Engaging Diverse Partners: Strategies to Address Environmental Public Health

A joint NIEHS meeting of the Partnerships for Environmental Public Health (PEPH) network and Disaster Research Response (DR2) program

Meeting Report

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National Institutes of Health • U.S. Department of Health and Human Services

A report from the joint meeting of the National Institute of Environmental Health Sciences (NIEHS) Partnerships for Environmental Public Health (PEPH) network and the National Institutes of Health Disaster Research Response (DR2) program on September 18-19, 2017.

A Joint Effort

The NIEHS workshop "Engaging Diverse Partners: Strategies to Address Environmental Public Health," brought together more than 100 researchers, community leaders, and government representatives to focus on successful approaches for engaging with diverse partners in environmental health research.

The event was a joint effort of the National Institute of Environmental Health Sciences (NIEHS) Partnerships for Environmental Public Health (PEPH) network and the National Institutes of Health Disaster Research Response (DR2) program. NIEHS leaders decided to hold the annual workshops back-to-back because of their common focus on community engagement. The organizers recognized the value of highlighting successful approaches to engaging diverse research partners and developing effective partnerships in the aftermath of disasters.

The combined format allowed some stakeholders to attend both workshops, providing an opportunity for attendees to interact with people outside of their usual networks and hear new perspectives. This report focuses on the PEPH portion of the workshop.

An Action-Oriented Workshop

To kick things off, Gwen Collman, Ph.D., director of the NIEHS Division of Extramural Research and Training, highlighted how engaging communities in the research process has become central to much of the research NIEHS supports. After sharing several success stories of NIEHS-funded community-engaged research, she told the room full of scientists and community leaders "It begins with you. You are the thought leaders, you possess the local knowledge, and you have the necessary skills to make environmental health research actionable."

PEPH lead, Liam O'Fallon, then highlighted the value of PEPH meetings to foster cross-program conversations and bring people out of their programmatic silos. He encouraged participants to learn from each other, share creative ideas, and identify new ways to advance community-engaged research within their own programs as well as through the PEPH network.

To facilitate interaction, workshop organizers planned six breakout sessions that provided participants with collaborative space for in-depth conversations about successful approaches, challenges, and opportunities to engage diverse partners. The goal of the action-oriented workshop was to identify and prioritize actions or outputs to advance and promote community-engaged research approaches.

Each breakout session focused on a key community partner group: decision-makers, educators, environmental justice communities, health care professionals, tribal partners, and workers.

Key Messages from Community Partner Breakout Groups

Decision-Makers

Much of the conversation in the decision-makers breakout group revolved around learning how to identify, access, and communicate with this audience. Participants noted the importance of thinking broadly about the way decision-makers are defined and to expand this definition to include elected officials, city planners, developers, industrial leaders, and other people with influence.

When engaging with elected officials, participants agreed that it is important to align the message with their motivations. Election platforms and local constituent interests can help reveal issues most important to the decision-maker. When meeting with time-pressed decision-makers, having a well-planned agenda and a clear, concise message can increase the chance of being invited back. After cultivating a supportive relationship with an elected official, it is important to move quickly to capitalize on this connection, as turnover is common in elected offices.

> **Key points – Decision-Makers**
>
> 1. Align message to stakeholder motivations
> 2. Have a well-planned agenda
> 3. Develop a clear, concise, consistent message
> 4. Act quickly
> 5. Learn from election platforms
> 6. Build public capacity to speak about environmental health issues

Communicating with decision-makers can be difficult. As professional groups, scientists and decision-makers can use different language when speaking about the same issue, making clear, consistent messaging a challenge. Some noted the need to develop a common vocabulary around critical scientific and political concepts. Many suggested opening with a story to capture the audience and then providing scientific data to back the presented position.

Some participants expressed a hesitance to engage with decision-makers at all because of concerns about blurring the line between scientific research and advocacy. One suggestion to address this challenge was to provide the public with evidence-based tools and resources that will empower them to speak knowledgeably about environmental health issues. There is a need to train scientists to: 1) talk about their research impartially, and 2) work with communities to build their capacity to speak confidently about scientific issues.

Educators

Participants in the educators breakout group discussed challenges, opportunities, and needs for incorporating environmental health into both formal and informal education settings. Formal education is classroom-based and provided by trained teachers, while informal education happens outside the classroom in after-school programs or community-based organizations (CBOs), for example. Key themes were common between both groups, with the exception that teachers

> **Key points – Educators**
>
> 1. Align activities to education standards
> 2. Engage youth
>   a. Interactive technology
>   b. Meaningful participation in research
> 3. Utilize NIEHS-funded research centers
> 4. Evaluate outcomes and publish results

in formal settings must meet curriculum requirements. For those engaging with formal educators, aligning lessons and activities with science education standards and curricula can help get environmental health content into the classroom.

Environmental health can be a gateway to teaching the public about science because it is personal and relevant to people's everyday lives. Youth are especially important to engage, as they will often share what they learn with families and friends, making them a conduit for reaching a wider audience. Participants discussed many approaches to get students excited about science, including using interactive technology and bringing them into a lab to see and participate in research.

NIEHS-funded research centers are uniquely positioned to advance environmental health education because they have access to research facilities and work with both scientists and community groups. To best use center programs as a resource to advance environmental health education, participants noted the need for science communication training opportunities for researchers and graduate students.

Finally, group members discussed the importance of evaluating project outcomes and publishing results in academic journals. Many noted that identifying the best journals to submit projects to is difficult. Another challenge is a lack of funding for project evaluation. As one participant noted, "evaluation is the springboard for publication," so having the resources to support evaluation efforts is critical to codify the field.

Environmental Justice Communities

Discussions in the environmental justice communities group centered on best practices to create equitable and sustainable partnerships within environmental justice communities. Participants emphasized the importance of listening to communities to understand their concerns and then shaping research around those concerns. Conducting interviews and focus groups with CBOs is one way to understand a community's motivations, experiences, concerns, and hopes.

It is important for academics to consider the local context of the community in which they work because each community has unique needs. Furthermore, as one participant explained, "environmental justice communities don't live a one-issue life." It requires flexibility from the researcher to balance research goals while responding to new community concerns as they emerge.

In community-academic partnerships, CBOs should feel they are a respected and equal partner. One way to communicate value to community members is to recognize their knowledge and contributions through awards, leadership opportunities, and acknowledgement in media coverage.

> **Key Points – Environmental Justice Communities**
>
> 1. Listen to community concerns
> 2. Consider local context
> 3. Create equitable partnerships
> 4. Return results in plain language
> 5. Consider data needs
> 6. Engage youth
> 7. Increase funding for research translation
> 8. Develop scalable evaluation metrics

Another way to create equitable partnerships is reliable report back of results to study participants and the community. Presenting results in plain language and being aware of cultural needs can help ensure individuals and the community understand what the findings mean and how to use the information to reduce exposures and improve health. Some participants suggested NIEHS add a 'report back plan requirement' into funding opportunity announcements to ensure a dissemination plan has been carefully thought out before the research even begins.

Result report back also touches upon issues of data sharing and ownership. Although some CBOs are comfortable managing data, others do not have this capacity. Building this capacity starts with the researchers, who should involve CBOs in conversations around data issues to better understand their needs and concerns. Researchers can also train CBOs to take ownership of and manage data. Some participants suggested connecting communities to data through online portals or hubs. Another suggestion was to host a 'hack-a-thon' event where community members, scientists, and technology experts come together to use data to address a specific issue; examples could include a community mapping project or creating a mobile app to address a specific environmental health issue.

Many participants noted the benefits of engaging youth in research projects, especially projects that involve technology, social media, or mobile apps for data collection and returning results. Youth like using technology and social media and can foster conversations about environmental health with both older and younger generations. This can be especially important in environmental justice communities where

older generations may not speak English. Furthermore, youth are good at identifying critical issues in the community and can often provide a sense of hope and empowerment around stressful issues.

A major challenge noted by the group was the need for funding to translate research results into action. One participant noted, "we are funded to do research, but resources for translating this research are scarce." When this is the case, participants emphasized the importance of transparency and letting CBOs know when there will not be resources available to make sustainable changes. Provide CBOs the power to initiate change themselves by connecting them with public health departments and other stakeholders, giving them data and helping them interpret it, and providing steps they can take to protect themselves and their families.

For researchers to secure funding to work in communities they must be able to publish their work and produce other academic outputs. To facilitate academic portfolio building, there is a need for a peer review process that recognizes the value of working with communities. There is also a need for common metrics to evaluate the impact of community-engaged research projects. Many participants noted this as a challenge because although their work is specific to local context, they need metrics that can be scaled up for use across communities.

Health Care Professionals

Although many session participants did not have direct experience working with health care professionals, they were eager to discuss opportunities to engage this audience. In general, the public views health care professionals as trusted messengers of health information. A health care community that understands the link between health and the environment can translate research findings into information patients and families can use to improve their health.

Throughout the session, time was noted as a limiting factor for incorporating environmental health information into a doctor visit. Health care professionals spend limited time with each patient, so adding environmental health questions and guidance into a visit can be a challenge. Clinicians need messages they can deliver quickly and clearly — this is important not only for the busy clinician but also for the patient who needs to understand the message. Messages should also be evidence-based and actionable.

Key Points – Health Care Professionals

1. Recognize time as a limiting factor
2. Develop clear, concise, and actionable messages
3. Utilize NIEHS-funded research centers
4. Consider local context
5. Expand educational and training opportunities for clinicians

Participants noted that materials created by Community Engagement Cores (CECs) within NIEHS-funded research centers can provide patients access to environmental health information that clinicians may not have time to address. These resources can be handed out by health care professionals or simply left in waiting rooms.

Environmental health guidance from clinicians needs to be context specific. For example, air quality issues may be important to discuss with patients living in one community whereas water quality may important in another. CECs work with communities and can help health care professionals understand the environmental health issues affecting their patients' lives.

Educational and training opportunities for clinicians are needed to further integrate environmental health into the doctor's office. Pediatricians and obstetricians were recognized as an especially important group to educate. Identifying places where environmental health information can be inserted into the medical

curriculum and providing continuing medical education opportunities can help educate clinicians at various levels, from the medical student to the experienced practitioner.

One clinician said, "If physicians are not tested on it, they won't commit it to memory." Getting environmental health information included in medical licensing examinations was suggested as a way to ensure clinicians are educated on key environmental health topics. Connecting environmental health networks, like PEPH, with medical networks, like the American Medical Association, can help begin to bridge this gap in medical education and training programs.

Tribal Partners

Working with Native American communities on environmental health issues requires an intentional approach and presents unique challenges and opportunities. One session participant called this approach tribally driven research; emphasizing that research should be initiated and driven by the tribe and that academics are a resource to address the tribe's questions and concerns.

Understanding the beliefs, values, customs, and history that shape a tribe's view of health and the environment is critical to successful engagement. Furthermore, researchers must recognize that tribes are not monolithic, each has their own history, culture, and traditions.

Key Points – Tribal Partners
1. Shape research around tribe's concerns
2. Understand the tribe's needs, values, culture, and history
3. Build relationships on mutual respect and ensure mutual benefits
4. Engage tribal leadership
5. Return results in plain language and provide recommendations
6. Respect the tribe's view on data ownership and sharing

When working with tribal communities it is important to cultivate a relationship built on trust and mutual respect. Meeting with tribal elders before engaging others in the community can clarify the tribe's concerns. In addition, active listening is critical to forge a lasting and meaningful partnership. It is also important to communicate the mutual benefits of the project by letting the tribe know what benefits they can expect and what the researchers will gain.

At the end of a project, it is critical to return results to the community in plain language. It is particularly important to provide recommendations on how the tribe can use the results to benefit public health and the environment as well as to enhance sustainability.

Issues of data ownership and sharing can also surface at the close of a project. Because tribes are semi-sovereign nations, they own the data, and it is the researcher's responsibility to receive permission before sharing results with outside entities. This poses a challenge for academic researchers who rely on publishing their results to build their portfolios. Engaging in conversations with tribal leaders about data issues early in the research process can help both parties benefit from the project.

Workers

Participants in the workers breakout session agreed that collaborating with CBOs is critical to successfully engaging with workers. CBOs can help researchers access workers and disseminate environmental and occupational health and safety messages. CBOs can also help researchers stay in touch with difficult-to-reach mobile populations, such as migrant workers and seasonal firefighters. Working with CBOs also makes it possible to leverage these partnerships when resources are limited, thus increasing a project's sustainability.

> **Key Points – Workers**
>
> 1. Work with CBOs
> 2. Recognize tensions among partner groups
> 3. Engage workers early
> 4. Translate materials into Spanish and other languages
> 5. Increase funding for material development and dissemination
> 6. Empower workers and communities

Although partnerships are essential, several participants noted that tensions can arise between partner groups. For example, it is important to work with unions and employers, but to keep in mind that they may have different motivations and priorities than workers. Another source of tension stems from workers' fear of losing their jobs if they participate in efforts to increase health and safety at work. This can make it difficult for researchers to engage with worker groups who may be worried about job security. Friction can also arise between CBOs supporting stricter environmental regulations and unions defending industry and jobs. Being aware of tensions between all partners can help researchers balance each group's needs while promoting health and safety in the workplace.

When developing outreach materials and safety curricula for the workplace it is important to engage workers during the early stages. Testing materials in focus groups can help researchers refine their messages to best reach impacted workers. Low literacy levels and a lack of cultural sensitivity may create a barrier for communication with workers. To close this gap, materials need to be written in plain language and translated into Spanish or other languages widely spoken in the community.

It is important to recognize that developing, testing, and disseminating materials requires resources, personnel, and time. Participants proposed that funding should include opportunities for researchers to create and disseminate factsheets and other tools at the end of their research projects.

A common thread throughout the session was the importance of empowering workers and communities and helping them understand that worker safety issues are health injustices. Researchers can organize meetings and events that give workers a voice and an avenue to stay interested, informed, and engaged. Peer-education or train-the-trainer approaches are other ways to empower workers to reduce injury and illness in the workplace. These training approaches also increase a project's sustainability.

> ## Cross-cutting Themes
> Several common themes emerged across the six community partner breakout groups:
>
> 1. **Engage a range of partners**.
> 2. **Address issues of data ownership and empower communities to use data.**
> 3. **Report results back to communities**.
> 4. **Translate research findings** in meaningful and actionable ways, and increase funding for research translation and dissemination.
> 5. **Evaluate and publish outcomes** of community-engaged research to increase recognition and acceptance of the field.

Moving Ideas Beyond the Meeting Room

The goal of the second day was to develop a set of collaborative actions based on conversations from the previous day. The morning was organized to enable participants to learn about, share, and begin initial work on actions each breakout group identified.

Participants had time to walk through the meeting room and review key information from each breakout session displayed on large poster boards. During this time, they were encouraged to expand upon or add new ideas to those already displayed.

Breakout leaders then provided a brief overview of the main topics, challenges, opportunities, and approaches discussed during their sessions. These presentations provided additional context to the information on the poster boards and gave participants the opportunity to ask clarifying questions and consider ways to synthesize the actions and outputs.

Attendees then participated in an active voting session, during which they revisited the poster boards and voted to prioritize outputs or products they considered important, feasible, and achievable. Recognizing that the group could not accomplish everything proposed, the goal was to identify activities on which participants were most willing to work.

Small groups then formed to begin initial work on each output or product selected in the active voting session. The goal was to provide participants time to productively use the information and ideas shared over the past two days to develop implementation and action plans for the outputs and actions they voted to participate in or lead.

The following matrix lists the actions or outputs identified by each breakout group, and the group leader:

Decision-Makers

Action/Output	Group Leader(s)
1. Create GIS mapping tool that layers all potential risks in a community; tool should include community assets and existing solutions.	Byran Luukinen, Esther Min
2. Use a power mapping approach to identify decision makers who may be receptive to a cause.	John Walkey
3. Create list of scientific expertise in NIEHS centers and grantees by state.	Laureen Boles, Robin Fuchs-Young, Madeleine Scammell
4. Involve community leaders in the academic community so they feel like they can interact from position of equality.	Kim Gaddy

Educators

Action/Output	Group Leader(s)
1. Propose workshop to develop a research agenda for using formal and informal science, technology, engineering, and math (STEM) education to advance environmental health literacy. Potential to use R13 grant mechanism.	Robin Fuchs-Young, Kathleen Gray, Shawn McElmurry
2. Convene an evaluation workgroup to enable conversation, and possibly publication, about STEM education approaches used across programs.	No leader*
3. Convene a workgroup to address long-term impacts of STEM education interventions.	No leader
4. Host webinars to help the STEM community learn about funding mechanisms and other opportunities.	Sharon Beard, Andrij Holian

Environmental Justice Communities

Action/Output	Group Leader(s)
1. Develop models to connect communities to data resources (e.g., hack-a-thon, citizen science, approaches to equitable data sharing/ownership).	Kerry Butch, Virginia Guidry, Herb Susmann
2. Use arts and culture to share work with larger audiences (e.g., film festival, photovoice).	No leader
3. Develop publications on best practices and future directions in community engaged research (CEnR).	Kim Gaddy, Jill Johnston, Edith Parker, Melanie Pearson
4. Develop metrics for CEnR for evaluation and assessment.	Matt Dellinger, Andrew George

Health Care Professionals

Action/Output	Group Leader(s)
1. Advance environmental health curricula.	Panagis Galiatsatos
2. Advance clinical tools.	Victoria Leonard
3. Provide continuing medical education opportunities.	No leader
4. Create a cross-system shared incentive structures.	No leader
5. Find ways to sustain established relationships that outlast project-specific funding.	No leader
6. Recognize health care professionals as a community of practice.	No leader
7. Develop a manuscript to outline opportunities to engage health care professionals (roadmap).	Paul Kilgore
8. Convene an expert meeting.	Annemarie Charlesworth
9. Use technology to connect clinicians to environmental health education and resources.	No leader

Tribal Partners

Action/Output	Group Leader(s)
1. Host a subsequent webinar to get input from stakeholders at concurrent tribal conferences.	Symma Finn, Liam O'Fallon
2. Develop article to educate academics on the ethical and legal implications of working with tribes.	Diana Rohlman
3. Develop article about the implications of tribal sovereignty, data sharing documents, MOAs, and IRBs; propose templates.	Melissa Gonzales
4. Engage tribal leaders in listening sessions to learn about environmental health concerns and research and community education needs.	Marti Lindsey
5. Explore how to systematically be a resource for tribal communities to help them overcome exposures and understand the outcomes of exposure.	Vi Waghiyi

Workers

Action/Output	Group Leader(s)
1. Develop listings of volunteer organizations to build public capacity and increase access workers and/or community members in emergency situations.	No leader
2. Develop a best practice guide for effective collaboration and communication with different partner groups.	Janelle Rios
3. Develop tool kits for air quality monitoring and managing data sets.	No leader
4. Develop a hub or library for sharing resources, hardware, and strategies by chemical type and/or by type of work.	Sharon Beard
5. Develop additional clearinghouses for worker health and safety and update frequently with new evidence (e.g., website).	No leader
6. Expand research funding to include material development and dissemination at the end of a research project.	No leader
7. Leverage partnerships when resources are limited.	No leader
8. Continue to find ways to give impacted communities a voice.	No leader

Appendix: Action/Output Contact List

Decision-Makers

1. **Create GIS mapping tool that layers all potential risks in a community; tool should include community assets and existing solutions.**
   - **Bryan Luukinen (Leader)**, Duke University - bryan.luukinen@duke.edu
   - **Esther Min (Leader)**, University of Washington - estmin@uw.edu
   - **Laureen Boles**, New Jersey Environmental Justice Alliance - Director@njeja.org
   - **Ferdouz Cochran**, U.S. EPA - cochran.ferdouz@epa.gov
   - **Andrew George**, University of North Carolina at Chapel Hill - andrewg@unc.edu
   - **Heather Henry**, NIEHS - henryh@niehs.nih.gov
   - **Jen Horney**, Texas A&M University - horney@sph.tamhsc.edu
   - **Jen Krenz**, University of Washington - jkrenz@uw.edu
   - **Victoria Leonard**, University of California, San Francisco - victoria.leonard@ucsf.edu
   - **James Nolan**, University of California, Berkeley - jnolan@berkeley.edu
   - **Raquel Silva**, Oak Ridge Institute for Science and Education - silva.raquel@epa.gov
   - **John Walkey**, GreenRoots Chelsea - johnw@greenrootschelsea.org

2. **Use a power mapping approach to identify decision makers who might be receptive to a cause (x-axis = spectrum of decision makers; y-axis=support of issue(s)).**
   - **John Walkey (Leader)**, GreenRoots Chelsea - johnw@greenrootschelsea.org
   - **Laureen Boles**, New Jersey Environmental Justice Alliance - Director@njeja.org
   - **Robin Fuchs-Young**, Texas A&M University - Fuchs-Young@Medicine.tamhsc.edu
   - **Sharon Sand**, University of Michigan - slsand@umich.edu

3. **Create a list of scientific expertise in NIEHS centers and grantees by state.**
   - **Laureen Boles (Leader)**, New Jersey Environmental Justice Alliance - Director@njeja.org
   - **Robin Fuchs-Young (Leader)**, Texas A&M University - Fuchs-Young@Medicine.tamhsc.edu
   - **Madeleine Scammell (Leader)**, Boston University - MLS@bu.edu
   - **Ferdouz Cochran**, U.S. EPA - cochran.ferdouz@epa.gov
   - **John Durant**, Tufts University - john.durant@tufts.edu
   - **Virginia Guidry**, NIEHS - virginia.guidry@nih.gov
   - **Ellen Hahn**, University of Kentucky - ejhahn00@mail.uky.edu
   - **Heather Henry**, NIEHS - henryh@niehs.nih.gov
   - **Catherine Kastleman**, Duke University - ck205@duke.edu
   - **Victoria Leonard**, University of California, San Francisco - victoria.leonard@ucsf.edu
   - **Bryan Luukinen**, Duke University - bryan.luukinen@duke.edu
   - **Shawn McElmurry**, Wayne State University - s.mcelmurry@wayne.edu
   - **Sharon Sand**, University of Michigan - slsand@umich.edu
   - **Vi Waghiyi**, Alaska Community Action on Toxics (ACAT) - vi@akaction.org
   - **John Walkey**, GreenRoots Chelsea - johnw@greenrootschelsea.org
   - **Siobhan Whitlock**, U.S. EPA - whitlock.siobhan@epa.gov

4. Involve community leaders in the academic community so they feel like they can interact from position of equality.
   - **Kim Gaddy (Leader)**, Clean Water Action - kgaddy@cleanwater.org
   - **Laureen Boles**, New Jersey Environmental Justice Alliance - Director@njeja.org
   - **Kerry Butch**, Rutgers University - kerry.butch@eohsi.rutgers.edu
   - **Robin Fuchs-Young**, Texas A&M University - Fuchs-Young@Medicine.tamhsc.edu
   - **Krista Haapanen**, University of California, Davis - kahaapanen@ucdavis.edu
   - **Catherine Kastleman**, Duke University - ck205@duke.edu
   - **Catherine Maas**, GreenRoots Chelsea - catemaas617@gmail.com
   - **Sharon Sand**, University of Michigan - slsand@umich.edu
   - **Madeleine Scammell**, Boston University - MLS@bu.edu

Educators

1. Propose workshop to develop a research agenda for using formal and informal science, technology, engineering, and math (STEM) education to advance environmental health literacy. Potential to use R13 grant mechanism.
   - **Robin Fuchs-Young (Leader)**, Texas A&M University - Fuchs-Young@Medicine.tamhsc.edu
   - **Kathleen Gray (Leader)**, University of North Carolina at Chapel Hill - kgray@unc.edu
   - **Shawn McElmurry (Leader)**, Wayne State University - s.mcelmurry@wayne.edu
   - **John Durant**, Tufts University - john.durant@tufts.edu
   - **Dana Haine**, University of North Carolina at Chapel Hill - dhaine@unc.edu
   - **Andrij Holian**, University of Montana - andrij.holian@umontana.edu
   - **Anna Hoover**, University of Kentucky - Anna.Hoover@uky.edu
   - **Catherine Karr**, University of Washington - ckarr@uw.edu
   - **Marti Lindsey**, University of Arizona - lindsey@pharmacy.arizona.edu
   - **Esther Min**, University of Washington - estmin@uw.edu

2. Convene an evaluation workgroup to enable conversation, and possibly publication, about STEM education approaches used across programs.
   - *No Leader**
   - **Kathleen Gray (*could lead if needed)**, University of North Carolina at Chapel Hill - kgray@unc.edu
   - **Matt Dellinger**, Medical College of Wisconsin - Mdellinger@mcw.edu
   - **Robin Fuchs-Young**, Texas A&M University - Fuchs-Young@Medicine.tamhsc.edu
   - **Krista Haapanen**, University of California, Davis - kahaapanen@ucdavis.edu
   - **Dana Haine**, University of North Carolina at Chapel Hill - dhaine@unc.edu
   - **Andrij Holian**, University of Montana - andrij.holian@umontana.edu
   - **Jill Johnston**, University of Southern California - jillj@usc.edu
   - **Paulette Jones**, Meadowlark Science and Education, LLC - paulette@meadowlarkscience.com

3. Convene a workgroup to address long-term impacts of STEM education interventions.
   - *No leader*
   - **John Durant**, Tufts University - john.durant@tufts.edu
   - **Robin Fuchs-Young**, Texas A&M University - Fuchs-Young@Medicine.tamhsc.edu
   - **Kathleen Gray**, University of North Carolina at Chapel Hill - kgray@unc.edu
   - **Dana Haine**, University of North Carolina at Chapel Hill - dhaine@unc.edu
   - **Andrij Holian**, University of Montana - andrij.holian@umontana.edu

- **Jen Horney**, Texas A&M University - horney@sph.tamhsc.edu
- **Catherine Kastleman**, Duke University - ck205@duke.edu
- **Marti Lindsey**, University of Arizona - lindsey@pharmacy.arizona.edu

4. Host webinars to help the STEM community learn about funding mechanisms and other opportunities.
   - **Sharon Beard (Leader)**, NIEHS - beard1@niehs.nih.gov
   - **Andrij Holian (Leader)**, University of Montana - andrij.holian@umontana.edu
   - **Anna Hoover**, University of Kentucky - Anna.Hoover@uky.edu
   - **Paulette Jones**, Meadowlark Science and Education, LLC - paulette@meadowlarkscience.com
   - **Brenda Koester**, University of Illinois at Urbana-Champaign - bkoester@illinois.edu
   - **Marti Lindsey**, University of Arizona - lindsey@pharmacy.arizona.edu

> **Potential webinar topics:**
> - Small Business & Technology Transfer grantees (Univ. of Montana, Univ. of Rochester).
> - Using social network analysis to understand impact (Univ. of Kentucky).
> - Other science education funding opportunities (NSF, private foundations).
> - Published environmental health science STEM education outcomes.

Environmental Justice Communities

1. Develop models to connect communities to data resources (e.g., hack-a-thon, citizen science, approaches to equitable data sharing and ownership).
   - **Kerry Butch (Leader)**, Rutgers University - kerry.butch@eohsi.rutgers.edu
   - **Virginia Guidry (Leader)**, NIEHS - virginia.guidry@nih.gov
   - **Herb Susmann (Leader)**, Silent Spring Institute - susmann@silentspring.org
   - **Ann Backus**, Harvard University - abackus@hsph.harvard.edu
   - **Laureen Boles**, New Jersey Environmental Justice Alliance - Director@njeja.org
   - **Annemarie Charlesworth**, University of California, San Francisco - annemarie.charlesworth@ucsf.edu
   - **Matt Dellinger**, Medical College of Wisconsin - Mdellinger@mcw.edu
   - **John Durant**, Tufts University - john.durant@tufts.edu
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   - **Kim Gaddy**, Clean Water Action - kgaddy@cleanwater.org
   - **Catalina Garzon**, California Environmental Health Tracking Program - catalina.garzon@cdph.ca.gov
   - **Jen Horney**, Texas A&M University - horney@sph.tamhsc.edu
   - **Jill Johnston**, University of Southern California - jillj@usc.edu
   - **Bryan Luukinen**, Duke University - bryan.luukinen@duke.edu
   - **Shawn McElmurry**, Wayne State University - s.mcelmurry@wayne.edu
   - **Adriana Perez**, Yakima Valley Farm Workers Clinic - AdrianaPe@yvfwc.org
   - **Diana Rohlman**, Oregon State University - diana.rohlman@oregonstate.edu
   - **Rania Sabty-Daily**, California State University, Northridge - rania.sabty-daily@csun.edu
   - **Sharon Sand**, University of Michigan - slsand@umich.edu
   - **John Walkey**, GreenRoots Chelsea - johnw@greenrootschelsea.org
   - **Siobhan Whitlock**, U.S. EPA - whitlock.siobhan@epa.gov

2. Use arts and culture to share work with larger audiences (e.g., traveling film festival, photovoice).
   - *No leader*

- **Laureen Boles**, New Jersey Environmental Justice Alliance - Director@njeja.org
- **Kerry Butch**, Rutgers University - kerry.butch@eohsi.rutgers.edu
- **Virginia Guidry**, NIEHS - virginia.guidry@nih.gov
- **Jen Krenz**, University of Washington - jkrenz@uw.edu
- **James Nolan**, University of California, Berkeley - jnolan@berkeley.edu
- **Elizabeth Torres**, KDNA Radio - etorres@kdna.org

3. Develop publications on best practices and future directions in community engaged research (CEnR).
   - **Kim Gaddy (Leader)**, Clean Water Action - kgaddy@cleanwater.org
   - **Jill Johnston (Leader)**, University of Southern California - jillj@usc.edu
   - **Edith Parker (Leader)**, University of Iowa - edith-parker@uiowa.edu
   - **Melanie Pearson (Leader)**, Emory University - mapears@emory.edu
   - **Laureen Boles**, New Jersey Environmental Justice Alliance - Director@njeja.org
   - **Catalina Garzon**, California Environmental Health Tracking Program - catalina.garzon@cdph.ca.gov
   - **Andrew George**, University of North Carolina at Chapel Hill - andrewg@unc.edu
   - **Krista Haapanen**, University of California, Davis - kahaapanen@ucdavis.edu
   - **Ellen Hahn**, University of Kentucky - ejhahn00@mail.uky.edu
   - **Catherine Karr**, University of Washington - ckarr@uw.edu
   - **Paul Kilgore**, Wayne State University - paul.kilgore@wayne.edu
   - **Brenda Koester**, University of Illinois at Urbana-Champaign - bkoester@illinois.edu
   - **Shawn McElmurry**, Wayne State University - s.mcelmurry@wayne.edu
   - **Esther Min**, University of Washington - estmin@uw.edu
   - **James Nolan**, University of California, Berkeley - jnolan@berkeley.edu
   - **Rania Sabty-Daily**, California State University, Northridge - rania.sabty-daily@csun.edu
   - **Elizabeth Torres**, KDNA Radio - etorres@kdna.org

4. Develop metrics for CEnR evaluation and assessment.
   - **Matt Dellinger (Leader)**, Medical College of Wisconsin - Mdellinger@mcw.edu
   - **Andrew George (Leader)**, University of North Carolina at Chapel Hill - andrewg@unc.edu
   - **Laureen Boles**, New Jersey Environmental Justice Alliance - Director@njeja.org
   - **Kerry Butch**, Rutgers University - kerry.butch@eohsi.rutgers.edu
   - **Ferdouz Cochran**, U.S. EPA - cochran.ferdouz@epa.gov
   - **Kathleen Gray**, University of North Carolina at Chapel Hill - kgray@unc.edu
   - **Krista Haapanen**, University of California, Davis - kahaapanen@ucdavis.edu
   - **Anna Hoover**, University of Kentucky - Anna.Hoover@uky.edu
   - **Catherine Kastleman**, Duke University - ck205@duke.edu
   - **Esther Min**, University of Washington - estmin@uw.edu
   - **Melanie Pearson**, Emory University - mapears@emory.edu
   - **Raquel Silva**, Oak Ridge Institute for Science and Education - silva.raquel@epa.gov

Health Care Professionals

1. **Advance environmental health curricula.**
   - **Panagis Galiatsatos (Leader)**, Johns Hopkins Medicine - pgaliat1@jhmi.edu
   - **Barbara Fiese**, University of Illinois at Urbana-Champaign - bhfiese@illinois.edu
   - **Paul Kilgore**, Wayne State University - paul.kilgore@wayne.edu
   - **Brenda Koester**, University of Illinois at Urbana-Champaign - bkoester@illinois.edu
   - **Victoria Leonard**, University of California, San Francisco - victoria.leonard@ucsf.edu

   > **Potential actions:**
   > - Get environmental health into the U.S. Preventative Service Guidelines.
   > - Perform a landscape survey of currently available environmental health curricula; develop new curricula and integrate into existing (use inter-professional consortium as reference).
   > - Strengthen and expand the pipeline of health providers and advocates trained in environmental health, including clinicians and community navigators (adults and youth).

2. **Advance clinical tools:**
   - **Victoria Leonard (Leader)**, University of California, San Francisco - victoria.leonard@ucsf.edu
   - **Annemarie Charlesworth**, University of California, San Francisco - annemarie.charlesworth@ucsf.edu
   - **Catherine Karr**, University of Washington - ckarr@uw.edu
   - **Paul Kilgore**, Wayne State University - paul.kilgore@wayne.edu
   - **Elizabeth Torres**, KDNA Radio - etorres@kdna.org
   - **Vi Waghiyi**, Alaska Community Action on Toxics (ACAT) - vi@akaction.org

   > **Potential actions:**
   > - Create and disseminate useful and relevant assessment tools for health care providers and patients.
   > - Create exposure prevention guidelines that are relevant and doable in diverse communities.

3. **Provide continuing medical education opportunities by endorsing and identifying clinicians trained in environmental health and occupational exposures.**
   - *No leader*
   - **Melissa Gonzales**, University of New Mexico School of Medicine - mgonzales@salud.unm.edu
   - **Virginia Guidry**, NIEHS - virginia.guidry@nih.gov

4. **Create a cross-system shared incentive structure that reward information transfer and prevention activities and support a shared payment model.**
   - *No leader*
   - **Andrew George**, University of North Carolina at Chapel Hill - andrewg@unc.edu

5. **Find ways to sustain established relationships that outlast project-specific funding. Apprenticeships in engagement to bring new personnel up-to-speed.**
   - *No leader*
   - **Neasha Graves**, University of North Carolina at Chapel Hill - neasha_graves@unc.edu

6. **Recognize health care professionals as a community of practice. Engage health care professionals like researchers engage communities or vulnerable populations.**
   - *No leader*
   - **Ann Backus**, Harvard University - abackus@hsph.harvard.edu
   - **Anna Hoover**, University of Kentucky - Anna.Hoover@uky.edu

7. Develop a manuscript to outline opportunities to engage health care professionals (roadmap).
   - **Paul Kilgore (Leader)**, Wayne State University - paul.kilgore@wayne.edu
   - **Sharon Beard**, NIEHS - beard1@niehs.nih.gov
   - **Annemarie Charlesworth**, University of California, San Francisco - annemarie.charlesworth@ucsf.edu
   - **Kim Gaddy**, Clean Water Action - kgaddy@cleanwater.org
   - **Panagis Galiatsatos**, Johns Hopkins Medicine - pgaliat1@jhmi.edu
   - **Kathleen Gray**, University of North Carolina at Chapel Hill - kgray@unc.edu
   - **Heather Henry**, NIEHS - henryh@niehs.nih.gov
   - **Bryan Luukinen**, Duke University - bryan.luukinen@duke.edu

> **Potential manuscript topics:**
> - Train the next generation of environmental health leaders (e.g., medical, nursing, and MPH students, residents, etc.).
> - Connect health care community with diverse experts and environmental health champions.
> - Identify, evaluate, and market priority environmental health resources (e.g., use surveys, apply social media metrics).

8. Convene an expert meeting to bring diverse stakeholders together, prioritize resources to share with health care professionals, and identify key metrics to measure impact.
   - **Annemarie Charlesworth (Leader)**, University of California, San Francisco - annemarie.charlesworth@ucsf.edu
   - **Sharon Beard**, NIEHS - beard1@niehs.nih.gov
   - **Neasha Graves**, University of North Carolina at Chapel Hill - neasha_graves@unc.edu
   - **Ellen Hahn**, University of Kentucky - ejhahn00@mail.uky.edu
   - **Vi Waghiyi**, Alaska Community Action on Toxics (ACAT) - vi@akaction.org

9. Use technology to connect clinicians to environmental health education resources.
   - *No leader*
   - **Bryan Luukinen**, Duke University - bryan.luukinen@duke.edu
   - **Raquel Silva**, Oak Ridge Institute for Science and Education - silva.raquel@epa.gov

> **Potential technologies:**
> - American Academy of Pediatrics Project ECHO: ongoing case-based consultations and education to meet the needs of rural doctors – could be used to teach process and demonstrate tools.
> - Environmental health E-Screener.
> - Electronic health records.

Tribal Partners

1. Host a subsequent webinar to get input from stakeholders at concurrent tribal conferences.
   - **Symma Finn (Leader)**, NIEHS - symma.finn@nih.gov
   - **Liam O'Fallon (Leader)**, NIEHS - ofallon@niehs.nih.gov
   - **Marti Lindsey**, University of Arizona - lindsey@pharmacy.arizona.edu
   - **Diana Rohlman**, Oregon State University - diana.rohlman@oregonstate.edu

2. Develop article to educate academics on the ethical and legal implications of working with tribes.
   - **Diana Rohlman (Leader)**, Oregon State University - diana.rohlman@oregonstate.edu
   - **Andrew George**, University of North Carolina at Chapel Hill - andrewg@unc.edu
   - **Melissa Gonzales**, University of New Mexico School of Medicine - mgonzales@salud.unm.edu
   - **Marti Lindsey**, University of Arizona - lindsey@pharmacy.arizona.edu

3. Develop article on the implications of tribal sovereignty, data sharing documents, Memorandum of Agreements (MOAs), and Institutional Review Boards (IRBs); potentially propose templates. Involve tribal lawyers.
   - **Melissa Gonzales (Leader)**, University of New Mexico School of Medicine - mgonzales@salud.unm.edu
   - **Matt Dellinger**, Medical College of Wisconsin - Mdellinger@mcw.edu
   - **Marti Lindsey**, University of Arizona - lindsey@pharmacy.arizona.edu
   - **Diana Rohlman**, Oregon State University - diana.rohlman@oregonstate.edu

4. Engage tribal leaders in listening sessions to learn about environmental health concerns and research and community education needs. Consultations at the National Congress of American Indians (NCAI) or other national forums provide a venue for this government to government engagement.
   - **Marti Lindsey (Leader)**, University of Arizona - lindsey@pharmacy.arizona.edu
   - **Neasha Graves**, University of North Carolina at Chapel Hill - neasha_graves@unc.edu
   - **Diana Rohlman**, Oregon State University - diana.rohlman@oregonstate.edu
   - **Vi Waghiyi**, Alaska Community Action on Toxics (ACAT) - vi@akaction.org
   - **Elaine Wilson**, Institute for Tribal Environmental Professionals - elaine.hale.wilson@gmail.com

5. Explore how to systematically be a resource for tribal communities to help them overcome exposures (e.g., remediation, new tribal rules, enacting their own processes to protect their health) and understand the outcomes of exposure (e.g., epigenetic outcomes passed down to children and grandchildren).
   - **Vi Waghiyi (Leader)**, Alaska Community Action on Toxics (ACAT) - vi@akaction.org
   - **Sharon Beard**, NIEHS - beard1@niehs.nih.gov
   - **Ferdouz Cochran**, U.S. EPA - cochran.ferdouz@epa.gov
   - **Matt Dellinger**, Medical College of Wisconsin - Mdellinger@mcw.edu
   - **Catalina Garzon**, California Environmental Health Tracking Program - catalina.garzon@cdph.ca.gov
   - **Melissa Gonzales**, University of New Mexico School of Medicine - mgonzales@salud.unm.edu
   - **Catherine Karr**, University of Washington - ckarr@uw.edu
   - **Marti Lindsey**, University of Arizona - lindsey@pharmacy.arizona.edu

- **James Nolan**, University of California, Berkeley - jnolan@berkeley.edu

Workers

1. Develop listings of volunteer organizations to build public capacity in emergency situations and increase access workers and/or community members.
   - *No leader*
   - **Ann Backus**, Harvard University - abackus@hsph.harvard.edu
   - **Mitchel Rosen**, Rutgers University - mrosen@rutgers.edu

2. Develop a best practice guide for effective collaboration and communication with different partner groups (e.g., union leaders, union members, government agencies, CBOs, clinics).
   - **Janelle Rios (Leader)**, University of Texas - janelle.rios@uth.tmc.edu
   - **Sharon Beard**, NIEHS - beard1@niehs.nih.gov
   - **Joyce Hargrove**, Environmental Health Consultant - DrJoyceH@gmail.com
   - **James Nolan**, University of California, Berkeley - jnolan@berkeley.edu
   - **Mitchel Rosen**, Rutgers University - mrosen@rutgers.edu
   - **Madeleine Scammell**, Boston University - MLS@bu.edu

3. Develop tool kits for air quality monitoring and managing data sets. Different tool kits will be needed for different air contaminants and/or labor sectors.
   - *No leader*
   - **Kim Gaddy**, Clean Water Action - kgaddy@cleanwater.org
   - **Catalina Garzon**, California Environmental Health Tracking Program - catalina.garzon@cdph.ca.gov
   - **Andrij Holian**, University of Montana - andrij.holian@umontana.edu
   - **Jen Krenz**, University of Washington - jkrenz@uw.edu
   - **Maria Tchong-French**, University of Washington - mitchong@uw.edu
   - **Elizabeth Torres**, KDNA Radio - etorres@kdna.org
   - **John Walkey**, GreenRoots Chelsea - johnw@greenrootschelsea.org
   - **Siobhan Whitlock**, U.S. EPA - whitlock.siobhan@epa.gov

4. Develop a hub or library for sharing resources, hardware, and strategies by chemical type and/or by type of work.
   - **Sharon Beard (Leader)**, NIEHS - beard1@niehs.nih.gov
   - **Jen Krenz**, University of Washington - jkrenz@uw.edu
   - **Maria Tchong-French**, University of Washington - mitchong@uw.edu

5. Develop additional clearinghouses for worker health and safety and update frequently with new evidence/research (e.g., website).
   - *No leader*
   - **Sharon Beard**, NIEHS - beard1@niehs.nih.gov

6. Expand research funding to include material development and dissemination at the end of a research project.
   - *No leader*
   - **Esther Min**, University of Washington - estmin@uw.edu
   - **Janelle Rios**, University of Texas - janelle.rios@uth.tmc.edu

7. Leverage partnerships when resources are limited (e.g., with universities and organizations).
   - *No leader*
   - **Sharon Beard**, NIEHS - beard1@niehs.nih.gov
   - **Melissa Gonzales**, University of New Mexico School of Medicine - mgonzales@salud.unm.edu
   - **Siobhan Whitlock**, U.S. EPA - whitlock.siobhan@epa.gov

8. Continue to find ways to give impacted communities a voice (e.g., workers).
   - *No leader*
   - **Sharon Beard**, NIEHS - beard1@niehs.nih.gov
   - **Catherine Maas**, GreenRoots Chelsea - catemaas617@gmail.com
   - **Rania Sabty-Daily**, California State University, Northridge - rania.sabty-daily@csun.edu
   - **Madeleine Scammell**, Boston University - MLS@bu.edu