EPI Center Stakeholder Summit on Science in Local Decision Making on Drinking Water Safety

February 6-7, 2020
Hyatt Regency Capitol Hill | 400 New Jersey Ave NW, Washington, DC

MEETING REPORT

SUMMIT PURPOSE AND PARTICIPANTS

On February 7th 2020, the American Association for the Advancement of Science (AAAS) Center for Scientific Evidence in Public Issues (EPI Center) held the third summit in a series of stakeholder meetings designed to engage decision-maker audiences, from state and local policymakers to judges and others, in exploring how and on what issues scientific evidence can be more effectively developed, accessed, and integrated into decision-making processes. The EPI Center seeks to better understand the issues that decision-makers are grappling with and where the Center can be of assistance by sharing clearly and strategically communicated scientific evidence.

This summit explored the use of scientific information on drinking water safety in local decision-making, with particular focus on per- and polyfluoroalkyl substances (PFAS) and other emerging contaminants. Participants received an overview of the current science related to these topic areas, and then discussed their experience grappling with these issues, the extent to which local policymakers have access to scientific information to inform their decision making, and what approaches/resources, if any, could help make such information more accessible/usable. The session was organized in close collaboration with the National League Cities (NLC). Participants included local elected officials, NLC council members, and other decision makers from 18 states, as well as experts on the topic areas. (*Full roster and contact information on p.11)*

The goals of the meeting were to:

- Provide a high-level overview of the scientific evidence on drinking water safety with a specific focus on PFAS and emerging contaminants;
- Map the critical, science-based issues and decisions local officials are contending with now and anticipate in the near future;
- Discuss how scientific evidence is and is not informing local decision making around issues, such as understanding when and why PFAS and other contaminants found in drinking water (and other routes of exposure) are of concern to communities, how to assess where those substances are coming from and who is responsible for mitigating exposure, and how best to understand options for reducing if not eliminating risks posed by these substances;
- Explore the extent to which existing scientific information is accessible and useful, and why; and
- Develop ideas for how AAAS could be most helpful in providing compiled or consolidated scientific information to help fill in current gaps and inform local decision making.

DISCUSSION THEMES

Participants Perspectives and Starting Points
Prior to the summit, through surveying and phone interviews, participants were asked to indicate whether and how drinking water safety issues have surfaced in their communities, and to articulate some of their most pressing questions related to this topic. *(See the attached PDF "Pre-Summit Survey Themes" for full results.)*

Nearly all respondents indicated that water contamination is an issue with which their community, or a neighboring community, has grappled. PFAS, including PFOS and GenX, were the mostly commonly mentioned contaminants of concern. Other contaminants mentioned included heavy metals, microplastics, BPA, PCEs, coal ash, and fertilizer run off.

Participants articulated a range of questions related to water contaminants and/or areas where they saw a need for more scientific information to support decision making. The most common included:

- More information on the toxicity and health risks of different contaminants.
- How are the standards for acceptable levels of PFAS and other contaminants set? Why are there differences state to state, or between states and the EPA?
- When and how should a community test for potential water contaminants?
- What testing is (or may be) already being done, and by whom? Is that information made publically available? Are there testing best practices?
- More information about treatment options, and how to select the right, cost effective and health protective treatment or management approach for your community.

Throughout the course of discussion, participants shared stories and examples from their communities to illuminate the types of circumstances in which these questions arise. Participant experiences varied widely, underscoring the ubiquity and complexity of water quality issues, as well as the complex intersection between this issue and a community's economic, infrastructure, and political context. Examples included:

- Aqueous film forming foams (AFFF) used in firefighting are among the most high profile sources of PFAS contamination, particularly in wildfire-prone areas and communities in, or adjacent to, military installations (where AFFF was regularly used in training) and airports. The high concentrations of PFAS in AFFF have found their way into water systems across the country. Though some states have banned PFAS-containing firefighting foams, others still allow (and in some cases require) fire fighters to carry AFFF. Even where AFFF use has been discontinued, communities grapple with clean up and treatment for years, and even decades, later due to PFAS's (often referred to as "forever chemicals") environmental persistence.
- Many communities are also affected by PFAS and other contaminant-containing leachate from landfills, the result of chemical waste, biosolids, and degrading consumer goods (mattresses, fabrics, coatings, and many more). Leachate enters surface and ground water, contaminating wells and drinking water, but also impacting agriculture and other industry. Various states have adopted standards/regulation for landfill leachate. However, as solid waste facilities limit the materials they will accept to meet these standards, communities are left to determine *where else* to put contaminated waste. Chemical waste incinerators are few and expensive. Many communities lack the infrastructure and/or resources to take advantage of these facilities.

- Contamination from agricultural runoff (nitrates, chloride, etc.) continues to affect drinking water in many parts of the country. In some communities, this phenomenon is complicated by geological factors and/or compounded by issues of water access and scarcity.
- Communities are also addressing contamination concerns from industrial chemicals used in mining operations (current and abandoned). In this context, contaminants of concern include, arsenic, cyanide, and heavy metals.
- Other issues and water contamination challenges participants mentioned included: storm and waste water runoff, asphalt sealant and treatment (e.g. salting), lead from a variety of sources, manufacturing emissions, and others.
- Across these examples, questions and challenges with responsibility and cost pervaded. Especially for legacy pollutants, it can be difficult (if not impossible) to track contamination back to a single polluter with certainty, and more difficult still to hold that entity or entities if more than one responsible for remediation. Participants described some cases in which cities and states have reached settlements with polluters to fund cleanup, but many times lack of direct liability or legal loopholes prevent such outcomes, and mitigation becomes a de facto public/community responsibility. Participants saw a need for strengthening legislation to hold polluters accountable, as well as economic data to help justify cleanup and treatment costs when they do, in fact, fall on public budgets.

Expert Panel

To begin to answer the questions participants raised, a series of scientific experts provided an overview of the science related to drinking water safety, PFAS, and other emerging contaminants. Tadbir Singh, Program Associate, and Patricia Reyes, Director, Interstate Technology and Regulatory Council (ITRC), provided an introduction to PFAS, their health risks, and the evolving policy landscape surrounding these substances. Dr. Michelle Crimi, Professor, Clarkson University, covered a range of current treatment and remediation approaches for PFAS-contaminated water, as well as new treatment solutions on the horizon. Dr. Christina Alito, Process Engineer, HDR, Inc., offered strategies for monitoring risk and communicating risk to communities. Finally, Lt. Brad Goodwin, CDC's Agency for Toxic Substances and Disease Registry (ATSDR), presented on the Centers' recent activities related to PFAS. *(Brief synopses provide below. Full presentations are attached as appendices.)*

PFAS – What Are They, Why Do We Care, & What Are We Doing About Them?

Tadbir Singh began with an overview of the characteristics, chemical properties, exposure pathways, and health risks of PFAS. PFAS are a class of over 4000 substances that were widely used in industrial processes and consumer goods for their oil, water, and stain-repellent properties. Many PFAS are extremely persistent and mobile, and because of this, and depending on their chain length, they accrue in a variety of environments, including ground and surface water, plants, soils and sediments, and in humans and other animals. Today, PFAS are in the environment all around the world. Humans are exposed to PFAS through a variety of pathways, including drinking water, meats and produce, consumer products, and air emissions. PFOS, PFHxS, and PFOA are among the most common and most studied PFAS species. These are linked to a range of health effects, including liver, immunological, reproductive, and cardiovascular effects, as well as cancer. Ms. Singh explained that there are fewer studies on other PFAS, but early indicators point to similar effects.

Patricia Reyes described a series of actions at the federal and state level to regulate PFAS. Nationally, PFOS, PFHxS, and PFOA were phased out of commercial use in 2015 (with some exceptions such as fire foam). The U.S. Environmental Protection Agency (EPA) has set lifetime health advisories for PFOA and

PFOS, but enforceable standards, like a maximum contamination level (MCL), are still being evaluated[1]. The EPA and other federal agencies are exploring ways PFAS could be addressed through existing legislation and rulemaking, such as the Toxic Substances Control Act (TSCA) and Clean Water Act (CWA), though for the most part these are still in the review process. Many bills related to PFAS have been introduced. However, Ms. Reyes noted that the time and resources required to evaluate potentially toxic substances and the sheer number of PFAS species, present significant challenges to regulating PFAS within the current regulatory framework.

Ms. Reyes explained that, absent a federal standard, states are independently setting values for drinking water guidelines, which are influenced by a number of factors, including uncertainty factors, lab animal-to-human extrapolation, risk to vulnerable populations, and consideration of existing state policy. Varying interpretation of these factors is one reason why states have arrived at different standards, complicating the regulatory landscape. A number of states have also sought to curb PFAS exposure through product bans and hazardous waste restrictions.

Treatment of PFAS-Contaminated Water

There are several reasons PFAS confound traditional water treatment methods. Chief among them are PFAS' enduring nature (for which they were specifically designed), and the fact that PFAS precursors break down into other chemicals of concern. Dr. Crimi provided an overview of PFAS-contaminated water treatment options, dividing them into three main approaches: immobilization, separation, and destruction. Immobilization and separation involve removing PFAS from water through chemical processes or sorption in binding agents like carbon. Destruction involves breaking down PFAS through high-energy processes like incineration. Dr. Crimi noted that the most efficient treatment methods combine separation and destruction to concentrate PFAS in a smaller volume before incineration. She described a range of treatment options, including carbon-based sorption, ion exchange, reverse osmosis, and redox manipulation, as well as the pros and cons of each. For example, carbon sorption is relatively less energy intensive, but hard to predict and less effective on short-chain compounds. While reverse osmosis is widely effective, but highly resource intensive and mostly applicable only in low flow systems. In response to questions about the effectiveness of in-home/under-the-sink filtration systems, Dr. Crimi noted that they are much less effective for PFAS than industrial treatment facilities because they involve less contact time (through filtering membranes) and require regular user maintenance.

Technical Support on PFAS Policy

Dr. Alito outlined a project HDR is undertaking in partnership with the American Water Works Association (AWWA) to provide information about PFAS to federal policy makers and assist utilities in supporting state-level policy discussion. As part of this effort, AWWA is developing a risk assessment framework to guide utilities in assessing the PFAS risk in their service areas and potential sources of exposure. Within this framework, AWWA and HDR are developing PFAS speciation profiles (or "fingerprints") to link contamination found in water samples to specific types of common PFAS sources (e.g. AFFF, industrial sites, landfills). Based on risk assessment results, the framework will offer guidance to utilities on implementing drinking water sampling/monitoring programs and risk mitigation strategies through source water management and/or treatment. Finally, the risk management framework will provide strategic guidance on public risk communication and crisis communication for PFAS. Dr. Alito noted that a key component of effective risk communication is proactive risk assessment, so that a municipality can identify potential risks early (i.e. before they become a public concern) and control the

[1] Subsequent the summit, on February 20, EPA released a proposed decision to set MCLs for PFOA and PFOS https://www.epa.gov/newsreleases/epa-announces-proposed-decision-regulate-pfoa-and-pfos-drinking-water

narrative around how risks are being, and should be, addressed. She added that it is important to align messaging and terminology across sectors (e.g. utilities and public health departments) and agencies (e.g. use the same terminology EPA uses to describe toxicity levels). Other experts also added the important caveat that a community's level of public concern does not always correlate with its level of risk (i.e. there may be quite vocal concern from communities with relatively low exposure risk and little/no publically expressed concern in communities with a relatively high exposure risk). AWWA aims to release these guidance materials in early March 2020.

An Overview of ATSDR's PFAS Related Activities and Resources

ATSDR is a non-regulatory agency within the Centers for Disease Control and Prevention that helps reduce exposure to hazardous chemicals by assessing the health risks of chemicals and identifying and mitigating exposure to harmful chemicals in communities. Lt. Goodwin described ATSDR's role in addressing PFAS concerns and its activities related to PFAS. CDC has deemed human exposure to PFAS a public health concern. As noted, studies have shown PFAS may interfere with humans' hormone and immune systems, and increase the risk of some cancers. However, more research is needed, and this is one of ATSDR's primary roles with regard to PFAS – to expand the science on the relationship between PFAS and health outcomes. In 2018, the Centers received funding to conduct exposure assessments in communities near military installations and conduct a multi-site health study in communities across the country, with the purpose of investigating the health effect of PFAS exposure, particularly through drinking water. This study is underway at its first site, the Pease International Tradeport. In addition to these studies, ATSDR is in the process of developing a toxicology profile for PFAS, a draft of which is available while awaiting finalization. Lt. Goodwin, pointed participants to other ATSDR resources on PFAS, including its Guidance for Clinicians and PFAS Exposure Assessment Technical Tools (PEATT), which is available upon request.

Discussion and Q&A

Following these presentations, participants engaged in discussion of what was shared, and asked additional questions of the expert panelists. Through this process, several other key points emerged:

- Studies have shown that PFAS bio accumulate in plants and animals, and that PFAS transfer into humans through ingestion. However, there is less research on the effects of PFAS on plants and animals (i.e. whether they are harmful) or on whether/how PFAS impact the food chain or ecosystems downstream. There is also little research on how PFAS reach and affect pet animals (though this is a frequent question among concerned owners). And, as mentioned, though PFAS are known to bio accumulate in humans and have been linked to a variety of negative health effects, more research is needed on the human health effects of PFAS and at what level of exposure they occur.
- The majority of PFAS exposure research has focused on drinking water and food. There have not been many studies on exposure through dust/inhalation, so this exposure pathway is less understood. However, experts suggested that communities and policy makers should focus attention primarily on exposure through ingestion (known pathways of high exposure), except for in communities near facilities known to have high PFAS emissions.
- Though certain PFAS have been banned from commercial use, companies generally are not required to report whether and which PFAS are present in the consumer good they produce, which makes it difficult to assess how much exposure people have through these products. Participants flagged this lack of reporting requirement, such as inclusion in the Toxic Release

Inventory (TRI), as a potential policy gap, related to early discussion around holding users/producers of PFAS responsible for pollution and exposure.

- Given the remaining uncertainty around the health effects of PFAS, some participants questioned why states and communities are already moving to regulate PFAS and investing in treatment. Experts clarified that while there is more research to be done, the scientific community widely agrees that PFAS present health concerns. It is more a question of clearly linking PFAS to specific health outcomes and determining what level of exposure presents a health risk to humans. And, since PFAS can persist in the body for years, it is safer to begin to try to limit exposure now, while these questions are still being answered.

Breakout Discussions

Drawing on these presentations and insights, participants broke into two discussion groups to further explore questions and concerns related to drinking water safety at specific decision points: monitoring/detection, risk assessment, risk management, and risk communication. Each group was tasked with: 1) Identifying specific questions/types of information under each category that would be particularly beneficial to local decision making; and 2) identifying potential activities the EPI Center (or other entities) could undertake to support the use of scientific information in local decision making. The following captures key points of discussion from both small group sessions and the plenary report out.

What specific questions/types of information related to *monitoring/detection* would be particularly beneficial to local decision making?

• What tools/resources are there to identify the source of PFAS contamination? Is it always possible to identify a source or sources?
  ○ Expert participants explained it is often not easy to connect contamination to a specific source with high certainty. However, tools are emerging to make this more possible (e.g. the previewed AWWA "fingerprint" tool).
• If multiple contamination sources are identified, is it possible to identify which contaminants came from which source for the purposes of designating responsibility?
• Can you track PFAS contamination back to a single event (e.g. a particular fire foam use), or to the various routes of exposure?
• The most common method for testing for PFAS in drinking water, EPA's method 537.1, only test for 29 species. Are the testing methods available for other PFAS species and should communities be testing for these as well?
  ○ Currently, tests are approximately $300 to $500 per sample and, due to continued high demand from more states establishing standards, costs are unlikely to go down in the near term
  ○ Expert participant noted that communities should beware of scam testing options. There are actors who offer low-cost, but typically not validated, water testing.
• Who might already be testing water in communities (e.g. military bases, utilities, state agencies and/or voluntary entities) and are those data available publicly?
• Who sets standards for validating new testing methods?

What specific questions/types of information related to *risk assessment* would be particularly beneficial to local decision making?

- Who is responsible for conducting risk assessments related to PFAS in drinking water? What about for other exposure pathways?
- Are there risk assessment tools/resources for exposure pathways other than water?
- How is the risk to vulnerable populations (e.g. pregnant mothers, infants) assessed, and how does/should that inform risk mitigation for a whole community?

What specific questions/types of information related to *risk management* would be particularly beneficial to local decision making?

- How can local decision makers assess what risk management strategy/plan is appropriate for their community? What experts and/or stakeholders should be involved?
    - Are there recommended methodologies for good risk management available?
    - Is there a compilation of information/learnings from risk assessments done in military bases and co-located communities?
    - Are decision trees (or other such tools) available to assist with local decision making, or could they be constructed?
- How should a community test and determine the needed robustness of its water treatment system(s)? Should/how should communities account for emerging contaminants in the design of new treatment facilities? How should they balance preparing for potential future threats against over-design or extraneous use of public funds?
- What innovative policy and/or financing solutions have helped communities pay for the cost of PFAS mitigation, particularly smaller communities?
    - Would a national requirement for testing help raise awareness and drive costs down? How much of a burden would it be to enforce?

What specific questions/types of information related to *risk communication* would be particularly beneficial to local decision making?

- What guidance is there on the balance between transparency/providing community members with appropriate information and over inundating the public and/or causing undue alarm?
    - Expert participants offered that, ideally, public risk communication campaigns should include recommended actions community members can take in response, as appropriate to the community and circumstances. Communicating risks without some information about how the community is (or should be) responding can create public confusion or frustration. That said, while studies connect PFAS (and other contaminants) to negative health impacts, advising action can be challenging when these effects are still being researched. However, this should not prevent community leaders from being proactive, forthcoming, and transparent about sharing information on these issues and any identified risks to the community.
- What public guidance is there for disposal of PFAS containing goods, or other contaminated waste?
- Are there comparisons that can be made between the risk of PFAS exposure and other, more commonly understood, risks to support public communication (e.g. the way air pollution risk is sometimes described in terms of it equivalency to smoking some number of cigarettes)?

What specifically could the EPI Center (or other entities) do to support the use of scientific information in local decision making and/or support communities in address water quality issues?
Potential Activities EPI Center Could Undertake • Encourage/support development of an enforceable, national standard for PFAS in drinking water to lessen confusion around different states have different standards. As noted, states largely draw on the same studies to set these values. The reason states have adopted differing values has more to do with how they are applying and interpreting various factors related to the science (e.g. uncertainty, risk to vulnerable population, economic factors). So perhaps one approach to aligning values could be aligning interpretation of these factors. • Establish a clearing house of information from federal agencies available to the public. Federal sources can carry a lot of weight with some state and local communities and officials. • Convene focus groups to test messaging around PFAS risk communication. What resonates with people? What is understandable? • Host a "fly in" event to engage with federal policy makers on these topics, advocate for more resources for research, and generate more attention on water quality generally. • Replicate this summit model within states and with other key stakeholder groups (e.g. county commissioners, consumers, manufacturers). **Potential Activities Other Entities Could Undertake** • Develop a state-by-state database of legislation related to PFAS and other emerging contaminants, as well as of innovative treatment solutions and financing approaches. • E.g. collect and/or generate cost/benefit analyses for investing in PFAS treatment (drawing on states like New Hampshire, Michigan, and others who already have done this work). • Explore ways to lower the cost of water testing methods for PFAS. Currently, there are relatively few certified testing facilities, and the cost of current testing presents a barrier to some communities. • Develop effective alternatives to AFFF and/or explore alternatives already used in other countries. • Improve consumer confidence reports from utilities. Currently they only report any substances/contaminants that were detected, but not what substances were and were not monitored.

Horizon Scan

To close, participants reflected on other topics related to water that are, or are expected to, significantly affect communities, and on which greater access to scientific information would be beneficial. Participants built on answers given in the pre-meeting survey. Participants also pointed to other community stakeholders and decision makers they felt should be engaged in these types of discussion, as well as potential originations through which to reach them.

On what other issues is there need for more/more accessible scientific evidence?
• Other environmental contaminants of concern: Heavy metals; micro plastics, BPA, PCEs, coal/fly ash, pharmaceutical waste, salt, storm water and fertilizer run off.

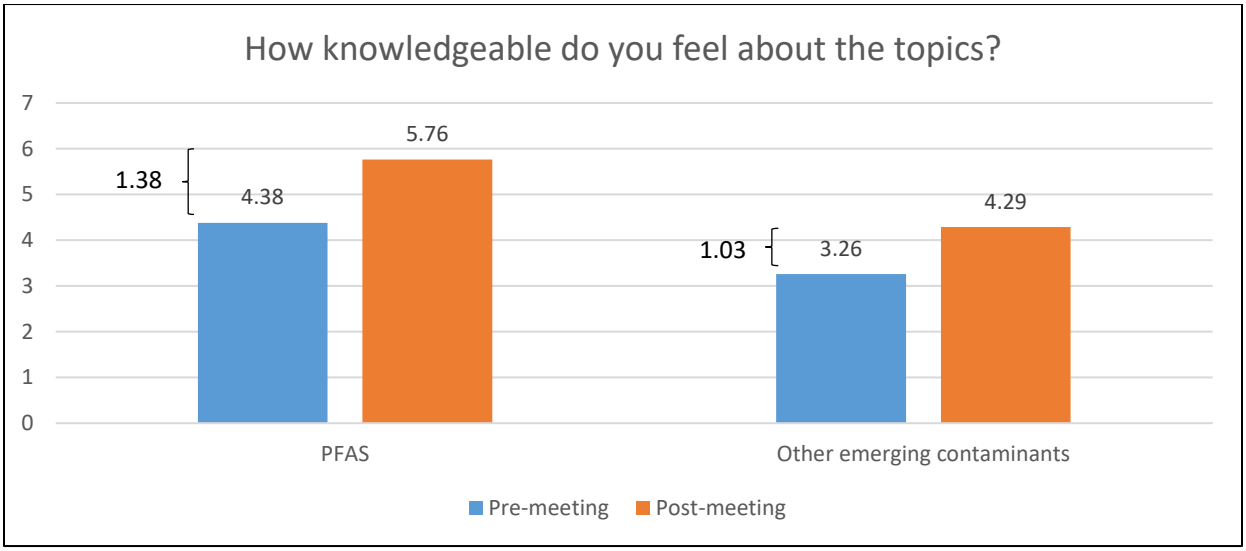
- The impact of water contamination on water access/scarcity, and water issues generally (e.g. how industrial and agricultural water use impacts natural systems and drinking water volumes).
- Human exposure to chemicals of concern through food and associated health risks.
- Long-term health and environmental effects of fracking.
- Air pollution (i.e., coal ash, or other industrial or manufacturing emissions).
- Climate change and its implications for city planning and public health and safety (flooding, heat water, food and water insecurity, etc.) – particularly in the face of environmental protection rollbacks.
- Sustainability initiatives in public works/operations.

What other stakeholders and decision makers should be engaged in discussions on this topic, and similar discussions?

- County commissioners (National Association of Counties)
- Metro agencies
- Consumer and community representatives and citizen scientists (Union of Concern Scientists)
- Utilities and public works managers
- Producers and manufacturers (particularly those that heavily use chemicals of concern)
- Public health officials (National Association of County and City Health Officials, National Association of State Health Officials)
- State legislators (National Conference Of State Legislatures)

PRE- AND POST-MEETING EVALUATION RESULTS

The following summarizes key results from the pre- and post-meeting evaluations completed by participants.



What were your expectations for this meeting and were they met?

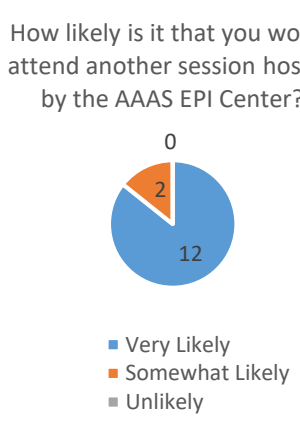
- Most participants indicated that their expectations were to gain better understanding of the topic areas and related policy/legislation, as well as to meet and learn from other officials grappling with these issues in other communities across the country. Nearly all said these expectations were met.

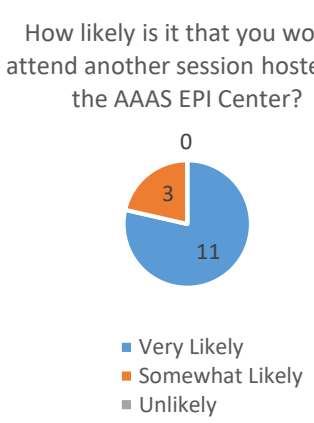
What part of the session did you find most valuable and why?

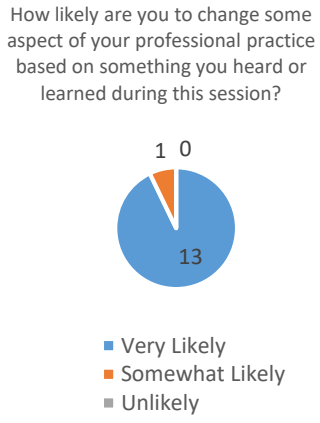
- Most participants indicated that they found the expert presentations most valuable.
- Many also said they gained a lot from simply hearing how other communities are handling these issues.

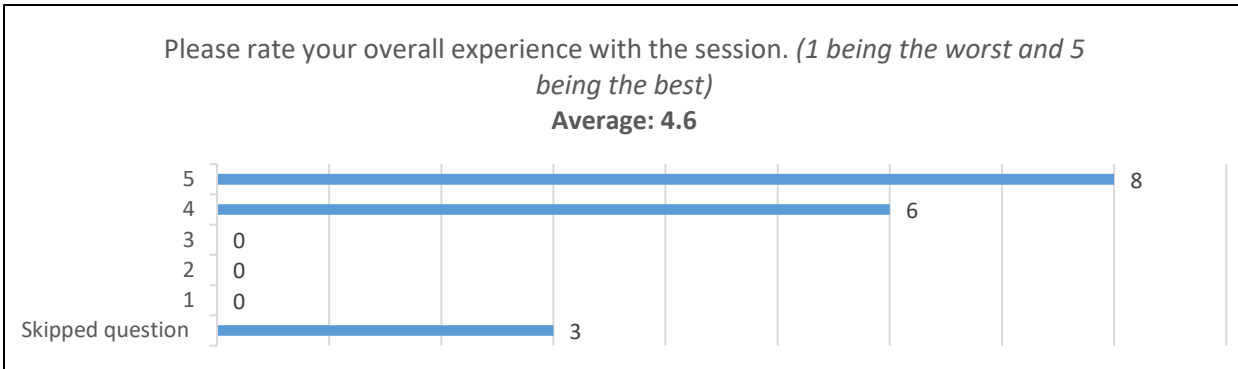
What would you have changed about the session and why?

- Some participants expressed a desire for more information on specific topics (e.g. health effects, economic implications, risk assessment). Participants particularly mentioned wanting more information on emerging contaminants, which were not covered in discussion nearly as thoroughly as PFAS.









EPI Center Stakeholder Summit on Science in Local Decision Making on Drinking Water Safety

PARTICIPANT ROSTER

Participants

Kitty Barnes
Commissioner
Catawba County, NC
KBarnes@CatawbaCountyNC.gov

Rich Calbi
Director, Ridgewood Water
Village of Ridgewood, NJ
rcalbi@ridgewoodnj.net

Deborah Calvert
Councilmember
Minnetonka, MN
dcalvert@minnetonkamn.gov

Wally Campbell
Councilmember
Goodyear, AZ
Wally.Campbell@goodyearaz.gov

TJ Cawley
Mayor
Morrisville, NC
TJCawley@townofmorrisville.org

Daniel Corona
Mayor
West Wendover, NV
mayor@westwendovercity.com

Chris Coudriet
County Manager
New Hanover County, NC
CCoudriet@nhcgov.com

Jerry Deschane
Executive Director
League of Wisconsin Municipalities, WI
jdeschane@lwm-info.org

Ramon Hache
Mayor
Village of Ridgewood, NJ
rhache@ridgewoodnj.net

Robert Harvie
Commissioner
Bucks County, PA
rjharvie@buckscounty.org

Denise Ihrig
Water Department Manager
Dubuque, IA
Dihrig@cityofdubuque.org

Peter King
Chief Executive Officer
Association of Washington Cities, WA
peterk@awcnet.org

Sue Leeming
Mayor
DeWitt, MI
sleeming@dewittmi.org

Shaun Mulholland
City Manager
Lebanon, NH
mulholland@lebanonnh.gov

Elizabeth Patterson
Mayor
Benicia, CA
EPatterson@ci.benicia.ca.us

Clayton Perry
Councilmember
San Antonio, TX
clayton.perry@sanantonio.gov

Tommy Ryan
Township Manager
Worcester Township, PA
tryan@worcestertwp.com

Mike Sesma
Councilmember
Gaithersburg, MD
michael.sesma@gaithersburgmd.gov

Ellen Smith
Councilmember
Oak Ridge, TN
ESmith@oakridgetn.gov

Gill Sorg
Mayor Pro Tem Emeritus
Las Cruces, NM
gsorg@las-cruces.org

Ed Stern
President, Councilman
Poulsbo, WA
estern@cityofpoulsbo.com

Zach Vruwink
Mayor
Wisconsin Rapids, WI
zvruwink@wirapids.org

Jo Walker
Operations Manager
Nevada League of Cities, NV
jwalker@nvleague.org

Experts and Speakers

Christina Alito
Process Engineer
HDR Inc.
Christina.Alito@hdrinc.com

Michelle Crimi
Professor
Clarkson University
mcrimi@clarkson.edu

Christy Gaines
Public Health Policy Analyst
Agency for Toxic Substance and Disease Registry, CDC
ore0@cdc.gov

Bradley Goodwin
Lieutenant
Agency for Toxic Substance and Disease Registry, CDC
ylm5@cdc.gov

Patricia Reyes
Director
Interstate Technology and Regulatory Council
preyes@ecos.org

Tadbir Singh
Project Associate
Interstate Technology and Regulatory Council
tsingh@ecos.org

Virginia (Ginny) Yingling
Hydrogeologist
Minnesota Department of Health
virginia.yingling@state.mn.us

National League of Cities

Carolyn Berndt
Legislative Director, Sustainability
berndt@nlc.org

National Association of Counties

Adam Pugh
Associate Legislative Director
apugh@naco.org

American Association for the Advancement of Science, EPI Center

Michael D. Fernandez
Director
mdfernandez@aaas.org

Rebecca Aicher
Project Director
raicher@aaas.org

Kathryn McGrath
Communications Director
kmcgrath@aaas.org

RESOLVE

Abby Dilley
Vice President of Programs and Senior Mediator
adilley@resolve.ngo

Mason Hines
Facilitator
mhines@resolve.ngo