fish species. Several potential health effects were identified and described in this [fact sheet](#).

As a result, ATSDR met with PIN leadership and recommended that tribal members stop eating anadromous fish identified as high risk in the health consultation. In the future, the PIN hopes ATSDR's efforts can justify stricter rules for removing contaminants before they are discharged into the river, to protect the tribe's health and their food source for generations to come.

# ATSDR 2021 ANNUAL REPORT

## 2021 YEAR IN REVIEW

Despite ongoing pandemic challenges in 2021, ATSDR adapted and continued to fulfill its mission to protect communities from health effects related to exposure to harmful hazardous substances found in the environment. ATSDR leveraged meaningful relationships at the state and local levels to address harmful odors in a New Jersey shopping center, created a website to highlight the work of APPLETREE grantees, connected ALS patients to clinical trials, and advanced the knowledge base of PFAS. In these stories, we encourage you to see for yourselves how ATSDR continuously strives to protect families and communities from harmful environmental exposures.

### In this section:

APPLETREE: Addressing Concerns about Odors in a New Jersey Shopping Center	23
Mapping the Success of the Choose Safe Places Program	25
National ALS Registry Expands Research	27
ATSDR PFAS Activities and Research: Building on Lessons of the Past to Advance the Future	30
GRASP Supports Environmental Exposure Work to Protect Community Health	34

## APPLETREE: ADDRESSING CONCERNS ABOUT ODORS IN A NEW JERSEY SHOPPING CENTER



**“We were contacted in April and released a report in July. It is critical that we were able to be responsive in a very timely fashion and we felt very proud of that. In the midst of the pandemic, we were able to get it done.”**

— *Somia Aluwalia, PhD, research scientist, New Jersey Department of Health*

***ATSDR’s Partnership to Promote Local Efforts to Reduce Environmental Exposure (APPLETREE) is a cooperative agreement program that helps 28 state health departments build their capacity to evaluate harmful environmental exposures to hazardous substances. This year, ATSDR is highlighting the work done by the New Jersey Department of Health (NJDOH). One of this APPLETREE recipient’s responsibilities was evaluating the health effects of an environmental exposure at the Marlboro Mall and recommending actions to address environmental releases and odors from a dry-cleaning facility.***

For 35 years, APPLETREE has provided funding to states to investigate and respond to requests related to harmful environmental exposures and to engage communities about exposure prevention and reduction. States use this funding to enhance their capacity to assess and respond to local environmental health concerns and related health risks. From 2020 through 2023, ATSDR will award nearly \$12 million annually to help 28 state health departments evaluate past and present environmental exposures and prevent or reduce future exposures.



On April 7, 2021, the New Jersey Department of Health (NJDOH) was contacted by a tenant of Marlboro Mall who was concerned about odors coming from a co-located dry cleaner. The tenant reported he had been smelling these odors since July 2020 and was concerned about potential health effects.



The Marlboro Mall property owner scheduled an environmental company to sample the air inside six spaces located near the dry cleaner in the Marlboro Mall during November 2020 and February 2021. Results showed high levels of tetrachloroethylene (PCE) and trichloroethylene (TCE) in the air of the six businesses — a restaurant, bagel store, pizzeria, nail salon, an insurance office, and the dry cleaners — with the dry cleaners as the source.



The tenant asked for NJDOH's help in evaluating whether the PCE and TCE levels were hazardous and could result in possible health effects. NJDOH gathered historical environmental sampling data for the Marlboro Mall site and compared those against New Jersey Department of Environmental Protection (NJDEP) screening levels. In July 2021, NJDOH released a [health consultation](#) documenting their evaluation and recommendations. This information was shared with the local health department of Monmouth County and building tenants. NJDOH staff members spoke with building tenants and addressed their health concerns. NJDOH staff members also spoke with the building owner's attorney and environmental consultant to encourage additional monitoring and actions to decrease the levels of PCE and TCE.

Through collaboration, NJDOH, NJDEP, and local licensed site remediation professionals worked together to reduce the levels of PCE and TCE in the air at the Marlboro Mall. From April to June 2021, they worked with the building owner to repair the heating, ventilation, and air conditioning system. The machine that used hazardous PCE was removed and use of TCE spot cleaners ended. Air samples were tested throughout the process to ensure that levels were within NJDEP screening guidelines. Fortunately, the PCE and TCE levels in the air decreased. The building owner also agreed to take additional indoor air samples to ensure that the levels of PCE and TCE continue to decrease. The owner will share this data with NJDOH for continued monitoring. These efforts in New Jersey are an example of APPLETREE's value to the health of communities.



## MAPPING THE SUCCESS OF THE CHOOSE SAFE PLACES PROGRAM



**“The Story Map is a tool states can use to showcase their impact, during the pilot phase, to potential partners. It is a way of capturing what we currently know and making sure it is in a format people can understand.”**

— Jennifer Farramola, MPH, CHES, health communication specialist fellow, ATSDR Office of Capacity Development and Applied Prevention Science (OCDAPS)

***The [Choose Safe Places for Early Care and Education \(CSPECE\) Story Map](#), a user friendly report that highlights CSPECE state programs from 2017–2019, is a top-viewed ATSDR webpage that helps state CSPECE programs engage partners and gain local support for [safe siting](#) of childcare programs.***

ATSDR [Choose Safe Places for Early Care and Education \(CSPECE\) Program](#) encourages careful consideration about where to place early care and education facilities, such as childcare centers. Many states do not have a formal process to assess these locations for harmful chemicals and to determine, for example, if they are on or near old gas stations, factories, or dry cleaners. That's why the program provides towns, cities, and states with a framework to adopt practices that ensure that childcare centers are located away from chemical hazards such as arsenic and lead. With 8.3 million children younger than the age 5 years attending daycares and other early childcare centers in the United States, CSPECE's work is essential to reduce childhood environmental exposures that could lead to childhood developmental delays and harmful health effects.

In 2021, ATSDR CSPECE Communication Workgroup created a [CSPECE Story Map report](#) to track the first 3 years (2017–2019) of the CSPECE program, highlight pilot programs across the 28 states, and increase awareness of their efforts. The workgroup collaborated with CSPECE partners to develop a user-friendly tool that uses qualitative and quantitative data to celebrate successes and lessons learned. The Story Map also positions the program to garner more support from childcare facilities, licensing agencies for childcare facilities, and state and local health departments.

In 2021, the Story Map emerged as a top-viewed ATSDR webpage that helped increase interest and awareness of the CSPECE program and its resources. It is a tool states can use to garner support for their programs. ATSDR encourages all towns, cities, and states to use this Story Map to



**Share data that inform current and potential partners about pilot efforts to protect children from harmful environmental hazards**



**Contact, engage, and build relationships across states that foster more collaboration and share lessons learned**



**Raise awareness and build interest in CSPECE's work across other states, regions, and federal entities**

The workgroup is looking to evaluate the Story Map through outreach to end-users. ATSDR will continue to help states make use of CSPECE and share their successes. It is also working to add more resources to its [current tools](#), with hopes of expanding the program to meet the needs of all states.



## NATIONAL ALS REGISTRY EXPANDS RESEARCH



**“If we can figure out what causes it, we can figure out what drugs can mitigate and possibly prevent ALS.”**

— Paul Mehta, MD, principal investigator, National ALS Registry

*The National Amyotrophic Lateral Sclerosis (ALS) Registry uses a novel approach to link persons with ALS (PALS) to scientists conducting research with the goal of slowing disease progression and getting closer to a cure.*

## The National ALS Registry by the Numbers:

# 17,800–31,843

An estimated **17,800 to 31,843 adults in the United States were living with ALS** in 2017 (prevalence: 5.5–9.9 persons per 100,000 population), with a mean of 24,821 cases (7.7 persons per 100,000 population)

# 50

More than **50 domestic and international institutions** have used the Registry to recruit **thousands of PALS** to participate in more than **65 clinical trials and epidemiological studies** to date

# 100,000+

**18 different online surveys** are currently available through the Registry to help identify ALS risk factors. At least **100,000 surveys** have been completed to date

# 60,000+

More than **60,000 specimens** (e.g., blood, hair) have been collected nationally from **more than 1,400 living PALS** and **more than 180 autopsies\*** (e.g., tissue, bone) have been conducted for the National ALS Biorepository

\* In partnership with the Johns Hopkins ALS postmortem program

# 21

The Registry has funded **21 research grants** to date

# 88

More than **88 Registry articles** have been published in peer-reviewed journals

The [National ALS Registry](#), launched in 2010 and maintained by ATSDR, is a program that collects and analyzes data about PALS and connects those persons with ALS resources. It includes data from existing national databases (e.g., Centers for Medicare and Medicaid Services and Veteran Affairs) and voluntary information provided by PALS using [CDC's online portal](#).

Although most people assume a registry is there to collect numerical data, Paul Mehta, MD, principal investigator of the National ALS Registry, highlights its uniqueness:

"The Registry does more than just count cases," Mehta said. "We want to figure out what causes ALS and how to mitigate, prevent, or better treat it."

The Registry is actively working to determine the risk factors for ALS to better understand the roles of genetics, disease progression, and environmental exposures. The Registry works toward this goal daily in a variety of ways:



**Serving as a biorepository of nationally representative specimens to be matched with Registry risk factor data**



**Overseeing the epidemiology of ALS by collecting data on incidence, prevalence, mortality, risk factors, and demographics**



**Examining environmental exposures to toxicants (e.g., heavy metals, herbicides, insecticides)**



**Funding R01 research project grants and other academic researchers focused on ALS**



**Partnering with national ALS associations and organizations to promote the existence and importance of the Registry**

One of the most important ways the registry contributes to the fight against ALS is by using the [Research Notification System](#) to connect patients with clinical trials.

“ALS patients are altruistic and caring individuals,” Mehta said. “They may know there is not a cure for them right now, but they want to help those in the future.”

To date, the life span of PALS is typically 2–5 years from diagnosis. The two treatments currently approved by the Food and Drug Administration (FDA) only prolong lives for 2–3 months on average. “These patients become our friends, they come to meetings, and then they unfortunately succumb to this terrible disease. It is heartbreaking,” says Mehta. “This Registry is for them and their families.”

Most patients and drug companies express positive feedback about the Research Notification System. In fact, most current and former drugs used to treat ALS have used the Registry at one time or another for recruitment support. This notification system, and the Registry as a whole, are free for all research institutions to use.

The Registry is a novel way to expand research and explore the unknowns of ALS. “We are hopeful that one of these clinical trials will help patients significantly slow, stop, or reverse their disease progression,” Mehta said.

While the goal of the Research Notification System is to be able to work with private institutions and academia to further this research, the Registry seeks to make a difference and add to the body of knowledge of ALS research. As one of ATSDR’s most prolific groups publishing in the peer-reviewed literature, the Registry is eager to add to the ALS knowledge base to get closer to a cure.

“We are one piece of the ALS puzzle and are making a difference in the lives of people with ALS,” Mehta said. “This Registry belongs to the patients, and we are its humble caretakers.”

## ATSDR PFAS ACTIVITIES AND RESEARCH: BUILDING ON LESSONS OF THE PAST TO ADVANCE THE FUTURE



**“We have just scratched the surface of understanding where PFAS exposure is occurring. Our job is to identify where exposures to hazardous substances are occurring and to make recommendations to stop them. This work is 100% the bread and butter of ATSDR’s mission.”**

— Rachel Rogers, PhD, MA, senior health scientist, NCEH/ATSDR

*Over many years, ATSDR has and continues to advance the knowledge base concerning per- and polyfluoroalkyl substances (PFAS). ATSDR has been a leader in assessing community concerns about PFAS exposure and possible health effects through its Multi-site Study, PFAS exposure assessments, and a newly published research agenda framework to guide PFAS research priorities for the Agency.*

[Per- and polyfluoroalkyl substances \(PFAS\)](#) are a group of thousands of manufactured chemicals that have been used in industry and consumer products worldwide since the 1940s. Some food packaging materials, water- and stain-repellent fabrics and carpets, firefighting foam, and cosmetics may still contain PFAS. PFAS are a public health concern because they can stay in people's bodies for a long time and have been linked to harmful health effects in humans.

CDC and ATSDR are longtime leaders in understanding PFAS exposure. Beginning in 1999, CDC's National Health and Nutrition Examination Survey (NHANES) was the first to document widespread exposure to PFAS in the United States in more than 98% of serum samples collected from people. By 2007, NHANES was expanded to include 11 additional PFAS. In 2009, ATSDR released its first draft *Toxicological Profile for Perfluoroalkyls*; the final [PFAS toxicological profile](#) was released in 2021 and is being further updated in 2022. In 2017, ATSDR added more PFAS to [ATSDR's Substance Priority list](#).

In 2019, ATSDR began exposure assessments in communities believed to be affected by PFAS drinking water contamination. It launched the [Pease Health Study](#) and [Multi-site Study](#) to assess and identify possible health effects from PFAS exposure. At that time, CDC's National Center for Environmental Health (NCEH) and ATSDR also brought together a multi-disciplinary group of PFAS experts to identify priority PFAS research areas. They also worked on developing a comprehensive research agenda covering the broad range of PFAS-related research activities conducted or supported internally and by other federal agencies. The group explored scientific advances and knowledge gaps that, if addressed, could inform public health actions and the federal response to PFAS contamination. It also identified 30 compelling questions to serve as the foundation for a multi-faceted strategy for advancing the scientific knowledge about PFAS and its public health effects.

In March 2021, NCEH and ATSDR published "[Advancing PFAS research: an overview of ATSDR and NCEH activities and recommendations](#)" in the peer-reviewed *Journal of Exposure Science and Environmental Epidemiology*. NCEH and ATSDR Senior Health Scientist Rachel Rogers, PhD, MA; ATSDR Associate Director Christopher Reh, PhD; and NCEH and ATSDR Director Patrick Breyse, PhD, CIH, wrote the article that described more than 2 years of work on a public health framework for PFAS research activities. The framework assesses future research priorities based on five scientific domains: 1) toxicology, 2) exposure, 3) human health, 4) public health action, and 5) cross-cutting priorities. NCEH and ATSDR will continue building on these PFAS research priorities and identifying opportunities for interagency collaboration.



## **Pease Health Study: Water Consumption, Working Together, and Wellness**

In 2021, ATSDR completed participant enrollment and blood and urine sample collection for the [Pease Health Study](#). This study evaluates the public health effects of people drinking [PFAS](#) contaminated water at the Pease International Tradeport and its supply wells in the Portsmouth, New Hampshire, area. Located on the site of the former Pease U.S. Air Force Base, the Tradeport's soil and groundwater were contaminated with PFAS — particularly



perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS) — from the use of aqueous film-forming foam during firefighter trainings and to extinguish flammable liquid fires when the site was a military base. This contamination migrated to the three supply wells that serve the Tradeport's main water distribution system. ATSDR hopes to finish analysis and present its findings and recommendations to the affected New Hampshire community in late 2022.

[The Pease Study](#) is the pilot and first site of the national [Multi-site Study](#), which looks at human health effects of PFAS exposure from drinking contaminated water at sites in eight U.S. states. The Pease study encountered unique challenges because of the COVID-19 pandemic. During the pandemic, participant recruitment was paused for 7 months because of the difficulty in locating and reaching eligible participants. ATSDR has been able to incorporate lessons learned from this study, however, to enhance procedures and methods at other Multi-site Study sites.



## **ATSDR Releases First PFAS Exposure Assessment Report**

In 2019, CDC and ATSDR started [PFAS exposure assessments](#) in communities near current or former military bases known to have had PFAS in their drinking water. Persons who participated in the exposure assessments provided blood and urine samples to CDC and ATSDR for analysis.

One of these exposure assessment sites is in the city of Westfield, in Hampden County, Massachusetts, where the Barnes Air National

Guard Base is located. Possibly as early as the 1970s, the base used aqueous film-forming foam containing PFAS for its firefighter training. Over time, PFAS from the foam entered the ground, moved into the groundwater to offsite locations, and affected nearby municipal wells, contaminating the water with PFAS.

Thanks to the participation of City of Westfield residents and CDC and ATSDR's work, residents in this area now have a better understanding of PFAS exposure levels in their community. ATSDR released its Westfield PFAS [exposure assessment report](#) in November 2021, and held a virtual community meeting with residents to review the report's findings and answer questions on December 2021.



The exposure assessment showed the following results:



Higher blood levels of certain PFAS in the Westfield community, possibly associated with past drinking water contamination, when compared with PFAS levels in a nationally representative sample.



All Westfield tap water samples collected during the exposure assessment in 2019 met the Environmental Protection Agency's (EPA) 2016 lifetime health advisory and Massachusetts Department of Environmental Protection's public health guidelines for PFAS in drinking water.



Patterns and levels of dust contamination measured in participating exposure assessment households are comparable to those reported in selected U.S. studies.



**The results of the Westfield exposure assessment will help participants and their neighbors better understand their PFAS exposure and what they can do to protect themselves from exposures.**

# GRASP SUPPORTS ENVIRONMENTAL EXPOSURE WORK TO PROTECT COMMUNITY HEALTH



*ATSDR [Geospatial Research, Analysis, and Services Program \(GRASP\)](#) team collaborated to design and update cartographic products generated by ATSDR Office of Community Health Hazard Assessment (OCHHA) site teams to determine the relationship between ethylene oxide concentrations in the air and proximity to sterilization and chemical manufacturing facilities.*



Ethylene oxide, known as EtO, is a chemical used to make ethylene glycol (a chemical used to make antifreeze and polyester) that is commonly used to sterilize medical equipment and supplies in hospitals or sterilization facilities. Contact with EtO occurs from occupational or environmental exposure, primarily through the air. Health and environmental agencies have determined that exposure to high levels of EtO can cause cancer and other adverse health outcomes.

Throughout 2021, GRASP worked with ATSDR Office of Community Health Hazard Assessment (OCHHA) and ATSDR Region 5 to design and update cartographic products generated by OCHHA site teams. Detailed maps and analyses show the relationship between concentrations of EtO in the air and proximity to sterilization and chemical manufacturing facilities. The GRASP team added polar plots to these custom maps to show potential sources of EtO and how EtO concentrations change with wind speed and direction. The team also contributed to exploratory data analysis and helped maintain a high standard of visual design.

GRASP staff worked with OCHHA scientists to develop alternate maps and data visualizations designed for multiple audiences both internal and external to ATSDR. These alternate visualizations increased ATSDR scientists' understanding of exposure in affected areas and enabled ATSDR scientists to effectively communicate complex exposure dynamics to communities. In some cases, different versions of the EtO maps were developed for specific groups — such as public health administrators, scientists, local officials, and community members — to provide the appropriate level of detail for those different audiences. The GRASP team used various data visualizations to better serve the priorities and expectations of the different audiences.

EtO work will continue in 2022 with the release of health consultations, using the analyses produced. GRASP will continue to help investigators at additional EtO sites as ATSDR's public health assessments continue.

# ATSDR 2021 ANNUAL REPORT

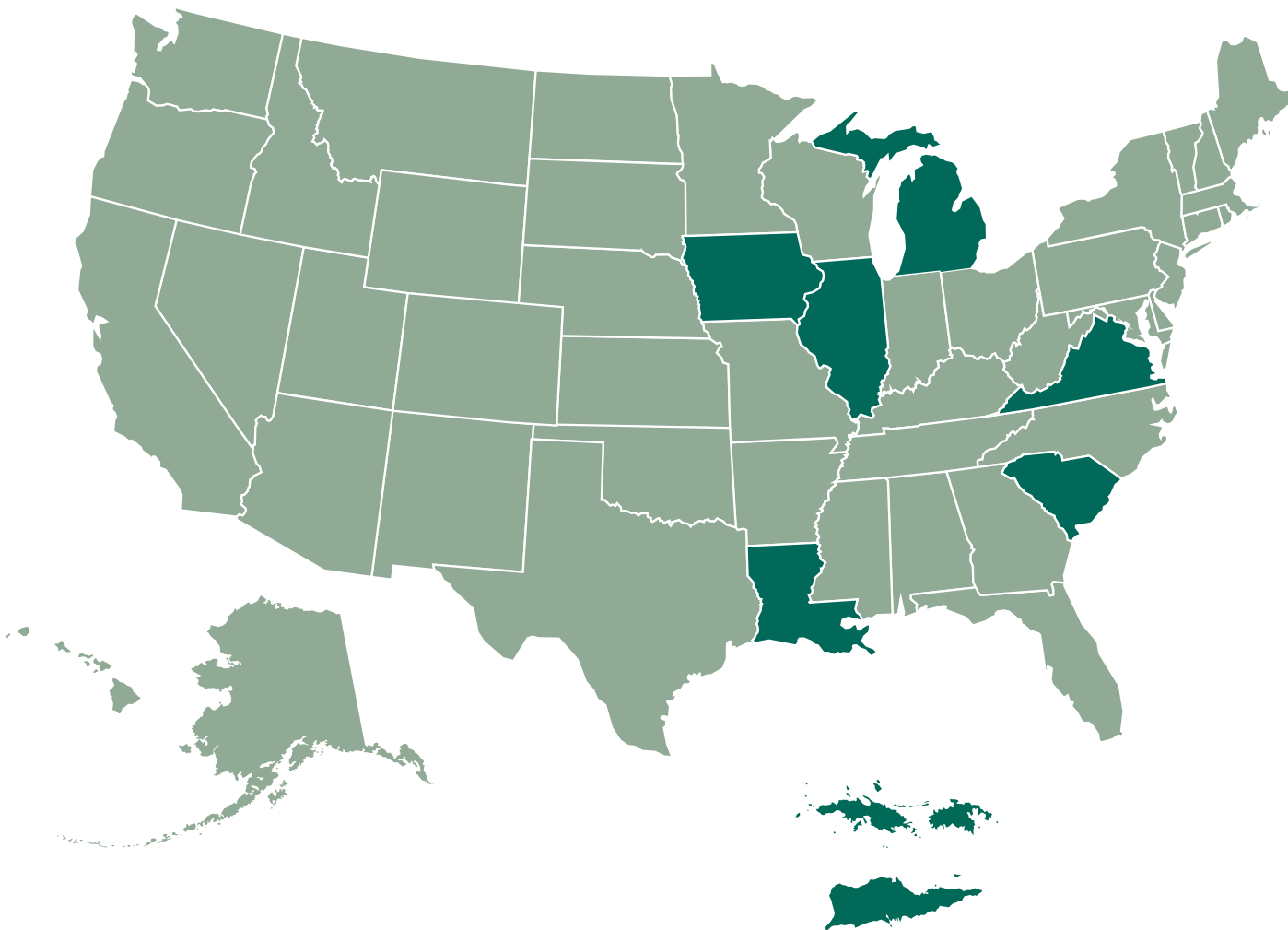
# EMERGENCY RESPONSE COLLABORATION

Individually, we are one drop. Together, we are an ocean. Effective work rarely progresses in isolation. Through diversity of thought, action, and expertise, ATSDR successfully collaborates with states, tribes, local organizations, areas, and territories to support a wide range of natural and man-made disaster emergency responses. In 2021, ATSDR supported more than 148 emergency preparedness and response activities. Those included responding to hurricanes Laura and Ida, assessing health effects from a chemical explosion fire at one of the largest lubricant manufacturing facilities in the United States, and developing novel ways to increase COVID-19 testing and vaccination. They also included partnering to identify challenges faced by state, tribal, local, and territorial (STLT) environmental and public health agencies when responding to concurrent disasters and identifying resources and conducting tabletop exercises to address these challenges.

## In this section:

ATSDR Support to COVID-19, Natural Disasters, and Other Responses	37
The Race Against COVID-19 at the Talladega Superspeedway	42
Helping Health Departments Manage Concurrent Disasters	45
Responding to Chemical Emergencies: Rockton, IL, Case Study	48

# ATSDR SUPPORT TO COVID-19, NATURAL DISASTERS, AND OTHER RESPONSES



During Fiscal Year (FY) 2021, ATSDR Emergency Management (EM) was involved in 148 activities, mostly unrelated to the COVID-19 response. Of these events, 12 were acute emergency response. In addition to the response work, EM engaged in 51 preparedness activities, including three actions related to ATSDR's role as the representative of the U.S. Department of Health and Human Services (HHS) on the National Response Team (NRT) established under the National Contingency Plan for Oil and Hazardous Substances (NCP; 40 CFR 300). EM often partnered with other ATSDR offices, such as the Office of Community Health Hazard Assessment (OCHHA), Office of Innovation and Analytics (OIA), and Office of Capacity Development and Applied Prevention Science (OCDAPS), and experts from the National Center for Environmental Health (NCEH) to support these activities. Some highlights of these activities are described below.





## Hurricanes Laura and Ida, Lake Charles/Grand Island, LA

In October 2020, Hurricane Laura made landfall near Lake Charles, LA. ATSDR Emergency Management (EM) coordinated the CDC/ATSDR response and recovery operations for this event. Significant events during this response included support to Emergency Support Function (ESF-10) after a fire at a biolaboratory in Lake Charles and subsequent deployment to evaluate impacts to public and private drinking water sources in the affected area.

In August 2021, Hurricane Ida made landfall near Grand Island, LA. EM coordinated the CDC/ATSDR response for this event.

In both incidents, EM monitored the response to various pollution incidents that had limited public health impacts during the response phase; recovery operations are ongoing and will be described in more detail in future reports.



## Limetree Bay/St. Croix Air Quality, St. Croix, U.S. Virgin Islands

In March 2021, the community raised concerns about air emissions from the recent startup of a previously closed oil refinery in St. Croix in the U.S. Virgin Islands. In April 2021, ATSDR participated in a conference call with Environmental Protection Agency (EPA) Region 2 about the history of previous issues that had prompted the closure of the refinery. NCEH/ATSDR staff on temporary duty with the U.S. Virgin Island Department of Health for hurricane recovery operations from the 2017 hurricane season notified ATSDR of a release of hydrogen sulfide attributed to the refinery. ATSDR helped address community concerns by

- Providing information to EPA (the lead agency of the response) and territorial authorities on notification procedures and health effects of hydrogen sulfide and odors in general
- Providing support to an extensive air monitoring program established and operated by an EPA response team, at the request of the EPA regional administrator
- Assuming responsibility for dealing with alerts sent by EPA's team, when certain agreed upon thresholds for hydrogen sulfide and sulfur dioxide were exceeded in real time, while ATSDR Office of Community Health Hazard Assessment (OCHHA) prepared to address long-term issues; ATSDR shared its evaluation of the detections with territorial officials
- Participating in a virtual community meeting arranged by a citizen's group on the island

The air monitoring system remained in place until the refinery ceased operations in September 2021. In mid-May, ATSDR received a petition from the citizen's group for a health assessment to evaluate air quality issues from all sources on the island. OCHHA is evaluating the request through ATSDR's [petition process](#).



---

## Catawba Paper Mill Air Quality, Catawba, SC

On April 25, 2021, a regional toxicologist from EPA Region 4 requested a consultation on the significance of exposure to paper mill emissions affecting both South Carolina and North Carolina, where a recognized Indian Tribe resides. EPA began collecting environmental data ATSDR provided from its [Toxicological Profiles](#) and discussed relevance of various comparison values during the initial call with the EPA toxicologist. Over the course of several days, ATSDR reviewed data provided by EPA and recommended that exposure to the air pollution be stopped to prevent adverse health effects in the community. ATSDR participated in multiple conference calls with EPA and both states. ATSDR Emergency Management (EM) worked closely with staff in ATSDR's Office of Community Health Hazard Assessment (OCHHA), Office of Innovation and Analytics (OIA), and Office of Capacity Development and Applied Prevention Science (OCDAPS) to support our partners.

---



## Sibley Train Derailment, Sibley, IA

In May 2021, the entire town of Sibley was included in an evacuation radius affected by the reported presence of ammonium nitrate. ATSDR monitored media reports and assessed site photos. Subsequent investigation revealed the derailed nitrate car was empty, but tank cars of hydrochloric acid were damaged and releasing the acid, creating an environmental hazard. A fire involving derailed railcars of asphalt was also occurring. ATSDR Emergency Management (EM) provided an acute event consultation, identifying potential health concerns of the incident to the region.

---



## Steamboat Creek Waste Oil Spill, Norfolk, VA

In May 2021, ATSDR Emergency Management (EM) was notified by ATSDR Region 3 that waste oil had spilled into Steamboat Creek near Norfolk, VA. The Coast Guard initiated a response with support from EPA Region 3 and the state. The Virginia Department of Health (VDH) requested ATSDR's support in reviewing environmental air monitoring and associated environmental data in response to odor complaints from the surrounding community. ATSDR and partners looked at potential exposures around the location of the spill — analyzing available data and using geospatial resources to estimate populations that could be exposed — and identified no environmental threats. ATSDR also provided information about the following to support the affected community: [how community members can take action to remove or reduce the odors](#); how residents can [document the odors](#) to support a response; and [health provider resources](#) for understanding, assessing, and responding to patient concerns about the odors.



---

## Wood River Rail Car Reaction, Wood River, IL

In June 2021, ATSDR received three National Response Center reports, an Interagency Modeling and Atmospheric Assessment Center (IMAAC) activation, and a U.S. Health and Human Services Secretary's Operations Center (SOC) alert of a reaction in a rail car containing waste sulfuric acid. Excessive pressurization in several tank cars, caused by exothermic reaction, resulted in a release of sulfur dioxide into the community. Local authorities ordered approximately 400 residents to shelter in their homes. ATSDR Emergency Management (EM) notified ATSDR Regions 5 and 7, as the event was close to the regional boundary. Working with ATSDR Region 5, EM provided action levels for air monitoring to the EPA Region 5 on-scene coordinator and discussed possible response actions with Illinois Department of Public Health (IDPH). Based on air monitoring results, the sheltering order was lifted on June 3, but reinstated briefly for a smaller group of homes the next day. ATSDR Region 3 forwarded a report from EPA Region 3 about two rail cars at a facility in Delaware with a similar problem as the one occurring in Illinois. EM forwarded information from the Wood River response, including action levels and a summary of air monitoring data up to that date, and monitored media reports to identify any community concerns.



---

## Chemical Fire, Rockton, IL

In June 2021, a chemical explosion resulted in a large fire at one of the largest lubricant manufacturing facilities in the United States, in Rockton, IL, near the Wisconsin border. Smoke from the fire lasted for several days and affected communities miles away in both states. An evacuation order was issued for residents and businesses within a 1-mile radius of the explosion; people located 1 to 2 miles out were advised to stay inside their homes and keep their windows and doors closed; and all people within 3 miles of the explosion were instructed to wear masks.

EPA Region 5 requested assistance from ATSDR in determining next steps for screening, sampling, evaluation, and education. The ATSDR Emergency Management (EM) collaborated with the Illinois Department of Health (IDPH) and provided screening values for real-time air monitors of all recommended chemicals of concern; led the collaboration, alongside public health authorities, to evaluate potential contamination of air, surface water, sediment, and groundwater in the community; provided recommendations for air sampling; and developed factsheets to educate the community on how to [protect themselves after returning home from a chemical fire](#). At the request of the health department, ATSDR also conducted an [Assessment of Chemical Exposures \(ACE\)](#) investigation. To read more about the response, see [Responding to Chemical Emergencies: Rockton, IL, Case Study](#).



---

## **Lithium Battery Warehouse Fire, Morris, IL**

In June 2021, ATSDR was contacted by an EPA on-scene coordinator through ATSDR Region 5 indicating that EPA was en route to a warehouse fire involving approximately 185,000 pounds of lithium batteries ranging in size from cell phone batteries to those used in hybrid cars. Local authorities asked for air monitoring support and EPA needed information about analytes and action levels for air contaminants these batteries might release. Approximately 1,000 homes were evacuated. ATSDR accessed Safety Data Sheets for lithium batteries and reviewed information for the North American Emergency Response Guide (ERG). ATSDR indicated the primary concern would be hydrogen fluoride and reactivity of the lithium. With Illinois Department of Public Health and ATSDR Region 5, ATSDR Emergency Management (EM) provided action levels and re-occupancy levels. ATSDR reviewed air monitoring data in real time from an EPA dashboard representing data from instruments surrounding the area. The fire was largely extinguished, and residents were allowed to return home.



---

## **Flat Rock Indoor Air Quality, Flat Rock, MI**

In August 2021, EPA Region 5 asked ATSDR Emergency Management (EM) for assistance regarding evacuation and reoccupation standards for residences in the neighborhoods surrounding a lift station in the sanitary sewer serving Flat Rock, MI. The contaminant was initially identified as benzene, then confirmed as petroleum (gasoline) that leaked from an underground storage tank at a nearby facility. The leak resulted in explosive levels of fumes in some homes and numerous odor complaints from homeowners with sump pumps. ATSDR worked with Michigan Department of Health and Human Services (MDHHS) to assist EPA and Michigan Department of Environmental, Great Lakes, and Energy in responding to the spill.

ATSDR was also able to do the following:

- Reviewed data from real-time air monitoring network and field laboratories operated by EPA, Michigan, and the responsible party
- Reviewed and agreed upon a decision tree on protective actions based on readings developed by MDHHS
- Evaluated the instruments proposed for use by state and federal partners
- Reviewed community fact sheets

# THE RACE AGAINST COVID-19 AT THE TALLADEGA SUPERSPEEDWAY



ATSDR played an essential role in the response to the COVID-19 pandemic, working with CDC's Increasing Community Access to Testing (ICATT) team to ensure access to testing and vaccinations in an approach that was effective, convenient, and most of all — fun.

In the summer of 2021, ATSDR and the ICATT team collaborated with the COVID-19 Testing and Diagnostics Working Group from the U.S. Department of Health and Human Services (HHS), the Alabama Department of Public Health (ADPH), and the Alabama National Guard to increase the number of people getting tested or vaccinated for COVID-19 in the United States.

**To accomplish this goal, the team crafted a novel way to encourage people to get tested or vaccinated that was**



**APPROACHABLE**



**CONVENIENT**



**FREE**



**UNIQUE**





# The unique incentive?



**Getting a COVID-19 test and/or vaccination?**

*You get to take 2 laps around the Talladega Superspeedway!*

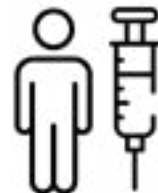
## HERE'S HOW IT WORKED

- 1 Take two laps in your own car
- 2 Decide whether you want a test or vaccine
- 3 Find one of the many stations set up in the racetrack bays
- 4 Quickly get your test or vaccine
- 5 Get your fact sheet about keeping yourself and others safe from COVID-19
- 6 Leave (and hopefully share your knowledge with others)

## The event was a huge success



**124**  
people were tested



**86**  
people were vaccinated



**"I felt like a millionaire,"**

said one participant after completing his laps around the Superspeedway.

## Benefits of this innovative approach included the following:



**It took testing and vaccines to where people live, work, and play**



**It provided insights on why people are hesitant to get tested or vaccinated**



**It demonstrated the advantages of creative engagement with hesitant populations**



**It spread accurate testing and vaccine knowledge to counter misinformation**



**It persuaded resistant participants to get a COVID-19 test or vaccination**



**It transformed participants into trusted sources for their communities**

“When you are trying to reach people during a response, you have to understand where they are coming from and go the extra mile. Reach out to them where they are and where it’s convenient. We learned we had to go where people were, rather than asking them to come to us.”

— Sue Casteel, MS, environmental health scientist, ATSDR Region 4 health education and community engagement coordinator

Additional information about CDC’s COVID-19 response efforts is available at: <https://www.cdc.gov/about/24-7/response-to-covid-19.html>.

## HELPING HEALTH DEPARTMENTS MANAGE CONCURRENT DISASTERS



**“For the general public, this means communities will have a larger toolbox of resources to better protect themselves and their families during concurrent disasters.”**

— Mollie Mahany, MPH, ATSDR Emergency Management Natural Hazards team lead

*In 2021, ATSDR Emergency Management (EM) responded to multiple environmental disasters, oversaw environmental health issues related to the COVID-19 pandemic, and partnered with the National Environmental Health Association (NEHA) and the Council of State and Territorial Epidemiologists (CSTE) to identify gaps and develop resources for local environmental and public health agencies responding to concurrent disasters.*

ATSDR Emergency Management (EM) serves as a central coordination point for CDC's National Center for Environmental Health (NCEH) and ATSDR-led emergency responses and manages environmental health issues during CDC Emergency Operations Center-led emergency responses.

In 2021, despite the COVID-19 pandemic, it was critical that NCEH/ATSDR maintain the ability to prepare for and respond to non-COVID-19 related emergencies and disasters. Multiple staff deployments, expanded roles related to the pandemic, staff shortages, worker safety precautions, and new staff resiliency and operational planning needs required the business model of emergency management preparedness and response to adapt — especially for the 2021 Atlantic hurricane season, the third most active in history.

Managing any environmental disaster requires swift coordination and a clear, detail-oriented focus. Now imagine working at a health department and having to manage a disaster during a global pandemic. NCEH/ATSDR Emergency Management Natural Hazards team lead Mollie Mahany, MPH, explains there's now a project to support this complex work, the [Concurrent Disasters Project](#).

"This project came about because we were having conversations with health departments and heard there were challenges in their ability to respond to disasters during the pandemic, so modifications were needed," said Mahany.

For this project, "concurrent disasters" refers to natural disasters such as hurricanes, wildfires, and earthquakes that occur at the same time as an infectious respiratory disease pandemic. However, the term can also apply to other sets of hybrid disasters that occur at the same time, or because of one another. "The COVID-19 pandemic added a layer of complexity we hadn't previously experienced on this scale," said Mahany.

To address this challenge, ATSDR is partnering with the National Environmental Health Association (NEHA) and the Council of State and Territorial Epidemiologists (CSTE) to

- Conduct a needs assessment to identify gaps and challenges faced by state, tribal, local, and territorial (STLT) environmental and public health agencies when responding to concurrent disasters
- Identify resources to address these challenges
- Develop tabletop exercises and other technical resources to support concurrent disaster planning, preparedness, and response activities in the future

Resources identified so far range from peer-reviewed journal articles to factsheets separated by audience and topic areas. Because this is an ongoing process, more resources will be added over time. The goal is to create a resource hub for state, tribal, local and territorial (STLT) jurisdictions to enhance their preparedness, response, and recovery for concurrent disasters.

"We are committed to supporting STLTs in the difficult work of responding to concurrent disasters," said Mahany. "We want to develop tools and resources to strengthen response and recovery capabilities, reduce risk to people living in settings that put them at higher risk of exposure, and strengthen community resilience."

While this work affects how the federal government and STLT partners respond to concurrent disasters, it also has implications at the individual level. Researchers are still analyzing resources, but initial findings

and future pilot implementations are promising. “We plan to hold tabletop exercises with six jurisdictions from July to September 2022,” said Mahany. “We plan to do these in two sets of three jurisdictions, to evaluate, revise, and make the final learnings into a tool.”

ATSDR, NEHA, and CSTE look forward to sharing their findings to broad networks and through partners such as the National Association of County and City Health Officials (NACCHO) and the Association of State and Territorial Health Officials (ASTHO).

ATSDR, NEHA, and CSTE also hope this work will highlight the need for better coordination across all public health sectors and foster opportunities for sharing information across practitioners and professionals. In the years to come, EM looks forward to developing customizable tools for STLT jurisdictions, bringing new professions to the table to increase health equity in emergency management, and sharing strategies from this resource hub to create safer communities for all.



## RESPONDING TO CHEMICAL EMERGENCIES: ROCKTON, IL, CASE STUDY



ATSDR Region 5 Director Mark Johnson and CDC Epidemic Intelligence Service Officers Jasmine Nakayama and Krishna Surasi contacting residents and distributing flyers in the neighborhood adjacent to the fire. Photo Credit: Mark Johnson

**“Building professional relationships amongst agencies before an emergency event happens is key to establishing how well a response will go. ATSDR participates in interagency planning at the national and regional level and supports interagency planning at the state and local level to develop these relationships in advance.”**

— Rich Nickle, MPH, ATSDR Emergency Management Hazardous Materials team lead

***ATSDR, Environmental Protection Agency (EPA), and others collaborated with the Illinois Department of Public Health (IDPH) to assess health effects and support communities after a chemical explosion and large fire occurred at one of the largest lubricant manufacturing facilities in the United States.***

When a natural or technological disaster or emergency strikes, ATSDR Emergency Management (EM) and CDC's National Center for Environmental Health (NCEH) work as a central coordination point for responding. By triaging and coordinating NCEH/ATSDR emergency response assets and unique expertise, EM helps federal, state, and local entities respond to environmental health emergencies. These entities also collaborate to address public health consequences of terrorist events and hazardous substance releases.

Under the coordination of EM, Office of Innovation and Analytics (OIA), Office of Community Health Hazard Assessment (OCHHA), and Office of Capacity Development and Applied Prevention Science (OCDAPS) also support emergency responses. OIA offers [Assessment of Chemical Exposure](#) (ACE) resources to perform rapid epidemiologic assessments. OIA's [Geospatial Research, Analysis, and Services Program](#) (GRASP) can help identify affected or at-risk areas, and OIA's Toxicological Section offers substance-specific toxicological expertise during an incident. OCHHA's [10 regional offices](#), located within the Environmental Protection Agency's (EPA) regional offices, provide unique technical and field experience from their assigned regions. [ATSDR's Partnership to Promote Localized Efforts to Reduce Environmental Exposure](#) (APPLETREE) recipients provide technical assistance and engage affected communities about potential exposures and ways to protect their health. [Pediatric Environmental Health Specialty Units](#), or PEHSUs, supported by ATSDR Office of Capacity Development and Applied Prevention Science (OCDAPS), provide information to affected communities on how to protect their health and help children cope during and after disasters. PEHSUs also educate healthcare professionals caring for the affected communities.

On June 14, 2021, a chemical explosion resulted in a large fire at one of the largest lubricant manufacturing facilities in the United States, in Rockton, Illinois, near the Wisconsin border. Smoke from the fire lasted several days, affecting communities miles away in each state.

A city dubbed as a "true Midwestern village," Rockton is home to nearly 8,000 residents, according to the 2020 Census. As the fire raged on in mid-June, an evacuation order was issued by the local fire department for residents and businesses within a 1-mile radius of the explosion site, to reduce exposure to hazardous materials. People within a second zone, from 1 to 2 miles out, were advised to stay inside their homes and keep their windows and doors closed. All people within 3 miles of the manufacturing facility were instructed to wear masks.

As the plume spread, health officials were concerned that volatile and semi-volatile organic compounds, asbestos, lead, cyanides, and acids could be present in the fire debris, due to the building age and chemicals used in its day-to-day operations. These hazards had the potential to cause cancer, heart and respiratory damage, and reproductive and developmental health effects. Action was critical to reduce the potential for harm. Furthermore, as a high energy fire, it was imperative that debris fields be mapped out to identify where the debris had landed and who was at most risk of exposure.

## **Supporting the Immediate Crisis Response**

Given the urgency, personnel from multiple federal, state, and local agencies and organizations responded to help Rockton. EM's expertise in chemical emergencies helped identify potential health effects in the immediate vicinity of the facility, such as respiratory irritation and cardiovascular effects in sensitive populations. After identifying harmful short-term exposures in the community, ATSDR provided affected

residents with resources for dealing with deposited dust and associated odors and handling stress after an environmental contamination.

EPA's Region 5 office requested assistance from ATSDR in determining next steps for screening, sampling, evaluation, and education. ATSDR supported the immediate crisis response over a 6-week span by



**Providing screening values for real-time air monitors of all recommended chemicals of concern**



**Leading the collaboration, alongside public health authorities, to review the environmental data collected by EPA and Illinois to evaluate potential contamination of air, surface water, sediment, and groundwater in the community**



**Recommending air sampling based on aerial images of the fire and information about chemical processes within the building**



**Developing factsheets with Illinois's state and local health departments to educate the community on [how to protect themselves after returning home from the fire](#)**

EM coordinated with ATSDR Region 5 office, the APPLETREE grantee at the Illinois Department of Public Health (IDPH), the Region 5 Pediatric Environmental Health Specialty Unit, NCEH/ATSDR Office of Communication, and OIA's surveillance team to support this work.

## **Listening and Responding to the Affected Communities**

Once ATSDR EM, the Illinois Department of Public Health, and Winnebago County Health Department collected and analyzed the environmental data, it was time to go to the people who mattered most—the Rockton residents, business owners, and first responders.

In early July, the county health director and state epidemiologist asked ATSDR to conduct an [Assessment of Chemical Exposures \(ACE\)](#) investigation. ATSDR OIA, along with state and county health officials and ATSDR regional staff, conducted a survey of residents in the 11 ZIP code areas identified by syndromic surveillance and plume modeling as the most affected, and responders. The goal was to assess possible exposures, health effects, and current needs due to the explosion and resulting smoke and debris.

Because of COVID-19 concerns, OIA did not perform its usual in-person surveys. They were fortunate to be able to use the county health department's patient engagement system, which had been used to register people for COVID vaccines, to reach more than 40,000 people in the 11 affected ZIP code areas with an online survey. The survey link was also shared through press releases, social media posts, and the county health department's website.

GRASP was consulted to prepare maps of survey participation, which identified an area of low participation near the location of the fire. ATSDR staff decided to visit this community to promote the survey and learned its residents were mostly older persons with limited internet access. Residents expressed concerns to the staff about longstanding groundwater contamination from an existing Superfund site located on the same site as the manufacturing facility. This conversation led to a request for more thorough water testing for the Superfund area, which was conducted by the Winnebago County Health Department.

This first attempt at completing the ACE survey online was very successful, with a total of 2,030 unique survey respondents within 2 weeks' time. Of the survey respondents, 45.1% reported one or more new or worsened symptoms since the fire, typically related to their ears, nose, and throat (69.7%); nervous system (52.2%); and eyes (41.8%). Four respondents reported being in the hospital after the fire.

Working with the CDC One Health office, OIA was able to develop a follow-up survey about pet and livestock health to people who said they had them in the first survey. GIS mapping and analysis of the responses was used to show where the smoke plume and fire debris traveled, document health symptoms, and identify gaps in first responder personal protection equipment.

OIA produced an initial summary and recommendations presentation for the health departments that was used by the county health department to create a presentation to the community about the reported exposures and health effects and guidance for about how to protect themselves and reduce exposure. The results were also made more broadly available in the [Morbidity and Mortality Weekly Report \(MMWR\) Notes from the Field article](#) and a more detailed analysis will be published in the future.

This case study demonstrates the level of quick response and collaboration needed for successful emergency response. By prioritizing emergency preparedness and activating established interpersonal relationships, response teams were able to form quickly to protect and empower community members and families in Rockton after this disaster.

# ATSDR 2021 ANNUAL REPORT

## WHAT'S NEXT

ATSDR is an innovative agency that seeks to protect communities more effectively and efficiently from harmful health effects of hazardous environmental exposures. Over the next year and beyond, novel efforts will focus on expanding our health equity and environmental justice work, continuing our work as a leader in understanding PFAS exposure, modernizing data strategies, and conducting an extensive data analysis of the Camp Lejeune cancer incidence and mortality data. These projects will continue to advance the mission of ATSDR to protect communities from harmful health effects related to exposure to natural and man-made hazardous substances.

### In this section:

Strengthening ATSDR's Environmental Justice and Core Health Equity Strategies	53
Preparing for the Future: PFAS Exposure Assessments and Multi-site Study	56
Advancing ATSDR's Data Strategy: Data Modernization	59
Conducting One of the Nation's Largest Cancer Incidence Studies: Camp Lejeune	60



# STRENGTHENING ATSDR'S ENVIRONMENTAL JUSTICE AND CORE HEALTH EQUITY STRATEGIES



*ATSDR's mission is to protect communities from harmful health effects that could result from exposure to hazardous substances. Foundational principles of ATSDR's work are health equity, environmental justice, and engaging and involving the communities who are expressing concern as a key part of the environmental public health process. The following strategies, resources, and tools highlight ATSDR's initiatives to advance health equity and environmental justice.*

## CORE Health Equity Science and Intervention Strategy

People who live and work in economically and socially marginalized settings continue to bear disproportionate effects of hazardous environmental exposures. ATSDR is broadening the reach of its equity and justice efforts by aligning with CDC's inaugural [CORE Health Equity Science and Intervention Strategy](#). During 2021–2023, ATSDR CORE goals will help communities and public health professionals address environmental health inequities by developing tools and data that empower them to identify and evaluate related factors. These tools include a comprehensive [Environmental Justice Index \(EJI\)](#) and an educational module on incorporating health equity into the public health assessment process.

---

## Public Health Assessment Health Equity Module

ATSDR's health assessors and regional offices evaluate community exposures and provide actionable information to marginalized communities. For example, ATSDR Region 10 is working with American Indian and Alaska Native tribes on five health consultations to evaluate exposures from drinking water or traditional and subsistence use on or near contaminated sites. ATSDR Health Equity Module (HEM) will be the latest addition to its [Public Health Assessment Guidance Manual](#). The HEM will guide public health professionals on how to evaluate health equity across the spectrum of public health assessments. HEM will outline a process for identifying sites with health equity or environmental justice concerns and provide guidance geared toward evaluating the unique needs of environmental justice communities.

---

## Environmental Justice Index (EJI)

In partnership with the Department of Health and Human Services' Office of Environmental Justice, ATSDR GRASP program and NCEH released the [Environmental Justice Index \(EJI\)](#), the first national, place-based tool designed to measure the cumulative impacts of environmental burden through the lens of human health and health equity.

The EJI builds off existing environmental justice indexes to provide a single environmental justice score for local communities across the United States so that public health officials can identify and map areas most at risk for the health impacts of environmental burden.

The EJI delivers a single score for each community so that public health officials can identify and map areas most at risk for the health impacts of environmental burden. Social factors such as poverty, race, and ethnicity, along with pre-existing health conditions, may increase these health impacts. This tool helps public health officials prioritize action for those communities most at need. Individuals and community-based organizations, public health officials at local, state, and federal levels, scientists, and researchers can use the EJI to

- Identify areas that may require special attention or additional action to improve health and health equity
- Educate and inform the public about their community
- Analyze the unique, local factors driving cumulative impacts on health to inform policy and decision making
- Establish meaningful goals and measure progress towards environmental justice and health equity

---

## **APPLETREE**

[ATSDR's Partnership to Promote Localized Efforts to Reduce Environmental Exposure \(APPLETREE\)](#) program is also supporting environmental justice and health equity efforts. ATSDR is working with APPLETREE participants to promote environmental justice and health equity through work at the regional and local levels, in alignment with [Justice40](#), a whole-of-government approach to expand investments in environmental justice, toxic waste remediation, and other areas.

---

## **Toxicological Profiles and PEHSUs**

ATSDR also works to provide the best available science and information about environmental contaminants, which often disproportionately affect communities at greater social and economic risk. [ATSDR's Toxicological Profiles](#) continue to provide state-of-the-science information to healthcare and public health professionals who are addressing exposure concerns in these communities. The [Pediatric Environmental Health Specialty Units \(PEHSU\)](#) network supported by ATSDR continues to advise parents and healthcare providers about how to protect and care for children potentially exposed to harmful chemicals.

## PREPARING FOR THE FUTURE: PFAS EXPOSURE ASSESSMENTS AND MULTI-SITE STUDY



*In 2022, ATSDR looks forward to grantees continuing work on the [Per- and Polyfluoroalkyl \(PFAS\) Multi-site Study](#), completing data collection for the [PFAS expanded environmental exposure investigation](#), and releasing the individual community reports and the final report for the [PFAS exposure assessments](#). Findings will help us learn more about health effects of PFAS exposure from PFAS-contaminated drinking water and other sources in differing populations. Findings also will help people better understand their risk for health effects associated with PFAS exposure.*

## PFAS Multi-site Study

[The Multi-site Study](#) (MSS) is designed to discover more about the relationship between PFAS exposure and health outcomes among differing populations and levels of PFAS exposure in communities across eight states exposed to PFAS-contaminated drinking water. This information will provide a better scientific understanding about the relationships between PFAS exposure and certain health outcomes and will help people across the nation understand their risk for health effects. ATSDR aims to enroll 2,100 children and 7,000 adults from the participating sites.

Data collection will focus on findings related to immune response, lipid metabolism, kidney function, thyroid disease, liver disease, glycemic parameters, and diabetes. After all data are collected and analyzed, each participant will receive their own test results, enabling them to learn more about their own exposure and health and potential next steps. An aggregate report evaluating data across all MSS study sites also will be released to inform public health practitioners about how PFAS affects human health.

---

## PFAS Exposure Assessment Releases

In 2022, ATSDR and CDC will complete the remaining PFAS [exposure assessments \(EAs\)](#) in communities near current or former military bases known to have had PFAS in their drinking water.

The primary goal of these assessments is to provide information to community residents about levels of PFAS in their bodies and how they can reduce exposure. The information also may be used to inform future studies evaluating the effects of PFAS exposure on human health. The [first EA](#) was released in November 2021 for the City of Westfield in Hampden County, Massachusetts, near Barnes Air National Guard Base. The remaining exposure assessments and a final report evaluating data across all EA sites will be released in 2022.

---

## PFAS Environmental Sampling

People can be exposed to PFAS through both drinking water and non-drinking water sources. In 2022, ATSDR and the Environmental Protection Agency (EPA) will investigate the potential for human exposure to PFAS from environmental sources other than drinking water. ATSDR will evaluate potential PFAS exposure inside the home by collecting samples from indoor air, indoor dust, and wet wipes for analyses. ATSDR also will evaluate potential exposure to PFAS from outdoor sources by sampling soil at residences and outdoor air in the community. In addition, participants will wear a silicone wristband that will be analyzed for any PFAS exposure the person might encounter during daily activities. Samples of locally grown produce also will be analyzed to evaluate PFAS concentrations that might contribute to dietary exposure.

The PFAS [environmental sampling](#) will occur at two PFAS EA sites, Hampden County, Massachusetts, and New Castle County, Delaware. Households who participated in these two EAs will be invited to participate in the environmental sampling. ATSDR anticipates recruiting approximately 30% of households from each EA, for a total of 80 households from Hampden County and 40 households from New Castle County.



## **What are PFAS?**

PFAS are manufactured chemicals that have been used since the 1940s. Some products, such as food packaging materials, water- and stain-repellent fabrics and carpets, firefighting foam, and some cosmetics, may still contain PFAS. PFAS are a public health concern because they can stay in people's bodies for a long time and have been linked to harmful health effects in humans. [Learn more about possible health effects of PFAS exposure.](#)

## ADVANCING ATSDR'S DATA STRATEGY: DATA MODERNIZATION



2022 will be a year of strategic alignment for ATSDR data. In collaboration with CDC, ATSDR is focused on solidifying and advancing its data strategy toward a new future state of connected, adaptable, and sustainable response ready systems and data that help to more effectively and efficiently respond to the evolving public health needs related to environmental contaminants.

## CONDUCTING ONE OF THE NATION'S LARGEST CANCER INCIDENCE STUDIES: CAMP LEJEUNE



*The Camp Lejeune Cancer Incidence Study is one of the largest studies of this type conducted in the United States. The study uses data linkages with state and federal cancer registries — a process of matching information from different sources about the same person to form a new dataset — to obtain individual-level cancer information.*

The [Camp Lejeune retrospective cohort Cancer Incidence Study](#) includes a total of 536,601 Marines, Navy personnel, and civilian workers. Those include Marines and Navy personnel who were stationed at U.S. Marine Corps Base Camp Lejeune, New River Air Station adjacent to Camp Lejeune, or Camp Pendleton at any time from April 1975 through September 1987. The civilian workers include those who worked at Camp Lejeune or Camp Pendleton at any time from October 1972 through December 1987.

This is one of the largest cancer incidence studies conducted in the United States, using data linkages from cancer registries in all 50 states, the District of Columbia, Puerto Rico, the Pacific Islands, and the U.S. Department of Veterans Affairs.

From the 1950s through the mid-1980s, drinking water at [Camp Lejeune](#) in North Carolina was contaminated with [trichloroethylene](#), [tetrachloroethylene](#), [vinyl chloride](#), and [benzene](#). The contaminants were in drinking water of family housing, barracks, officers' quarters, and non-residential buildings on the base. The heavily contaminated drinking water supply wells were shut down by February 1985.

In 2014, ATSDR initiated a retrospective cohort cancer incidence study of Marines and civilian employees at Camp Lejeune. The study was designed to include comparison cohorts of Marines and civilian workers unexposed to contaminated drinking water who were stationed at Camp Pendleton. ATSDR convened an expert panel meeting in the summer of 2014 to help guide the process for carrying out the study. In addition to cancer incidence data, this study is also evaluating cause of death information. The purpose of this study is to follow up on the findings from a mortality study of Marines and civilian employees at Camp Lejeune that was published in 2014.

During 2015, ATSDR prepared a draft study protocol that was reviewed by an expert panel and four independent peer reviewers. In December 2015, the Camp Lejeune Cancer Incidence Study received approval from the CDC Institutional Review Board to proceed.

In 2016, work began to complete the approval process for each registry in the nation. After 4 years of dedicated effort, data linkages were conducted in the fall and winter of 2020–2021. After manual review to verify the data linkage matches, ATSDR received the cancer incidence data in the spring of 2021.

ATSDR is conducting extensive data analyses of the cancer incidence and mortality data for the cohorts of Marines and plans to draft reports of the cancer incidence study and mortality studies of the Marines and civilians.

# I ATSDR 2021 PUBLICATIONS

## ATSDR Peer-Reviewed Publications

Bassan A, Alves VM, Amberg A, Anger LT, Auerbach S, Beilke L, Bender A, et al. [In silico approaches in organ toxicity hazard assessment: Current status and future needs in predicting liver toxicity](#). *Comput. Toxicol.*; 2021; 20(100187).

Bassan A, Alves VM, Amberg A, Anger LT, Beilke L, Bender A, et al. [In silico approaches in organ toxicity hazard assessment: Current status and future needs for predicting heart, kidney and lung toxicities](#). *Comput. Toxicol.*; 2021; 20(100188).

Berens AS, Palmer T, Dutton ND, Lavery A, Moore M. [Using search-constrained inverse distance weight modeling for near real-time riverine flood modeling: Harris County, Texas, USA before, during, and after Hurricane Harvey](#). *Nat. Hazards*. 2021; 105(1): 277–292.

Berman L, Casteel S, Unkart S, Charley PH, Singer N, Robinson D, et al. [Educating the future environmental health workforce during covid-19: Developing a virtual curriculum for Navajo student interns using the environmental health and land reuse certificate program](#). *J. Environ. Health*. 2021; 84(3): 44–49.

Bui DP, Kukielka EA, Blau EF, Tompkins LK, K., Bing KL, et al. [The occupational health effects of responding to a natural gas pipeline explosion among emergency first responders – Lincoln County, Kentucky, 2019](#). *Disaster Medicine and Public Health Preparedness*. 2021; 1–8.

Cruz MA, Rivera-González LO, Irvin-Barnwell E, Cabrera-Marquez J, Ellis E, Ellis B, et al. [Public health branch incident management and support as part of the federal government response during the emergency phase of Hurricanes Irma and Maria in Puerto Rico and the US Virgin Islands](#). *J. Emerg. Manage.* 2021; 19(8): 63–77.

Diesel J, Sterrett N, Dasgupta S, Kriss JL, Barry V, Esschert KV, et al. [COVID-19 vaccination coverage among adults — United States, December 14, 2020–May 22, 2021](#). *MMWR Recomm. Rep.* 2021; 70(25): 922–927.

Dunne EM, Morgan E, Wells-Moore B, Pierson S, Zakroff S, Haskell L, et al. [COVID-19 outbreaks in correctional facilities with work-release programs — Idaho, July–November 2020](#). *Morb. Mortal. Wkly. Rep.* 2021; 70(16): 589–594.

Fletcher KM, Espey J, Grossman MK, Sharpe JD, Curriero FC, Wilt GE, et al. [Social vulnerability and county stay-at-home behavior during COVID-19 stay-at-home orders, United States, April 7 –April 20, 2020](#). *Ann. Epidemiol.* 2021; 64 76–82.

Ford L, Lee C, Pray IW, Cole D, Bigouette JP, Abedi GR, et al. [Epidemiologic characteristics associated with severe acute respiratory syndrome Coronavirus 2 \(SARS-CoV-2\) antigen-based test results, real-time reverse transcription polymerase chain reaction \(rRT-PCR\) cycle threshold Values, subgenomic RNA, and viral culture results from university testing](#). *Clin Infect Dis*; 2021; 73(6); e1348–e1355.



Gold JAW, Kiernan E, Yeh M, Jackson B, Benedict K. [Health care utilization and outcomes associated with accidental poisonous mushroom ingestions — United States, 2016–2018](#). MMWR Surveill. Summ. 2021; 70(10): 337–341.

Hughes MM, Wang A, Grossman M.K, Pun E, Whiteman A, Deng L, et al. [County-level COVID-19 vaccination coverage and social vulnerability — United States, December 14, 2020–March 1, 2021](#). MMWR Surveill. Summ. 2021; 70(12): 431 –436.

Irvin-Barnwell EA, Benson KM, Lu M, Ragin A, Wheeler, Hoffman R. [Environmental toxins found historically in the polycythemia vera cluster area and their potential for inducing DNA damage](#). J Environ Anal Toxicol; 2021; 8(1): 1–6.

Keim ME, Runnels LA, Lovallo AP, Pagan MM, Roman RE, Ramery SM. [Measuring the efficacy of a pilot public health intervention for engaging communities of Puerto Rico to rapidly write hurricane Protection Plans](#). Prehospital Disaster Med. 2021; 36(1): 36–41.

Kalkowska DA, Franka R, Higgins J, Kovacs SD, Forbi JC, Wassilak SGF, et al. [Modeling poliovirus transmission in Borno and Yobe, Northeast Nigeria](#). Risk Anal. 2021; 41(2): 289–302.

Li Z, Jones C, Ejigu GS, George N, Geller AL, Chang GC, et al. [Countries with delayed COVID-19 introduction - characteristics, drivers, gaps, and opportunities](#). Global Health. 2021; 17(28).

Li Z, Serio T, Meiman J, He X, Ragin-Wilson A. [The biomonitoring of great lakes populations-iii program: The Milwaukee angler project](#). J. Environ. Health. 2021; 83(6): 40–43.

Liu M, Nordstrom M, Forand S. Lewis-Michl EL, Wattigney WA, Kannan K, et al. [Assessing exposures to per- and polyfluoroalkyl substances in two populations of Great Lakes Basin fish consumers in Western New York State](#). 2021 Dec 7; 240: 113902.

Mansouri K, Karmaus AL, Fitzpatrick J, Patlewicz G, Pradeep P, Alberga D, et al. [CATMoS: Collaborative acute toxicity modeling suite](#). Environ. Health Perspect. 2021; 129(4): 047013.

Melnyk LJ, Lin J, Kusnierz DH, Pugh K, Durant JT, Suarez-Soto RJ, et al. [Risks from mercury in anadromous fish collected from Penobscot River, Maine](#). Sci Total Environ. 2021; 781: 146691.

Morar C, Berman L, Unkart S, Erdal S. [Sustainable brownfields redevelopment in the European Union: An overview of policy and funding frameworks](#). J. Environ. Health. 2021; 84(4): 24–31.

Mumtaz MM, Buser MC, Pohl HR. [Per- and polyfluoroalkyl mixtures toxicity assessment “Proof-of-Concept” illustration for the hazard index approach](#). J. Toxicol. Environ. Health Part A. 2021; 84(13): 553–567.

Mumtaz MM, Nickle RA, Lambert JC, Johnson MS. [Advances in assessing hazard and risk to emerging threats and emergency response: Comparing and contrasting efforts of 3 federal agencies](#). Toxicol Sci. 2021; 185(1): 1–9.

Ojelade M, Rodriguez A, Gonzalez D, Otokunrin D, Ramachandrani S, Cuevas E, et al. [Travel from the United Kingdom to the United States by a symptomatic patient infected with the SARS-CoV-2 B.1.1.7 variant – Texas](#). Morb. Mortal. Wkly. Rep. 2021; 70(10): 348–349.

- Petriello MC, Mottaleb MA, Serio TC, Balyan B, Cave MC, Pavuk M, et al. [Serum concentrations of legacy and emerging per- and polyfluoroalkyl substances in the Anniston Community Health Surveys \(ACHS I and ACHS II\)](#). Environ Int. 2022 Jan; 158: 106907.
- Pray IW, Ford L, Cole D, Lee C, Bigouette JP, Abedi GR, et al. [Performance of an antigen-based test for asymptomatic and symptomatic SARS-CoV-2 testing at two university campuses - Wisconsin, September-October 2020](#). Morb. Mortal. Wkly. Rep. 2021; 69(5152): 1642–1647.
- Przybyla J, McClure PR, Zaccaria KJ, Pohl HR. [Chemical interactions and mixtures in public health risk assessment: An analysis of ATSDR's interaction profile database](#). Regul. Toxicol. Pharmacol. 2021; 125(104981).
- Qing Y, Yang J, Zhang Q, Zhu Y, Ruiz P, Wu M, et al. [Bayesian toxicokinetic modeling of cadmium exposure in Chinese population](#). J. Hazard. Mater. 2021; 413: 125465.
- Rogers RD, Reh CM, Breysse P. [Advancing per- and polyfluoroalkyl substances \(PFAS\) research: an overview of ATSDR and NCEH activities and recommendations](#). J. Expos. Sci. Environ. Epidemiol. 2021; 31(6): 96 –971.
- Schmitt HJ, Calloway EE, Sullivan D, Clausen WH, Tucker PG, Rayman J, et al. [Chronic environmental contamination: A systematic review of psychological health consequences](#). Sci. Total Environ. 2021; 772(145025).
- Sullivan D, Schmitt HJ, Calloway EE, Clausen W, Tucker P, Rayman J, et al. [Chronic environmental contamination: A narrative review of psychosocial health consequences, risk factors, and pathways to community resilience](#). Soc. Sci. Med. 2021; 276(113877).
- Surasi K, Nakayama JY, Johnson M, Martell S, Patrick S, Owen LR, et al. [Deployment of an electronic self-administered survey to assess human health effects of an industrial chemical facility fire — Winnebago County, Illinois, June–July 2021](#). Morb. Mortal. Wkly. Rep. 2021; 70(49): 1715–1716.
- Vaughan Watson C, Naik S, Lewin M, Ragin-Wilson A, Irvin-Barnwell E. [Associations between select blood VOCs and hematological measures in NHANES 2005–2010](#). J. Expos. Sci. Environ. Epidemiol. 2021; 31 (2): 366–376.
- Wattigney WA, Irvin-Barnwell E, Li Z, Ragin-Wilson A. [Biomonitoring of toxic metals, organochlorine pesticides, and polybrominated biphenyl 153 in Michigan urban anglers](#). Environ Res. 2021; 203: 111851.
- Wattigney WA, Savadatti SS, Liu M, Pavuk M, Lewis-Michl EL, Kannan K, Wang W, et al. [Biomonitoring of per- and polyfluoroalkyl substances in minority angler communities in Central New York State](#). Environmental Research. 2021; 204(Pt C): 112309.
- Zarus GM, Muianga C, Hunter CM, Pappas RS. [A review of data for quantifying human exposures to micro and nanoplastics and potential health risks](#). Sci. Total Environ. 2021; 756: 144010.
- Zhang C-Y, Flor S, Ruiz P, Ludewig G, Lehmler H-J. [Characterization of the metabolic pathways of 4-Chlorobiphenyl \(PCB3\) in hepG2 cells using the metabolite profiles of its hydroxylated metabolites](#). Environ. Sci. Technol. 2021; 55(13): 9052–9062.

## ALS-specific Peer-Reviewed Publications

Andrew AS, Bradley WG, Peipert D., Butt T, Amoako K, Piro EP, et al. [Risk factors for amyotrophic lateral sclerosis: A regional United States case-control study](#). Muscle Nerve. 2021; 63(1): 52-59.

Andrew AS, Piro EP, Li M, Shi X, Gui J, Stommel EW, et al. [The Incidence of Amyotrophic Lateral Sclerosis in Ohio 2016-2018: The Ohio Population-Based ALS Registry](#). Neuroepidemiology. 2021; 55(3): 196-205.

Bear TM, Malek AM, Foulds A, Rager J., Deperrior SE, Vena JE, et al. [Recruitment of population-based controls for ALS cases from the National ALS Registry](#). Amyotrophic Lateral Scler. Frontotemporal Degener. 2021; 22(5-6): 395-400.

Bledsoe M.J., Rechtman L, Wagner L, Mehta P, Horton DK, Kaye WE. [Analysis of biospecimen demand and utilization of samples from the national amyotrophic lateral sclerosis biorepository](#). Biopreservation Biobanking. 2021; 19(5): 432-437.

Mehta P, Raymond, Han MK, Larson T, Berry JD, Paganoni S, et al. [Recruitment of patients with amyotrophic lateral sclerosis for clinical trials and epidemiological studies: Descriptive study of the national ALS registry's research notification mechanism](#). J. Med. Internet Res. 2021; 23(12) e28021.

Mehta P, Raymond J, Punjani R, Larson T, Bove F, Kaye W, et al. [Prevalence of amyotrophic lateral sclerosis \(ALS\), United States, 2016](#). Amyotrophic Lateral Scler. Frontotemporal Degener. 2021; 23(3-4): 220-225.

Mitsumoto H, Garofalo DC, Gilmore M, Andrews L, Santella RM, Andrews H, et al. [Case-control study in ALS using the National ALS Registry: lead and agricultural chemicals are potential risk factors](#). Amyotrophic Lateral Scler. Frontotemporal Degener. 2021; 23(3-4): 190-202.

Nelson LM, Topol B, Kaye W, Raymond J, Horton DK, Mehta P, et al. [Evaluation of the completeness of ALS case ascertainment in the U.S. National ALS registry: Application of the capture-recapture method](#). Neuroepidemiology. 2021; 56: 104-114.

Raymond J., Mehta P., Larson T., Factor-Litvak P., Davis B., Horton K. [History of vigorous leisure-time physical activity and early onset amyotrophic lateral sclerosis \(ALS\), data from the national ALS registry: 2010-2018](#). Amyotrophic Lateral Scler. Frontotemporal Degener. 2021; 22(7-8): 535-544.

Raymond J, Mehta P, Larson T, Piro E., Horton KD. [Reproductive history and age of onset for women diagnosed with amyotrophic lateral sclerosis: Data from the National ALS Registry: 2010-2018](#). Neuroepidemiology. 2021; 55(5): 416-424.

## GRASP-specific Peer Reviewed Publications

- Barry V, Dasgupta S, Weller DL, Kriss JL, Cadwell BL, Rose C, et al. [Patterns in COVID-19 vaccination coverage, by social vulnerability and urbanicity - United States, December 14, 2020-May 1, 2021](#). *Morb. Mortal. Wkly. Rep.* 2021; 70(2): 818–824.
- Carlson SA, Whitfield GP, Davis RT, Peterson EL, Fulton JE, Berrigan D. [Associations between perceptions and measures of weather and walking, United States—2015](#). *Int. J. Environ. Res. Public Health.* 2021 18(16): 1–13.
- Medley AM, Gasanani J, Nyolimati CA, McIntyre E, Ward S, Okuyo B, et al. [Preventing the cross-border spread of zoonotic diseases: Multisectoral community engagement to characterize animal mobility—Uganda, 2020](#). *Zoonoses Public Health.* 2021; 68(7): 747–759.
- Mendes A, Palmer T, Berens A, Espey J, Price R, Mallya A, Brown S. [Mapathons versus automated feature extraction: a comparative analysis for strengthening immunization microplanning](#). *Int. J. Health Geogr.* 2021; 20(1): article number 27.
- Miller PW, Reesman C, Grossman MK, Nelson SA, Liu V, Wang P. [Marginal warming associated with a COVID-19 quarantine and the implications for disease transmission](#). *Sci. Total Environ.* 2021; 780: 146579.
- Ousmane S, Ibrahim DD, Goel A, Hendley WS, Mainou BA, Palmer T, et al. [Achieving high poliovirus antibody seroprevalence in areas at risk of vaccine-derived poliovirus transmission—Niger experience](#). *Open Forum Infect. Dis.* 2021; 7(8): 1–7.
- Peterson EL, Carlson SA, Ussery EN, Dunn I, Brown DR, Galuska DA. [Differences in park plans and policies across U.S. municipalities](#). *J. Park Recreat. Admin.*; 2021; 34(4).
- Rickless DS, Wilt GE, Sharpe JD, Molinari N, Stephens W, Leblanc TT. [Social vulnerability and access of local medical care during Hurricane Harvey: A spatial analysis](#). *Disaster Med. Public Health Preparedness*; 2021; 1–9.
- Sharpe JD, Wolkin AF. [The epidemiology and geographic patterns of natural disaster and extreme weather mortality by race and ethnicity, United States, 1999-2018](#). *Public Health Rep.* 2021; 00(0); 1–8.
- Troppy S, Wilt GE, Whiteman A, Hallisey E, Crockett M, Sharpe J., et al. [Geographic associations between social factors and SARS-CoV-2 testing early in the COVID-19 pandemic, February–June 2020, Massachusetts](#). *Public Health Rep.*; 2021; 136(6): 765–773.
- Ussery EN, Omura JD, McCain K, Watson KB. [Change in prevalence of meeting the aerobic physical activity guideline among US adults, by states and territories-behavioral risk factor surveillance system, 2011 and 2019](#): *J. Phys. Act. Health.* 2021; 18(1): S84–S85.
- Whiteman A, Wang A, McCain K, Gunnels B, Toblin R, Lee JT, et al. [Demographic and social factors associated with COVID-19 vaccination initiation among adults Aged ≥65 Years — United States, December 14, 2020–April 10, 2021](#). *MMWR Recomm. Rep.* 2021; 70(19): 725–730.

## Book Chapters

Fowler BA, Chou C-HSJ, Jones RL, Costa M, Chen C-J. [Arsenic](#). Handb. on the Toxicol. of Met, Vol. II – Specific Metals. 5th ed. Cambridge (MA); 2021.

Keith LS, Faroon OM. [Uranium](#). Handb. on the Toxicol. of Met. 5th ed. Cambridge (MA); 2021.

Keith LS, Maples-Reynolds N. [Germanium](#). Handb. on the Toxicol. of Met. 5th ed. Cambridge (MA); 2021.

---

## 2021 Draft & Final Completed Tox Profiles

[1,2-Dichloropropane | Toxic Substances | Toxic Substance Portal | ATSDR \(cdc.gov\)](#)

[1,2,3-Trichloropropane | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Dinitrophenols | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[3,3'-Dichlorobenzidine | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Acetone | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Pentachlorophenol | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Chlorophenols | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Aldrin/Dieldrin | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Disulfoton | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Perfluoroalkyls | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[1,1,2-Trichloroethane | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Hexachlorobutadiene | Toxicological Profile | ATSDR \(cdc.gov\)](#)

[Endrin | Toxicological Profile | ATSDR \(cdc.gov\)](#)



## Public Health Assessment and Exposure Assessment Reports

US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Office of Community Health Hazard Assessment. [Review of anadromous fish: Penobscot River, Indian Island, Maine](#). Maine (ME). US Department of Health and Human Services. 2021 May.

Tennessee Department of Health, US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Office of Capacity Development and Applied Prevention Science. [Former custom cleaners NPL site soil, soil, gas, and indoor air evaluation](#). Tennessee (TN). US Department of Health and Human Services. 2021 Apr.

US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Office of Community Health Hazard Assessment. [Evaluation of Per- and Polyfluoroalkyl Substances \(PFAS\) in private wells near the Saint Gobain performance plastics site in Southern New Hampshire](#). Public Comment version. New Hampshire (NH). US Department of Health and Human Services. 2021 Dec.

US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Office of Community Health Hazard Assessment. [Public health evaluation of surface soil data at the Weirton BOP implosion site](#). West Virginia (WV). US Department of Health and Human Services. 2021 Dec.

National Center for Environmental Health, Agency for Toxic Substances and Disease Registry. [Westfield Hampden County, Massachusetts information to protect our communities Per-and Polyfluoroalkyl Substances \(PFAS\) Exposure Assessment Report](#). Massachusetts (MA). National Center for Environmental Health. 2021 Nov.

---

## Educational Products

US Department of Health and Human Services, Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry. [ATSDR clinician brief: Radon](#). 2021.

Agency for Toxic Substances and Disease Registry. [ATSDR's Community engagement playbook](#). 2021.



**U.S. Department of  
Health and Human Services**  
Agency for Toxic Substances  
and Disease Registry