



# Office of Research and Development (ORD) Environmental Justice (EJ) Relevant Research: Context and Research Highlights

**Disclaimer:** The views expressed in this presentation are those of the author and do not necessarily represent the official views or policies of the Agency.

**February 2022**



## Outline

- **Purpose of this Presentation**
- **Drivers for Incorporating EJ into ORD research**
- **What is EJ-Relevant Research?**
- **Existing EJ-Relevant Research in ORD**
  - Research Baseline
  - Examples of EJ-Relevant Research



## Purpose

- Provide background context, examples, and resources for planning and implementing EJ-relevant research.
- Highlight opportunities to expand EJ-relevant research across Centers and Research Programs and enhance translation of research for EJ applications.
- Demonstrate and communicate examples of ORD's ongoing investment in EJ-relevant research to internal and partner audiences and highlight the ORD EJ Council's recent efforts to advance EJ integration across ORD.

- Administrator Michael Regan
  - “Every person in the United States has the right to clean air, clean water and a healthier life no matter how much money they have in their pockets, the color of their skin or their zip code. Yet too many Black, indigenous, Latinx and other people of color bear the highest burden of pollution.” (March 16, 2021)
  - “Too many communities whose residents are predominantly of color, Indigenous, or low-income continue to suffer from disproportionately high pollution levels and the resulting adverse health and environmental impacts. We must do better. This will be one of my top priorities as Administrator, and I expect it to be one of yours as well.” (April 7, 2021)



# Supporting Executive Orders

- [EO 13985: Advancing Racial Equity and Support for Underserved Communities through the Federal Government \(2021\)](#): “...the Federal Government should pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality....[A]dvancing equity requires a systematic approach to embedding fairness in decision-making processes...”
- [EO 14008: Tackling the Climate Crisis at Home and Abroad \(2021\)](#): “Agencies shall make achieving environmental justice part of their missions ... to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts.”
- [EO 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations \(1994\)](#): “...each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States...”



# Environmental Justice: Definition

- **Environmental Justice** – The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.
- **Procedural Justice** - The right to be treated as an equal in political decisions as to how goods and opportunities are distributed.
- **Distributive Justice** - The same right to equal goods and opportunities as anyone else.
- **Recognitional Justice** - The need for valuing individuals and communities and ensuring consideration of impacts from their perspective.
- **Social Justice** - The state in which all classes of people have their well-being needs met.
- **Structural Justice** - The righting of structural processes in our society that perpetuate inequities by race and other groups of people.

# Reflections on EJ Definition

- *Evaluating Environmental Protection Agency's Definition of Environmental Justice – Lee (2021)*
  - **Equality:** Same levels of support for all segments of society (assumption that everyone benefits from the same supports)
  - **Equity:** Everyone gets the support they need such that there is greater fairness in outcomes
  - **Justice:** Systemic barriers are eliminated / causes of inequity are addressed
  - Tend to focus on procedural justice
  - More emphasis on equity goals
- Community stakeholder perspective: science-informed action to solve problems





## EPA and EJ

- EPA (2016) Environmental Justice Research Roadmap – Science challenges:
  - Developing decision-support tools for identifying and prioritizing concerns, assessing cumulative impacts, and evaluating mitigation options
  - Improving our understanding of environmental health disparities and developing methods and data for assessing cumulative risks
  - Supporting Tribal sustainability and well-being
  - Characterizing climate justice
- EPA (2003) Framework for Cumulative Risk Assessment\*
  - Planning, scoping, and problem formulation
  - Analysis
  - Risk characterization
  - Does not frame issues from an environmental justice perspective

\*EPA is developing a Risk Assessment Forum document, *Guidelines for Cumulative Risk Assessment: Planning and Problem Formulation*, which is currently undergoing review within EPA.





## NEJAC Recommendations

- [National Environmental Justice Advisory Council \(NEJAC\) \*Ensuring Risk Reduction in Communities with Multiple Stressors: Environmental Justice and Cumulative Risks/Impacts\* \(December 2004\)](#)
  - Institutionalize a bias for action within EPA through the widespread utilization of an Environmental Justice Collaborative Problem-Solving Model.
  - Fully incorporate the concept of vulnerability, especially its social and cultural aspects, into EPA's strategic plans and research agendas.
  - Promote a paradigm shift to community-based approaches, particularly community-based participatory research and intervention.
  - Incorporate social, economic, cultural, and community health factors, particularly those involving vulnerability, in EPA decision-making.
  - Develop and implement efficient screening, targeting, and prioritization methods/tools to identify communities needing immediate intervention
  - Address capacity and resource issues (human, organizational, technical, and financial) within EPA and the states, within impacted communities and tribes, and among all relevant stakeholders.



## NEJAC Recommendations (cont.)

- [NEJAC Recommendations for Integrating Environmental Justice into the EPA's Research Enterprise \(June 2014\)](#)
  - Prioritize an EJ research agenda informed by engagement/dialogue with vulnerable communities.
  - Continue serving as a convener of stakeholders to encourage collaboration among various entities in order to identify/clarify research questions needed to address environmental inequities.
  - Improve data collection and sharing to increase assessment of health disparities and other burdens of pollution “on the ground” and allow for comparisons in vulnerable communities over time.
  - Provide the necessary training and involve external stakeholders in the development/implementation of EJ training and how to conduct community-engaged research training.



# WHEJAC Recommendations

- [White House Environmental Justice Advisory Council \(WHEJAC\) Final Recommendations: Justice40, Climate and Economic Justice Screening Tool & Executive Order 12898 Revisions \(May 2021\)](#)
  - Provide communities of color, Tribal and indigenous communities, low-income communities, and people with disabilities opportunity for meaningful participation on development and design of research strategies.
  - Improve Federal research and data collection efforts related to the health [of] environmental justice communities.
  - Make achieving EJ part of its mission (i.e., to ensure that each person enjoys improvement in human health and environmental outcomes in their communities).
  - Each EJ strategic plan must contain strategies to improve direct guidance and technical assistance to EJ communities with respect to the communication of science, regulations, and policy related to Federal agency action on EJ issues.
  - Create leadership pipeline of youth from frontline communities working in their communities on identified citizen science projects with grassroots EJ groups.



# NACEPT Recommendations

- National Advisory Council for Environmental Policy and Technology (NACEPT):
  - [Environmental Protection Belongs to the Public: A Vision for Citizen Science at EPA \(2016\)](#)
  - [Information to Action—Strengthening EPA Citizen Science Partnerships for Environmental Protection \(2018\)](#)



# Scientific Research and Communities

- Wing (2005)
  - Experimental and quasi-experimental techniques are designed to remove complexity and social context.
  - Environmental justice requires that these be embraced.
  - “Trust, loyalty, social justice, respect for people, and environmental sustainability are valued more than an idealized concept of detached objectivity.”
- Hammersley (2011)
  - Researchers work in context (stakeholders, reviewers, research subjects, etc.).
  - Researchers affect the research process and what they are researching.
  - Researchers contextualize research questions, findings, and recommendations
- Positionality – The way in which an individual’s identity interacts with those of other individuals
- Reflexivity – The research process is influenced by the prior experience, assumptions, and belief of the researcher

# Community-Based Participatory Research

- **Community-based participatory research** – A research approach that features the direct involvement of the community at all stages in the research process.
- Projects generally originate from a perceived risk or pollution **in the community** (Commodore et al., 2017)
- Characteristics of projects that drive “structural change” (e.g., zoning) (Davis and Ramírez-Andreotta, 2021).
  - **Community members hold formal leadership roles**
  - Decision-makers and policy goals (**actions**) are at the center of the research design
  - **Research questions** and **study design** are **informed** by members of the **local community**
  - **Long-term partnerships** are sustained through multiple funding mechanisms



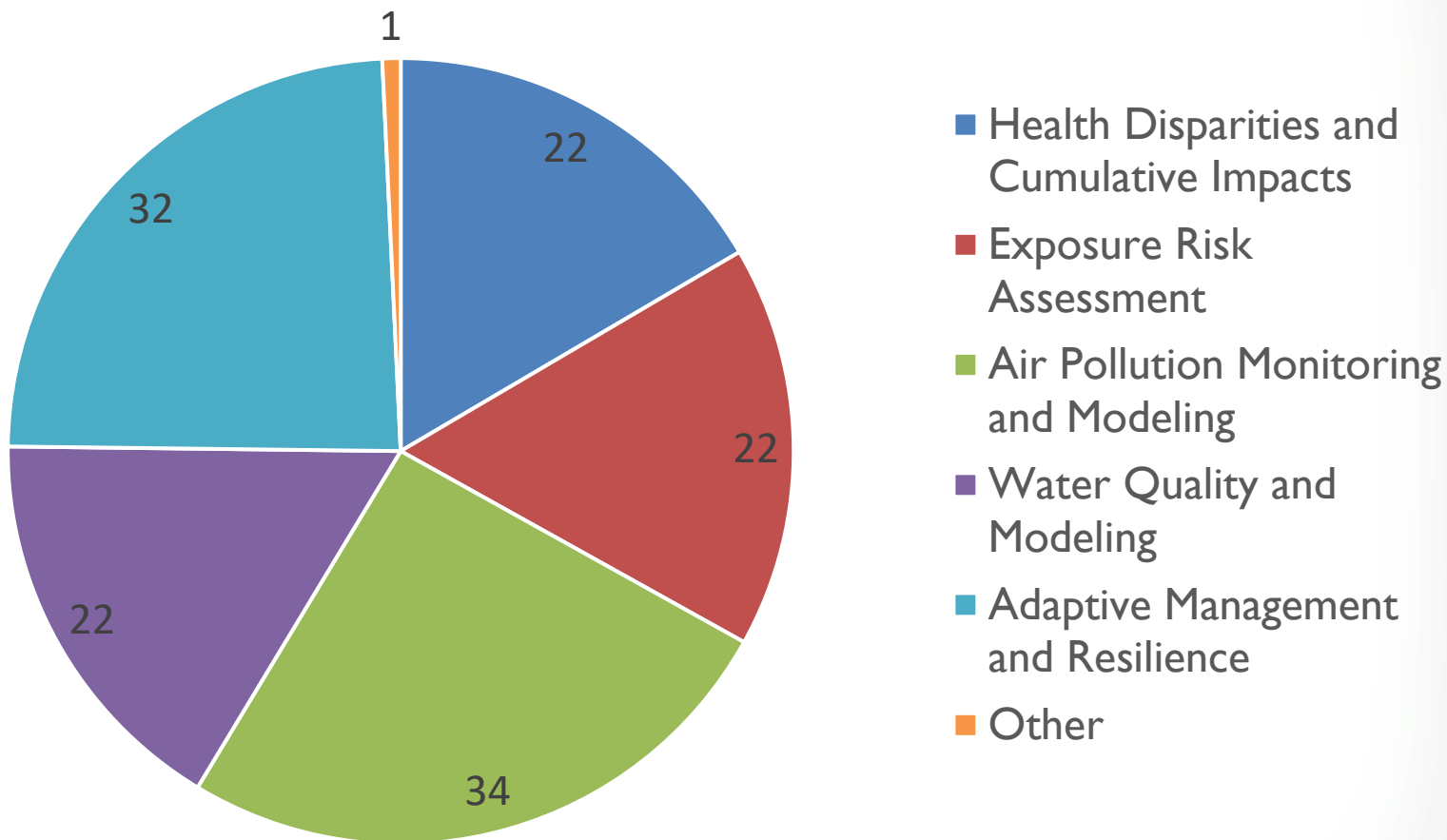


## ORD Environmental Justice-Relevant Research - Baseline Analysis

- **Developed inventory of research products that relate to environmental justice**
  - Goal was to understand our current footprint in this topic
  - FY19-FY22 research products and 2016-2020 Regional-ORD research collaboration products were queried
  - A total of 133 products were identified
- **Categorized products by topic**
  - Health Disparities and Cumulative Impacts
  - Exposure Risk Assessment
  - Air Pollution Monitoring and Modeling
  - Water Quality and Modeling
  - Adaptive Management and Resilience



## Baseline Analysis – # Products by Topic



**Number of Products in each  
Topic (n = 133)**





## Examples of ORD EJ-Relevant Research by Topic

- Health Disparities and Cumulative Impacts.....Slides 18-23
- Exposure Risk Assessment.....Slides 24-27
- Air Pollution Monitoring and Modeling.....Slides 28-31
- Water Quality and Modeling.....Slides 32-36
- Adaptive Management and Resilience.....Slides 37-42



## Health Disparities and Cumulative Impacts

- Health Impact Assessment (HIA) Applications to Brownfields Reuse and Redevelopment to Support Community Resiliency and Revitalization (SHC.9.4.3)
- Neighborhood Disadvantage, Aging, and Environmental Health (SHC.9.3.1)
- Documenting and baselining the health benefits of community revitalization at Sun Valley Colorado (SHC.9.3.6)
- Assessing the health risks from soil, sediment, and water contamination related to disposal sites near Alaskan federally recognized Tribes (RESES 2456)
- Populations Potentially at Increased Risk of a PM-related health effects (HERA.1.2.2)



# Health Disparities and Cumulative Impacts

## Health Impact Assessment (HIA) Applications to Brownfields Reuse and Redevelopment to Support Community Resiliency and Revitalization



Booker Washington Community Center,  
Rockford, IL.

**Product Type:** Report on cumulative EJ impacts of Brownfields with customizable worksheets for intervention strategies, using a case study/example from Rockford, IL.

**Point of Contact:** Timothy Barzyk

**EJ Issues:** Disproportionate cumulative impacts of contaminated sites from pollution and other social determinants of health

**Description:** Brownfields are contaminated or possibly contaminated sites that impact EJ communities with more than pollution. HIAs assess Brownfields' social, economic, and public health impacts to develop intervention strategies to mitigate disproportionate cumulative burden.

### **Partners & Roles:**

- **EPA Office of Research and Development:** Cumulative assessment methodologies and policy applications
- **EPA Office of Brownfields and Land Revitalization:** Partner engagement and distribution of results to EJ communities with Brownfields concerns
- **City Officials:** Community coordination and real-world implementation of intervention strategies
- **Community Representatives:** Feedback on cumulative impact policies and social determinants of health

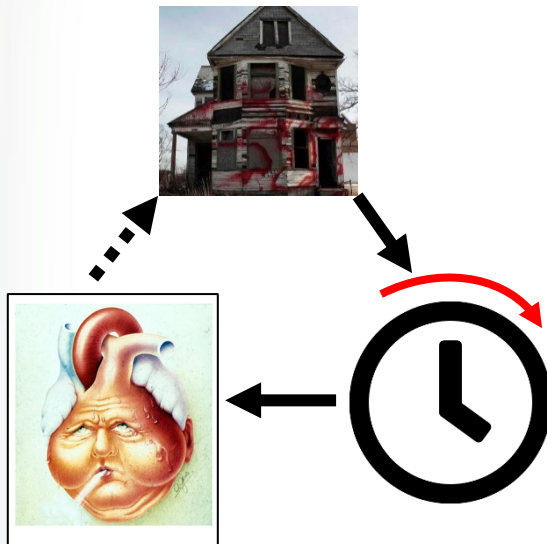
**Results & Impact:** For Rockford, Illinois, HIA revealed a range of cumulative impacts associated with contaminated site redevelopment, such as: 1) Housing; 2) Neighborhood and Built Environment; 3) Parks and Greenspace; 4) Employment and Economy; 5) Crime and Safety; and 6) Social and Cultural Wellbeing. This work provides best practices and intervention strategies to maximize the public health benefits of Brownfield reuse and redevelopment, with results to be distributed across Brownfield EJ communities.



# Health Disparities and Cumulative Impacts

## Neighborhood Disadvantage, Aging, and Environmental Health

SHC.9.3.3 CPHEA



**Project/Product Type:** Journal Articles

**Point of Contact:** Cavin Ward-Caviness

**EJ Issues:** Understanding how stressors found in disadvantaged neighborhoods impact future environmental health risks

**Description:**

This project examines how neighborhood stressors accelerate aging in an urban, primarily Black population. We studied novel epigenetic biomarkers of aging and mortality risk that provided a quantifiable assessment of these concepts. We then used biomarkers of accelerated aging associated with the neighborhood to study environmental health risks. It is a unique look at how EJ “gets under the skin” to impact health.

**Partners:** Office of Air and Radiation, Office of Environmental Justice, University of North Carolina

**Results & Impact:** We demonstrated that neighborhood exposure to EJ-correlated factors like poor streets, abandoned cars, and graffiti accelerated aging and mortality risks in an urban, Black population. This acceleration was offset by positive community factors such as greenspace. Further we demonstrated that people with accelerated aging have stronger responses to air pollution, reflected in increased risk of vascular disease and higher blood pressure. This maps out a vicious cycle of EJ and environmental health risks which we may be able to track using quantitative aging biomarkers

**Citations:** Ward-Caviness, et. al. (2020). *Aging* 12(23); Ward-Caviness, et. al. (2020). *Clinical Epigenetics* 12(1); Martin, et. al. (2021). *Aging* 13(6)



# Health Disparities and Cumulative Impacts

## Documenting and baselining the health benefits of community revitalization at Sun Valley Colorado



### **Partners & Roles:**

ORD: Data Collection

Denver Housing Authority:  
Recruitment  
and community outreach

**Product Type:** Report and Datasets

**Point of Contact:** Michael Nye

**EJ Issues:** Sun Valley is the poorest public housing neighborhood in Denver. ~70% of residents are people of color, and many are recent immigrants. They are exposed to poor air quality, have significantly higher rates of respiratory and cardiovascular morbidity, and have less access to green space and healthy food compared to Denver. The EJ Screen Demographic Index score for the Sun Valley neighborhood is 99.

**Description:** Sun Valley is undergoing a significant revitalization and transformation effort aimed at improving well being and healthy living for residents. EPA, Colorado State University, and the Colorado School of Public Health are working with Denver Housing Authority (DHA) and Sun Valley residents to collect data on current environmental, built environment, and public health conditions to create a robust baseline for comparison and use in outcome assessment once the revitalization project is complete. This project extends these efforts to include a health survey and non-invasive saliva sampling and analysis for biomarkers of stress, physiological status, and chronic infection.

**Results & Impact:** Recent studies conducted by EPA at other project sites demonstrate a strong association between neighborhood environmental quality and stress hormones. Tracking subclinical health outcomes using biomarker data is a more robust means of assessing the public health benefits of revitalization than tracking through secondary data collection and self-reported health outcomes. These data will assist DHA, other revitalization practitioners, and scientific communities to better understand and communicate about the health benefits of revitalization to their respective stakeholder groups.





# Health Disparities and Cumulative Impacts

**Assessing the health risks from soil, sediment, and water contamination related to disposal sites near Alaskan federally recognized Tribes**



**Product Type:** Information and Reports to Alaska Tribes

**Points of Contact:** Page Jordan, Britta Bierwagen and team, Angel Ip, and Michelle Davis

**EJ Issues:** The loss of permafrost and increased erosion may magnify the environmental health impacts of solid waste management in rural Alaska. Human waste, household hazardous waste and electronic waste may be co-mingled with typical solid waste, allowing for the transport and release of contaminants to adjacent land and water resources.

**Description:** The team will work with Alaska Tribes using Tribally-driven research and co-production of knowledge approaches. The team will develop conceptual models addressing potential health impacts of waste in rural Alaska and characterize and sample contaminants for Alaska Tribes.

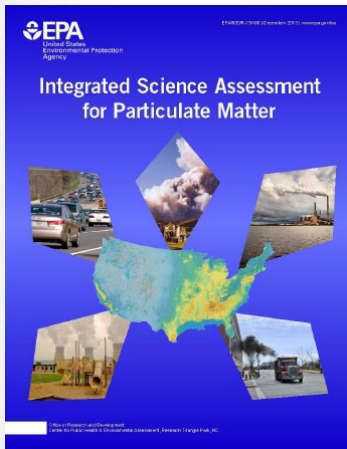
**Partners & Roles:** Alaska Tribes (co-principal investigators); Partners include Agency for Toxic Substances and Disease Registry, Alaska Department of Health and Social Services, Alaska Pacific University, Yukon River Inter-Tribal Watershed Council, Zender Environmental Health and Research Group

**Results & Impact:** Through this research, Alaska Tribes, EPA, and partners will have information that will assist them in long range planning for improved management and potential cleanup of landfills. The information will help managers make informed decisions and institute best practices to protect the health of their most vulnerable residents.



# Health Disparities and Cumulative Impacts

## Populations Potentially at Increased Risk of a PM-related health effects



**Product Type:** Assessment

**Point of Contact:** Jason Sacks

**EJ Issues:** EJ communities may experience disparities in PM exposures or the risk of PM-related health effects

**Description:**

The ISA serves as the scientific foundation for the review of the National Ambient Air Quality Standards (NAAQS) for the criteria pollutants, including PM. In addition to evaluating the current state of the science with respect to the health effects of a criteria pollutant, each ISA

also assesses the evidence as to whether specific populations or lifestyles are at increased risk of a health effect because the NAAQS are intended to protect the entire population, including those populations at increased risk. Scientific evidence is evaluated across scientific disciplines and conclusions presented to convey our overall confidence that a specific population or lifestyle is at increased risk.

**Partners & Roles:**

- Office of Air and Radiation: End user of PM ISA for development of Policy Assessment (PA) and Risk and Exposure Assessment (REA), if warranted
- Public: Academia, NGOs, and Industry (each uses the ISA for a different purpose)

**Results & Impact:** The PM ISA concluded there was *adequate* evidence that nonwhite populations experience greater PM<sub>2.5</sub> exposure and are at increased risk of PM<sub>2.5</sub>-related health effects, specifically mortality due to long-term PM<sub>2.5</sub> exposure. The evidence is *suggestive* for people of low socioeconomic status (SES).

## Exposure Risk Assessment

- Health Effects of Changing Lead Exposures and Community Factors Which May Alter Potential Health Benefits (SHC.5.2.4)
- Prioritizing Chemicals of Greatest Health Risk to Susceptible Populations (CSS.2.6.6)
- Models and Simulations for Community Vulnerability and Climate Resiliency to Flood Impacts on Contaminated Sites (SHC.10.4.1)





# Exposure Risk Assessment

## Health Effects of Changing Lead Exposures and Community Factors Which May Alter Potential Health Benefits

Child blood Pb



Predicted Exposure Surface



Health Outcomes



**Product Type:** Presentations, Journal Article, Database

**Points of Contact:** Lauren H. Wyatt, Cavin Ward-Caviness, and Ana G. Rappold

**EJ Issues:** Community health benefit of mitigating lead (Pb) exposure

### **Description:**

Assess the health benefit of reductions in Pb exposures across communities:

- 1) Characterize community factors that determine risk and changes in risk of Pb exposure in children,
- 2) Measure health burden associated with temporal changes in Pb exposure across communities.

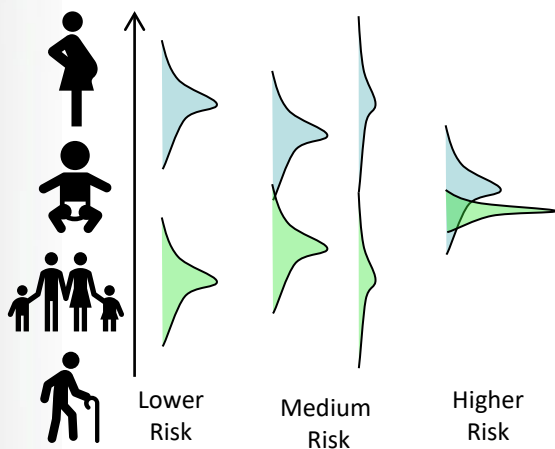
### **Partners & Roles:**

NC Department of Health and Human Services (child blood Pb data), EPA Region 4 (guidance & direction), EPA Office of Children's Health Protection (planned guidance & direction)

### **Progress:**

Child blood lead level DUA in review with OGC; electronic health record data for child health assessment undergoing quality check

## Prioritizing Chemicals of Greatest Health Risk to Susceptible Populations



**Product Type:** Journal Articles, Online Tools, Work Flows, and Models

**Points of Contact:** John Wambaugh, Elaina Kenyon, and Jill Franzosa

**EJ Issues:** Susceptible populations

**Description:** Developing and using new methods and models to rapidly screen and prioritize chemicals that might pose the greatest health risks to specific susceptible populations, including the mother and growing fetus, pediatric and elderly life-stages, and genetically and other susceptible populations.

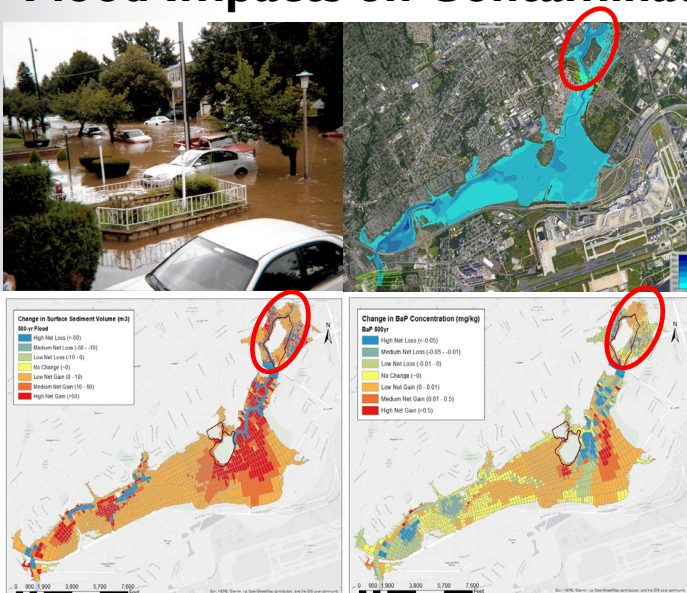
**Partners:** FDA, University of North Carolina, Internal partners include OPP, OPPT, OCHP, States such as MN Dept. of Health, international organizations-ECHA & Health Canada

**Results & Impact:** This research develops tools that can be used to prioritize and evaluate chemicals that are of greater risk to susceptible populations and provides a better understanding of how health disparities may arise from chemical exposures among susceptible groups in environmentally burdened and vulnerable communities.



# Exposure Risk Assessment

## Models and Simulations for Community Vulnerability and Climate Resiliency to Flood Impacts on Contaminated Sites



**Sub-Product Type:** Geospatial Maps for Community Engagement

**Point of Contact:** Pai-Yei Whung

**EJ Issues:** Coastal communities near CERCLA and/or RCRA contaminated sites are vulnerable to flooding and potential sea level rise impacts

**Description:** Changing climate and extreme rainfall events exacerbate multiple stressors on communities, one being potential flood-driven sediment and toxics transport from contaminated sites. A majority of the country's contaminated sites are near low-income housing. Communities have expressed the need for localized, future flooding information to develop climate resiliency plans. The project team applied an innovative model-coupling approach to simulate sediment and contaminant dynamic redistributions in multiple sea level rise and flood scenarios in PA and NJ.

○ is a near-site flooded neighborhood

**Partners & Roles:** EPA R2, R3 and NJDEP. Partners identified the community vulnerability issues, guided the problem formulation of the project, provided a suit of modeling-required contaminant and geospatial data layers, are serving as liaison to the community, and can incorporate our research results into community decision making and planning.

**Results & Impact:** Collaborating partners can use the research results to inform remedial actions, resampling in feasibility plan, and nearby communities in developing climate resiliency plans.

## Air Pollution Monitoring and Modeling

- Community Participation in Classifying Odors from Air Pollution Emissions (RESES 2337)
- Real-Time Measurement of Air Pollutants Near the Port of New York & New Jersey (RARE 1360)
- Differential effects of air pollution on health outcomes by community-level sociodemographic factors (ACE.3.2.2)



# Air Pollution Monitoring and Modeling

## Community Participation in Classifying Odors from Air Pollution Emissions



**Product Type:** Odor Explore App

**Points of Contact:** Rachelle Duvall, Sheryl Good, and Dawn Taylor

**EJ Issues:** Air Pollution, odors, industrial equity, health disparities

**Description:** Many communities are impacted by odors from air pollution emissions. Some odors are due to hazardous air pollutants (HAPs) and volatile organic compounds (VOCs) which can contribute to ozone and particle formation. Persistent odors can be a nuisance and may cause health concerns for impacted communities.

**Partners & Roles:** Partners include the Louisville Metro Air Pollution Control District (APCD) and the Louisville Metropolitan Sewer District (MSD). APCD and MSD provide feedback on the app design and contents. APCD facilitates pilot testing and recruiting pilot testers, responds to odor complaints, and coordinates meetings with the community to share progress on this research.

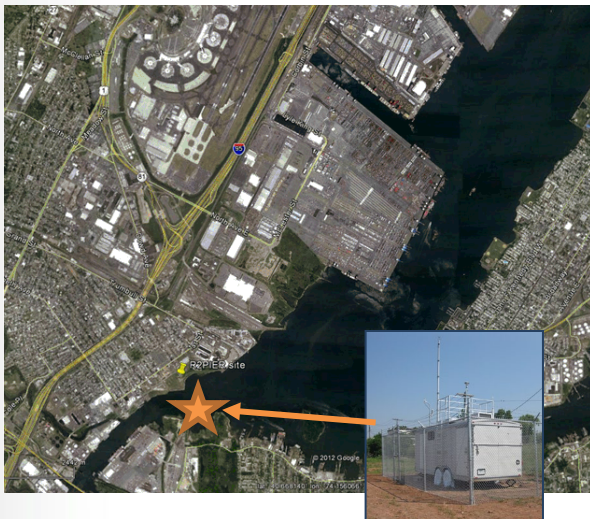
**Results & Impact:** A beta version of Odor Explore was developed for iOS and Android phones and pilot tested by community volunteers in the Rubbertown area in Louisville, KY – a community with EJ concerns. The app will engage and empower communities and expand the ability of state/local/regional governments to respond to odor complaints. The app data set will educate the public on odors and can be used by government and industry to develop air pollution and odor mitigation strategies.





# Air Pollution Monitoring and Modeling

## Real-Time Measurement of Air Pollutants Near the Port of New York & New Jersey



**Product Type:** Journal Article

**Points of Contact:** Gayle Hagler, Daniel Birkett, and Mindy Pensak

**EJ Issues:** Transport equity, health disparities, air pollution monitoring

**Description:** The Clean Air Strategy for the Port of NY and NJ aims to cut cumulative emissions by 3–5% annually. This project responds to port-adjacent community requests to assess the effectiveness of the strategy by measuring actual emission reductions over time from key port sources.

**Partners:** Port Authority of NY and NJ, NJ Department of Environmental Protection, New York State Department of Environmental Conservation, community groups

**Partner Roles:** Provision of data to complement research study (NJDEP); information exchange (all partners)

**Results & Impact:** This study observed changes in pollutant concentrations over time, finding reductions in SO<sub>2</sub>, NO<sub>x</sub>, and BC associated with the port emissions areas. While modeling studies had predicted improvement, this study demonstrated the reality of how the conditions evolved using advanced analytical methods to characterize air pollution in complex geographic areas.

**Citation:** Hagler, et. al. (2021). *Aerosol Air Qual. Res.* 21(3).



# Air Pollution Monitoring and Modeling

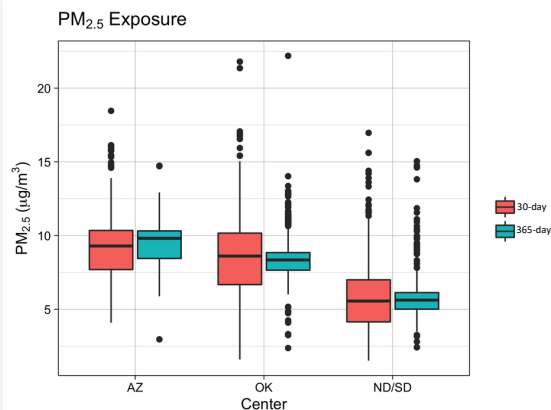
## Differential effects of air pollution on health outcomes by community-level sociodemographic factors

**Product Type:** Journal Articles

**Point of Contact:** Anne Weaver

**EJ Issues:** Health effects from air pollution well-characterized in urban settings with few American Indians. Less is known about associations among American Indians and in rural areas.

**Description:** This study examines air pollution and related health effects among American Indian participants of the Strong Heart Study in AZ, OK, and ND/SD.



**Partners:** Jada Brooks, Giselle Corbie-Smith, David Peden, **UNC**; Joseph Yracheta, Ana Navas-Acien, Mengyuan Li, **Columbia University**; Jessica Reese, Ying Zhang, **University of Oklahoma**

Expertise in Indigenous research methods, Strong Heart Study

**Results & Impact:** Variations in air pollution exposure among participants by site and by season: highest in AZ, lowest in ND/SD fall/winter.

Analyses assessing associations between PM<sub>2.5</sub> and hypertension are ongoing.



## Water Quality and Modeling

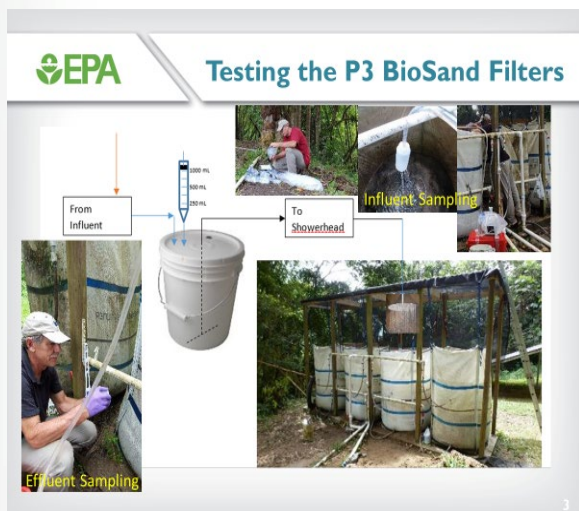
- Evaluation of drinking water treatment and monitoring technologies to improve public health in non-PRASA communities in Puerto Rico (RARE 1784)
- Assessing the Resilience of Region 2 Drinking Water Systems to Natural Disasters (RARE 2071)
- UST Finder : ORD's EJ Mapper : EJSCREEN Index (SHC.4.1.1)
- Analysis of the San Juan Watershed Monitoring project monitoring data for use by States and Tribes (SSVWR.1.6.1)





# Water Quality and Modeling

## Evaluation of drinking water treatment and monitoring technologies to improve public health in non-PRASA communities in Puerto Rico



**Product Type:** Presentation and Report

**Points of Contact:** Craig Patterson and Cristina Maldonado

**EJ Issues:** There is a clear need for a multi-barrier approach to provide safe drinking water and improve the health of individuals living in rural communities not served by the Puerto Rico Aqueduct and Sewer Authority (Non-PRASA water systems).

**Description:** This project was designed to improve the reliability of drinking water treatment systems and effectively remove and disinfect pathogens from surface water sources by determining the effectiveness of biological sand filters in terms of turbidity and pathogen removal over time and optimizing the operation and maintenance of the filtration process.

**Partners & Roles:** EPA Region 2 and ORD provided technical support in collaboration with Inter- American University using citizen science with residents in non-PRASA communities near Patillas, Puerto Rico.

**Results & Impact:** The filters met surface water treatment rule criteria for 4 log removal for *Cryptosporidium* oocysts and therefore will provide safe water and improve the health of individuals living in small communities served by non-PRASA water systems. Results and findings on the efficacy of biosand filters and water quality monitoring systems were disseminated to EPA Region 2, ORD, ORD Contractors, InterAmerican University and water industry professionals in the U.S. and throughout the world.

## Assessing the Resilience of Region 2 Drinking Water Systems to Natural Disasters

**Product Type:** Journal Article

**Points of Contact:** Terra Haxton, Regan Murray, and Josh Kogan

**EJ Issues:** Ensure that all people served by community water systems have drinking water that meets applicable health-based standards

**Description:** Drinking water systems in the US Virgin Islands have the potential to be severely impacted by hurricanes and tropical storms. The Water Network Tool for Resilience (WNTR) is used to model and simulate a four-week power outage to water pumps on the islands followed by a two-week recovery time-period.

**Partners & Roles:** U.S. Virgin Islands Water and Power Authority (WAPA) – drinking water utility that provided information on their system, including network models used in the analysis, disaster scenarios of interest, and feedback on analysis results; Naval Postgraduate School (NPS) – collaborator that coordinated connections with WAPA and Witt O'Brien's and provided analysis support; Witt O'Brien's – consultant for WAPA that provided feedback on analysis results.

**Results & Impact:** The information will be used to assist WAPA in obtaining FEMA funds to upgrade the distribution system to be more resilient for future hurricane power outages and other scenarios.

**Citation:** Assessing the Resilience of Region 2 Drinking Water Systems to Natural Disasters

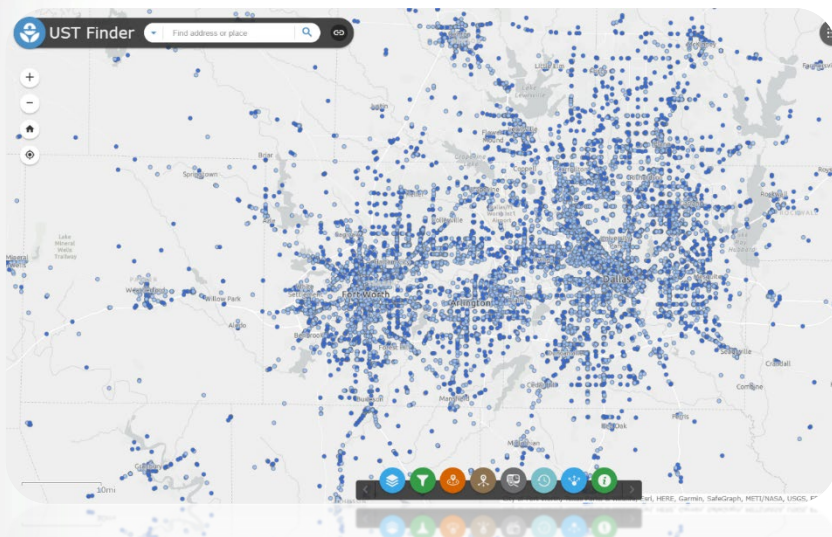




# Water Quality and Modeling

## UST Finder : ORD's EJ Mapper : EJSCREEN Index

SHC.4.I.1 | CESER



### **Partners:**

Office of Underground Storage Tanks  
Office of Environmental Justice  
Association of State and Territorial  
Solid Waste Management Officials

### **Results & Impact:**

UST Finder and a new EJSCREEN Index provide stakeholders and state UST program offices the tools necessary to assess risk to vulnerable populations.

**Product Type:** Dataset

**Points of Contact:** Alexander W. Hall and Fran Kremer

### **EJ Issues and Tools:**

UST Finder is a national and tribal database and web application with information on locations of 2.2 million underground storage tanks (USTs) and over 500,000 UST toxic releases. Analysis from this data shows low-income and minority communities disproportionately burdened by UST infrastructure and their toxic releases. These data are included as an index in EJSCREEN so that EJ impacts related to UST infrastructure can be measured, quantified, and acted upon. ORD is also incorporating EJSCREEN data into UST Finder in order to identify vulnerable communities near UST infrastructure.

USTs and their associated petroleum and hazardous substance releases can contaminate public and private drinking water and cause vapor intrusion into residential and commercial properties—these environmental and human health issues have important EJ implications.



# Water Quality and Modeling

## Analysis of the San Juan Watershed Monitoring project monitoring data for use by States and Tribes

SSWR.1.6.1 | CEMM



**Partners:** Regions 6, 8, and 9 and OW

**Results & Impact:** Scientific and communication tools developed in this climatically and culturally diverse watershed may provide tools for other multijurisdictional watersheds nationally.

**Product Type:** EPA Report

**Point of Contact:** Kate Sullivan

**EJ Issues:** Because of historic mining within the headwaters of the Animas River, the San Juan River Watershed has been dealing with acid mine drainage for many years, impacting both the environment and the health of surrounding Tribes and communities.

**Description:**

Under direction of EPA Region 8, the mining area is currently a Superfund cleanup site, with a watershed monitoring program coordinated with EPA Regions 6, 8, and 9 and funded by the Water Infrastructure Improvements for the Nation Act in collaboration with Colorado, New Mexico, Utah, Arizona, the Navajo Nation, the Southern Ute Indian Tribe, and the Ute Mountain Ute Tribe. This product includes evaluation of the results from the watershed-wide monitoring effort and will assist states and Tribes to accomplish specific decision-making objectives and application of ORD tools such as watershed modeling and biological assessment in support of state and tribal watershed restoration plans.

## Adaptive Management and Resilience

- Interactive Guidance for Individuals to Safely Clean, Decontaminate, and Reoccupy Flood and Hurricane-Damaged Houses (RESES 2314)
- Community Resilience Planning and Decision-Making Framework for Coastal Communities (RESES 2341)
- Assessing Ecological and Human Well-Being Indicators for Great Lakes Areas of Concern, Superfund Cleanup, Brownfields Remediation, and Waterfront Revitalization (SHC.9.3.1)
- Community Participation, Perceptions, and Well-Being in Great Lakes Areas of Concern (SHC.9.3.1)
- An Examination of EPA Tools through a Capacity Lens (SHC.10.3.1)





# Adaptive Management and Resilience

## Interactive Guidance for Individuals to Safely Clean, Decontaminate, and Reoccupy Flood and Hurricane-Damaged Houses



**Project Type:** Website with How-To Videos

**Points of Contact:** Keely Maxwell and Chandler Milhollin

**EJ Issues:** Flooded homes in communities with EJ concerns can present health risks to children, seniors, & other populations of concern from lead, asbestos, and mold, among other hazards; socioeconomically disadvantaged households face additional obstacles to recovery.

**Description:** This project uses disaster anthropology and human-centered design to develop risk communication about indoor air quality risks from flooded homes and what to do about them.

**Partners & Roles:** EPA, CDC, HUD, FEMA (technical input); Florida Department of Health, Florida Department of Health, Florida State University, Louisiana State University Extension Office (outreach, technical input); St. Bernard's Project (filming host); Lab at OPM (design expertise);

**Results & Impact:** The website is intended to help make EPA become a trusted source of information that meets people where they're at after a flood. Its how-to videos can help homeowners, renters, and volunteers take action to clean up and repair flooded homes. Getting people back into their homes quickly and safely is central to household and community resilience after a flood.



# Adaptive Management and Resilience

## Community Resilience Planning and Decision-Making Framework for Coastal Communities

**Product Type:** EPA Report

**Points of Contact:** Brian Dyson, Tim Canfield, and Rafaela Moura

### **EJ Issues:**

- Equitable Housing, Crime
- Social Cohesion, Climate Induced Stressors

### **Description:**

- Anticipated population growth raises concerns over impacts to stability and diversity of existing neighborhoods and rising costs of housing.
- Increased climate-related coastal flooding exacerbates the concerns.
- The decision tool DASEES integrates community and environmental concerns and appropriate metrics in a quantitative consequence analysis framework



### **Partners:**

ORD, Region 4, Broward County, FL  
Southeast Florida Regional Climate Change Compact

### **Results & Impact:**

- Fair and meaningful involvement of EJ community residents in development of resilience plans affecting public health, social and economic well-being, and environmental conditions.
- Demonstration of the ORD tool DASEES and its potential for the inclusion of EJ community concerns in the creation and evaluation of solutions to community resilience problems.



# Adaptive Management and Resilience

## Assessing Ecological and Human Well-Being Indicators for Great Lakes Areas of Concern, Superfund Cleanup, Brownfields Remediation, and Waterfront Revitalization



Photo credit: UW-Extension

**Product Type:** Journal Articles

**Points of Contact:** Theodore Angradi and Joel Hoffmann

**EJ Issues:** Distribution of wellbeing, community benefits, environmental change, community perception

**Description:** Quantitative analysis of demographic, health, and amenity access data in four Great Lakes Areas of Concern (AOC) to examine potential relationships between demographics, environmental remediation and restoration, and the resulting access to and distribution of green and blue-spaces. This study will identify and characterize how indicators can be used by agencies and communities to ensure more equitable access to ecosystem services - the components of nature, *directly* enjoyed, consumed, or used to provide human well-being.

**Partners:** Great Lakes National Program Office, Areas of Concern agencies

**Results & Impact:** The Great Lakes Restoration Initiative has catalyzed revitalization throughout the region. This research will provide a set of relevant indicators, similar to determinants of health, to better characterize the benefits to communities and to minimize potential negative impacts.





# Adaptive Management and Resilience

## Community Participation, Perceptions, and Well-Being in Great Lakes Areas of Concern



Photo credit: USEPA

**Product Type:** Journal Articles

**Points of Contact:** Jennifer Josephs and Katie Williams

**EJ Issues:** Community participation, community partnerships, community perception of environmental condition, community assets

**Description:** One study will use qualitative analysis to evaluate current status of community participation in Great Lakes AOCs through literature review and conclude with research recommendations. The second study will work with partners to assess community perceptions and recreational use of degraded areas before and after clean-up.

**Partners:** Great Lakes National Program Office; City of Superior, Wisconsin; Lake Superior National Estuarine Research Reserve; Great Lakes Areas of Concern agencies

**Results & Impact:** Remediation and restoration in the Great Lakes has the potential to provide clean, green and blue spaces to overburdened communities. This research will provide suggestions for how to enhance community participation in making decisions about revitalizing the Great Lakes and gather ideas from the community about how the areas could be revitalized for improved recreational opportunities.



# Adaptive Management and Resilience

## An Examination of EPA Tools through a Capacity Lens



**Product Type:** Report

**Points of Contact:** Mary Clare Hano and Ana Rappold

**EJ Issues:** Increased risks faced by individuals in vulnerable populations in three counties in the Western U.S. related to wildfire smoke

**Description:**

This project is community-engaged research effort that aims to support local efforts to mitigate the public health impacts of wildfire smoke and increase community resilience to future smoke events through a collaborative approach to local readiness planning and response.

**Partners & Roles:** *Community partners:* Butte-Silver Bow, Montana; Garfield County, Colorado; Jackson County, Oregon – In each county our partners are co-leaders of the local planning project.

*Organizational partners:* USFS, OAR, OEJ, OCHP – Early in the project we established partnerships with subject matter experts as part of the problem formulation and research design processes. Currently we are implementing this research and our partnership continues with subject matter experts continues by way of guest presentations and consultations with local teams.

**Results & Impact:** While the project is currently underway, the intended impacts are to 1) support our partner communities' efforts to increase public health readiness and resilience to wildfire smoke events, and 2) inform broader recommendations for effective approaches to increase community-level resilience in the context of wildfire smoke.



## Presentation Contributors

- Theodore Angradi
- Timothy Barzyk
- Britta Bierwagen
- Daniel Birkett
- Tim Canfield
- Jennifer Cashdollar\*
- Michelle Davis
- Kacee Deener\*
- Rachelle Duvall
- Brian Dyson
- Jill Franzosa
- Chris Frey
- Andrew Geller
- Sheryl Good
- Gayle Hagler
- Alexander W. Hall
- Mary Clare Hano
- Terra Haxton
- Joel Hoffmann
- Angel Ip
- Page Jordan
- Jennifer Josephs
- Susan Julius\*
- Elaina Kenyon
- Josh Kogan
- Fran Kremer
- Cristina Maldonado
- Russell Massey\*
- Keely Maxwell
- Sarah Mazur\*\*
- Chandler Milhollin
- Rafaela Moura
- Regan Murray
- Onyemaechi Nweke\*
- Michael Nye
- Craig Patterson
- Mindy Pensak
- Ana G. Rappold
- Danielle Ridley
- Eletha Roberts\*
- Jason Sacks
- Matthew Small\*
- Kate Sullivan
- Dawn Taylor
- Sania Tong Argao\*\*
- Michael Troyer\*
- Cavin Ward-Caviness
- John Wambaugh
- Anne Weaver
- Pai-Yei Whung
- Katie Williams
- Lauren H. Wyatt

\* EPA Office of Research & Development's EJ Council members

\*\* Current EJ Council co-chairs