ISES 2026 Annual Meeting – List of Proposed Sessions, Sorted by Themes

Air Pollution

[11] Exposure to Air Pollution and Climate Extremes and Linkage With Human Health in the LMICs
[26] Air Pollution and Brain Health: Emerging Evidence on Neurological and Mental Health Outcomes
[47] Advancing Precision Environmental Health in Rural and Underserved Communities
[48] From Exposure to Impact: Decoding the Health Burden of PM2.5 and PM10 in Vulnerable Communities Through an Exposomic Lens.
[64] Global Air Pollution Exposure in a Changing Climate and Society: Evidence Across Diverse and Understudied Regions

Artificial Intelligence, Machine Learning & Data Science Methods

[14] Artificial Intelligence and Machine Learning in Exposure Science
[38] A Double-Edged Sword: Ethical Artificial Intelligence in Exposure Science
[42] Data-Driven Approaches to Improve Realism in Exposure Assessment
[70] Advancing Statistical Methods in Exposure Science for Public and Environmental Health
[77] AI in Exposure Science and Risk Assessment - Applications and Limitations

Biological Exposures

[81] Exposure Sciences to Unravel the Microbiological Environment: From Methods to Applications

Chemical Exposome

[28] Advancing Large-Scale, High-Throughput Chemical Exposome Profiling Through Emerging Analytical and Computational Methods
[37] Identifying Novel Chemical Stressors Across the Exposome: From Discovery to Health-Relevant Insights
[46] Unlocking the Chemical Exposome: Advances and Pitfalls in Non-Targeted Analysis
[79] Advancing Exposure Forensics for Environmental Health Protection

Chemical Exposures: Pesticides, PFAS & Plastics

[13] Pesticides and the Exposome: Advancing Collaborative Approaches to Assess and Protect Community Health
[18] Advancing the Science of Pesticide Exposure: Novel Approaches to Dietary and Non-Dietary Exposures in Global Settings
[72] Chemical Exposures From Food and Agricultural Sources: Monitoring, Risk Assessment & Research Needs in Latin America
[32] Beyond Legacy PFAS: Human Exposure to and Health Effects of Emerging PFAS
[50] Micro- and Nanoplastics and Human Health: Advancing Exposomics by Integrating Laboratory Sciences, Exposure Science, and Public Health Translation
[62] Plastics and Plastic-Related Chemical Exposures in Asia-Pacific: Current Evidence and Emerging Health Risks

Children's Health & Early-Life Exposures

[10] Exposure Factors and Community-Driven Asthma Research Studies Across the Globe
[19] Small Bodies, Big Exposures: Environmental Risks for Children
[30] Early-Life Environmental Exposures and Lifecourse Maternal-Child Health: Findings from Pooled U.S. ECHO Cohort Sites on Prenatal and Childhood Exposures, Mixtures, and Health Trajectories.
[59] Ensuring Healthy Indoor Environments in Schools in a Changing Climate

Climate Change & Extreme Environmental Events

[35] Emerging Event-Based Environmental Exposures in the Climate Era: Identification, Attribution, and Health Impacts
[60] Temperature Data Products: What Is the Right Data Product for Your Health Study?
[61] Using Exposure Research to Inform Climate Action in Cities
[67] Firefighter Exposures at the Wildland Urban Interface (WUI)

Community Engagement, Translation & Ethics

[29] Beyond Hazard Detection: Evaluating and Understanding the Health Risk Implications of Exposures
[33] Po-tate-o, Po-taa-toe: Reconciling the Exposome and Cumulative Impacts with Communities' Needs.

[41] Evaluating Report-Back of Research Results: Learning From and Improving How to Share Study Results With Participants
[43] Integrating Public Data to Underscore Exposure Trends
[49] Exposure-Reducing Intervention Studies: Moving Towards Solutions
[55] Beyond Publishing Papers: Leveraging Data to Transform Markets and Shift Policies Toward Safer Solutions
[66] How to Build and Maintain a Sustainable and Stronger Community Through Academic Partnerships.
[68] From Lived Experience to Measured Exposure: Reimagining the Exposome Through Community-Driven Science

Emerging Sources

[9] From E-Waste to the Exposome: Integrating Metal Toxicity, Oxidative Stress Biomarkers, and Cancer Risk in Vulnerable Communities
[16] Innovative Technologies, Methods, and Partnerships to Advance Disaster Research Response
[24] Fossil Fuels & Toxic Trespass in Fenceline Communities
[39] Data Centers: What We Know and What We Don't Know about Human Exposures
[44] Oil and Gas Development, Climate Change, and the Exposome: Pathways, Populations, and Policy
[54] Untangling the Evidence: Hair Products and Health
[56] Beyond the Surface: Exposure and Health Implications of Chemical UV Filters
[57] Complex Exposures From Emerging Nicotine Delivery Devices and Their Implications on the Exposome: Linking Product Design, User Behavior, and Chemical Mixtures
[69] Integrated Assessment of Bioavailability of Substances in Solid (Complex) Matrices
[76] Exploring Thermal Runaway Exposure Characteristics, Environmental Impacts, and Health Consequences

Environmental Justice & Vulnerable Populations

[21] Integrating Multipollutant Exposures and Social Determinants in Exposome Science
[34] Collaborative Approaches to Community-Level Monitoring of VOC and Chemical Exposures
[36] Beyond Single Stressors: Tools for Measuring Social Vulnerability and Compounding Environmental Hazards

[40] “Hidden Exposures": Rethinking Health Communication for Black Women
[63] Pure Earth and the Partnership for a Lead-Free Future: Using Exposure Science to Reduce Lead Exposure in 21+ Low and Middle Income Countries

Exposomics & Multi-Omics Integration

[8] Advancing Canada’s Contributions to Population-Based Exposomics: Methods, Infrastructure, and Coordination
[23] Leveraging Exposomics and Multi-Omics to Understand the Molecular Etiology of Chronic and Complex Diseases
[31] Characterizing the Human Exposome to Address Real-World Environmental Exposure Scenarios
[51] Beyond Mitigating Exposure Levels: Interactions Between Environmental Pollutants and Non-Environmental Factors in Human Health
[53] Integrating External and Internal Environmental Stressors – How Real-world Exposome Influences Human Health
[58] Integrating Mechanistic Mixture Toxicology and Exposome Science to Advance Environmental Health Research
[74] Translational Exposomics for Precision Prevention and Public Health Enhancement
[75] AI-Driven Integration of Genomic and Exposome Data for Precision Cancer Prevention: From Combined Risk Scores to Clinical Translation

Geospatial & Place-Based Exposure Science

[12] Address-Level Exposure Science: Integrating National Address Data, Housing Conditions, and Multimodal Environmental Signals for Population Health Research
[27] Bridging the Geo-Health Data Gap: Resources and Approaches to Advance the Integration of Environmental Exposure and Exposomic Data into Epidemiologic and Clinical Research

Human Biomonitoring

[15] How to Improve the Involvement of Participants in Human Biomonitoring Studies (HBM) Studies? Current Experiences and “Lessons Learnt” From Population Surveys
[65] Biomonitoring of National and Regional Populations: Translations to Public Health Interventions and Regulatory Efforts.
[71] Leveraging HBM Efforts in Europe: Harmonisation, Data Integration and Communication in PARC

[73] PARC Advances in Human Biomonitoring and Risk Assessment in Europe: From HBM4EU Foundations Towards the OSOA Framework
[78] From Risk Assessment to Health-Based Interpretation of Human Biomonitoring Data: A Case Study on Inorganic Arsenic

ISES Europe Chapter

[45] The European Chapter of the International Society of Exposure Science: Developing and Advancing Exposure Science.

Occupational Exposures

[17] Exposure Mitigation as the Key to Control the Risk of Workers of Developing Occupational Disease
[80] Quantifying Ambient Ethylene Oxide Exposure in the General Population: Defining the Research Gaps and Proposing a Path Forward

ISES 2026 Annual Meeting – Proposed Sessions

[8] Advancing Canada's Contributions to Population-Based Exposomics: Methods, Infrastructure, and Coordination

Exposomics has expanded the ability to measure environmental influences on human health, but conducting reproducible, population-scale studies remains technically challenging and resource-intensive. Canada hosts internationally recognized expertise in analytical chemistry, computational annotation, exposure assessment technologies, and longitudinal cohort infrastructure. Despite these strengths, Canada has not emerged as a leading contributor to large-scale population-based exposomics research. This gap reflects a broader challenge within the field: advances in measurement and computation do not automatically translate into coordinated, harmonized, population-scale research. Analytical scalability, cross-laboratory reproducibility, incomplete chemical annotation, integration of biologically derived and external exposure metrics, and embedding high-dimensional data within longitudinal cohorts remain major constraints.

This session will examine how complementary Canadian strengths across the exposomics workflow can be aligned to address these challenges. Presentations will focus on methodological advances in high-throughput biological measurement, scalable annotation frameworks, integrative informatics, coordinated external exposure assessment, and integration within harmonized cohorts. The session will culminate in a structured discussion aimed at identifying practical strategies for coordination and harmonization that strengthen Canada's contributions to international exposomics research.

[9] From E-Waste to the Exposome: Integrating Metal Toxicity, Oxidative Stress Biomarkers, and Cancer Risk in Vulnerable Communities

The rapid global expansion of electronic waste (e-waste) recycling—particularly within informal sectors of low- and middle-income countries-represents a critical and under-characterized component of the modern exposome. Unregulated dismantling, open burning, and crude material recovery practices result in chronic human exposure to complex mixtures of toxic metals (e.g., lead, cadmium, chromium, copper), persistent organic pollutants, and combustion by-products. These exposures disproportionately affect socio-economically vulnerable populations and raise significant environmental justice concerns.

This session will explore how exposure science can move beyond environmental measurements toward integrated exposomic approaches that link external exposure, internal dose, biological response, and disease risk. Particular emphasis will be placed on:

- Characterizing occupational and environmental exposure pathways in informal e-waste settings
- Biomonitoring strategies, including toxic metals in biological matrices
- Disruption of micronutrient homeostasis and antioxidant defense systems
- Oxidative stress and DNA damage biomarkers (e.g., 8-OHdG, OGG1, p53)
- Early cancer risk indicators (e.g., PSA, AFP, chromosomal aberrations)
- Mechanistic pathways linking metal exposure, redox imbalance, and carcinogenesis
- Community-level implications and translational policy relevance.

This session will foster interdisciplinary dialogue among exposure scientists, toxicologists, molecular epidemiologists, clinicians, and policy researchers. It aims to demonstrate how applying an exposome-informed framework to e-waste exposure can advance collaborative science, support vulnerable communities, and strengthen evidence-based environmental health policy.

[10] Exposure Factors and Community-Driven Asthma Research Studies Across the Globe

This session will present community-based research studies around the world that focus on both pediatric and adult asthma, asthmatic conditions (wheezing) and employ various research investigations, innovative tools, surveys and methodologies. We encourage all researchers (new investigators, students, established research excellence centers pilot studies etc.) to submit and especially represent underserved communities with limited resources and those disproportionately affected by asthma and/or exposed to various chemicals, PM2.5 and other toxicants.

[11] Exposure to Air Pollution and Climate Extremes and Linkage With Human Health in the LMICs

Climate change is the greatest threat to human health. Lower- and middle-income countries (LMICs) face the dual burden of air pollution and climate change, and, with high population density and limited resources, their populations are more vulnerable to these environmental threats than those in the Global North. However, most of the evidence driving climate and clean air policies comes from the Global North, and policymakers often question its representativeness for LMICs.

In this session, we invite contributions that examine exposure to air pollution and climate extremes, leveraging diverse data sources such as satellite observations, low-cost sensors, reanalysis data, and climate or chemical transport models, and integrating them in a machine learning framework for exposure assessment. We also invite studies that further investigate the linkages between exposure to air pollution and climate extremes and the communicable and non-communicable disease burden, using primary or secondary health data to fill evidence gaps from LMICs. We encourage studies that address environmental justice in this context, with a focus on LMICs.

The session will bring together researchers focused on LMICs and enable cross-learning on innovative methods for applications in low-resource settings to address these problems.

[12] Address-Level Exposure Science: Integrating National Address Data, Housing Conditions, and Multimodal Environmental Signals for Population Health Research

Addresses represent one of the most precise and scalable spatial anchors for characterizing environmental exposures, social conditions, and contextual risk factors. Recent advances in national address infrastructure and data linkage tools have created new opportunities to operationalize address-level exposure assessment across epidemiology, environmental health, and public health informatics.

This session will explore emerging methods and applications for using residential addresses as the central unit for exposure characterization. Topics may include linkage of health and research data to address-level environmental indicators such as housing conditions, code violations, and property characteristics (e.g., building type, valuation, and infrastructure quality) that can serve as proxies for socioeconomic and environmental risk. Presentations may also examine the integration of multimodal data streams, including street-level imagery, satellite observations, video surveillance, and other sensor-derived data, to infer housing characteristics and modifiers or sources of environmental exposures.

The session will highlight the growing role of national geospatial infrastructure, including the Federal Geographic Data Committee's National Address Database and the U.S. Thoroughfare, Landmark, and Postal Address Data Standard, as foundations for reproducible address-based exposure science. Methodological topics may include address parsing and standardization, record linkage, geocoding alternatives, and scalable pipelines for integrating address-level datasets across jurisdictions and sources. By bringing together researchers developing address-based data infrastructure, exposure assessment methods, and applied epidemiologic studies, this session will examine how address-level analytics can advance exposome research and support actionable insights for healthier communities.

[13] Pesticides and the Exposome: Advancing Collaborative Approaches to Assess and Protect Community Health

Pesticide residues are widely detected in the environment and in human biomonitoring datasets within agricultural communities and beyond, underscoring their relevance within the broader exposome. While the presence of exposure is well documented, the more meaningful questions relate to context: How do measured exposures compare with relevant toxicological endpoints? When do concerns represent actual risk versus perceived risk? And how can collaborative, community-informed methodologies strengthen our understanding of real-world exposures?

This session will highlight critical scientific, methodological, and community-relevant topics in pesticide safety assessment for farmers, nearby residents, and the general population. Presentations are encouraged to show how monitoring data, exposure modeling, new approach methodologies, and integrated risk-assessment frameworks can collectively inform a more complete picture of the pesticide exposome.

We welcome submissions addressing:

- Advances in cumulative, aggregate, and community-relevant exposure and risk assessment methods
- New approach methodologies and digital tools that improve exposure assessment and mitigation
- Key data gaps in exposure and risk assessment and strategies to address them, including reducing compounding conservatism
- Approaches emphasizing environmental justice, sustainability, and protection of vulnerable populations
- Tools for ongoing community-level exposure assessments and evaluations of new agricultural technologies
- Dietary and non-dietary exposure analyses that contribute to a comprehensive understanding of pesticide-related health considerations

By integrating exposure science, toxicology, community engagement, and methodological innovation, this session aims to demonstrate how collaborative science can drive healthier people and stronger communities—bringing the exposome into action.

[14] Artificial Intelligence and Machine Learning in Exposure Science

Artificial Intelligence (AI) and machine learning (ML) are disruptive technologies that affect every aspect of our lives, including how we conduct exposure science. This session will explore 1) how AI/ML is being used in exposure science, 2) in what types of research does AI/ML work well or fail, 3) how to ethically use AI/ML in our research, and 4) how to assure the outputs are scientifically rigorous. Suggested topics include “omics” approaches, digital twins (i.e., agent-based models), data fusion for exposure assessment, prediction of health impacts following acute exposures, and predictive toxicology and risk assessment.

[15] How to Improve the Involvement of Participants in Human Biomonitoring Studies (HBM) Studies? Current Experiences and "Lessons Learnt" From Population Surveys

Biomonitoring studies in the general population are interesting tools for studying a part of the exposome in a concrete way and in particular to approach the chemical exposome. However, in recent years the general population seems to be less inclined to follow study invitations issued by governmental bodies, and the willingness the share personal information and spend time for research activities decreased notably. This decline seems to especially pronounced after the Covid pandemic. In parallel, HBM surveys necessitates large samples of randomly selected individuals especially when targeting the national level and population representativeness. Attention should be given to the duration of examinations and questions, as they are potential factors that influence the participation rate. Hence, a careful prioritization of topics covered in the survey is needed. Besides, it is considered well-known that certain population groups are more difficult to enroll in studies than others and the general response may vary depending also on the current political and societal "climate". How to improve the participation rate of these groups of population?

This session aims at bringing together study PIs to exchange on current experiences from fieldwork of large (HBM) population surveys, prioritization methods, measures taken to increase response or reach the desired sample size, and lessons learnt regarding the potential limits of goodwill of the participants regarding the extent of the survey programme. Presentations should focus on current large-scale surveys and discussions may expand on international views and experiences regarding various challenging aspects of study conduct.

[16] Innovative Technologies, Methods, and Partnerships to Advance Disaster Research Response

Disasters, both natural and manmade, create unique environmental hazards that can have significant impacts on human health. Disasters often generate a complex mix of environmental exposures that are concentrated and can be short-lived and therefore difficult to measure. Effects on impacted populations can be acute, but long-term, sustained health consequences are also possible, especially if exposures persist in the environment. New technologies, approaches, and resources to support research are emerging in the face of increasing numbers of disasters. Using the Los Angeles fires of 2025 as an example, a novel partnership was formed between local philanthropic organizations and several academic institutions to fund a large, multi-institution research consortium for a period of 10 years. Various groups embarked on collecting key environmental data, such as hyperspectral and Street View imaging of impacted neighborhoods, soil and ash assessment in communities, and sampling of indoor environments. Regular engagement with community groups and concerned residents take place to share new findings or recommendations.

This session seeks to explore the exposome in action following a disaster and highlight the latest innovations in disaster research response throughout the life cycle of a disaster event, from preparedness to response through recovery to resilience. Sharing these advancements in tools and technologies, study design and analysis techniques, or novel partnerships will help promote more efficient, robust disaster research.

[17] Exposure Mitigation as the Key to Control the Risk of Workers of Developing Occupational Disease

Occupational exposures to of physical, chemical and biological agents may lead to occupational disease. The aim of this session is to share and discuss research findings that support the prevention of occupational disease by development, implementation and evaluation of exposure mitigation measures. Human biomonitoring (HBM) will be discussed for both research and health surveillance of exposure to chemicals. The added value of this approach is useful e.g. in case dermal uptake may be significant as additional route of exposure next to inhalation. Also, indirect routes of exposure may contribute significantly to internal exposure often without the worker being aware. In these cases, a HBM guidance value (HBM-GV) may be useful to add to the framework of compliance testing next to occupational exposure levels based on air concentrations only.

The hierarchy of controls offers a framework of prioritisation based on the philosophy that suitable working conditions should be offered to protect the worker. The idea is that the working conditions should be adapted to the worker, instead of adapting the worker to the workplace by ‘dressing up’ the worker with personal protecting equipment. In the hierarchy of controls this is a last resort. Exposure scientists can study working conditions and discuss proportionality of solutions that fit in this framework of worker protection. Similar to citizen’s research, worker participation in research helps to identify potential sources and routes of exposures and develop effective and feasible strategies for exposure reduction leading to improved working condition and prevention of occupational disease.

[18] Advancing the Science of Pesticide Exposure: Novel Approaches to Dietary and Non-Dietary Exposures in Global Settings

Use of pesticides ensures high productivity of agricultural crops in the interest of the supply of high quality and affordable food for many. However, this comes at the expense of environmental pollution, loss of biodiversity, and occupational, residential and dietary exposures to humans. Population-based studies have suggested associations of pesticide use with diseases like Parkinson's disease, neuropsychological effects in children and adolescents, cancer of which some types like lymphatic and brain cancers are found during childhood, subfertility and adverse pregnancy outcomes. To better understand relationships between pesticides exposures in farmers, people living in agricultural communities, and the general public, studies of real-world exposures are required. For some classes of pesticides, such as insecticides, residential sources may contribute meaningfully to pesticide intake (such as from biocide use). Further, findings from human biomonitoring (HBM) studies cannot be fully explained from known dietary intake. Recent findings of exposures assessed by new methods of exposure assessment indicate non-dietary sources of exposures to complex mixtures of pesticide residues in particular the results from indoor dust collections and direct contact suggested by analysis of silicone wristbands. Additionally, duplicate diet studies show discrepancies with the standard methods currently applied to predict dietary uptake from market basket approaches. Some recent findings can be shared from the EU Horizon programme such as the recently completed Sustainable Plant Protection Transition (SPRINT) project in 10 EU countries and Argentina. Additional findings from emerging research in East Africa on pesticide exposures among men and women smallholder farmers can also be shared.

[19] Small Bodies, Big Exposures: Environmental Risks for Children

Children are often at greater risk for elevated exposures to environmental pollutants, compared to adults as a result of their biology and behavior. Children are considered to be more vulnerable to negative health endpoints due to their smaller size and potential windows of susceptibility that may occur during development. Environmental exposures can frequently lead to increases in negative health outcomes that can extend across the lifespan.

This session showcases topics that support environmental exposures leading to chronic diseases in children, which supports the Make America Healthy Again (MAHA) public health initiative. This includes work coming from exposure science and/or epidemiology that assess: environmental pollutant exposure among children; different exposure windows from in-utero to adolescence; and health effects associated with exposures to environmental pollutants in childhood. The goal of this session is to characterize exposures and potential impacts in children and the development of strategies to reduce exposure within this population.

[21] Integrating Multipollutant Exposures and Social Determinants in Exposome Science

Advancing exposure science requires moving beyond single-chemical frameworks to approaches that capture the complexity of real-world environmental exposures. The exposome concept provides a framework for understanding how multiple environmental pollutants interact with social and behavioral factors to influence health across populations. This session will highlight research examining multipollutant exposures alongside social determinants such as socioeconomic conditions, neighborhood environments, and structural inequities. Contributions may include studies investigating combined exposures to metals, PFAS, air pollutants, pesticides, and other environmental contaminants in human populations. The session will also showcase emerging analytical and methodological approaches used to evaluate complex exposure patterns, cumulative environmental burdens, and their relationships with health outcomes.

Aligned with the conference theme, The Exposome in Action: Collaborative Science for Healthier People and Stronger Communities, this session will emphasize interdisciplinary collaboration across exposure science, epidemiology, environmental health, and community-engaged research. Presentations may include population-based studies, cohort investigations, environmental monitoring efforts, and community-focused exposure assessments.

By bringing together diverse perspectives and methodological approaches, this session aims to advance understanding of how environmental and social exposures jointly shape disease risk and to highlight opportunities for translating exposome research into strategies that support healthier and more resilient communities.

[23] Leveraging Exposomics and Multi-Omics to Understand the Molecular Etiology of Chronic and Complex Diseases

Chronic and complex diseases, including cancer, cardiovascular disease, and neurodegenerative disorders, arise from dynamic interactions between genetic susceptibility and lifelong environmental exposures. Capturing this complexity requires approaches that integrate advanced exposure assessment with high-dimensional molecular profiling across the life course. Exposomics provides a powerful framework for identifying environmental drivers of chronic disease and translating these discoveries into strategies that promote healthier populations and communities.

This session highlights how exposomics is advancing chronic disease etiology and prevention research. Presentations will showcase progress in integrating targeted and untargeted exposure assessment with multi-omics technologies, including epigenomics, transcriptomics, proteomics, and metabolomics, enabling characterization of a broad spectrum of environmental chemicals and the biological responses they trigger, and helping to uncover molecular pathways linking exposures to disease development.

Topics will include advances in high-resolution mass spectrometry, methods for integrating external exposure data with internal omics signatures, and statistical frameworks for analyzing complex exposure mixtures and high-dimensional datasets. Case studies from population-based cohorts and community-focused research will illustrate how these approaches generate actionable insights into the environmental determinants of chronic diseases, with direct implications for prevention and intervention.

Consistent with the conference theme, this session emphasizes how collaborative exposomics research translates scientific discovery into improved public health practice. By bridging exposure science, epidemiology, toxicology, and data science, exposomics creates new opportunities to identify modifiable environmental risk factors, inform prevention strategies, and support precision public health approaches benefiting diverse populations and communities.

[24] Fossil Fuels & Toxic Trespass in Fenceline Communities

From oil and gas extraction, transport, refinement, to combustion and petrochemical manufacturing, communities have long shed light on their exposure to hazardous air pollutants stemming from the fossil fuel industry. Air contaminants released by these industries include volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons, metals, particulate matter, nitrogen dioxide, and sulfur dioxide. This session will feature 5 community-academic research initiatives across the fossil fuel exposure continuum. The session will begin with findings of indoor pollutant changes following stove interventions alongside evidence of toxic air contaminants informing the California Air Resources Board's appliance standards. The session will then transition to three studies of personal and outdoor air pollution monitoring. These include analyses of concurrent personal-ambient exposures of semivolatile air pollutants using wristbands and outdoor samplers in refinery communities in Los Angeles, California; community-led monitoring using portable air quality sensors in neighborhoods impacted by oil extraction in Colorado; and high-resolution mobile monitoring in Louisiana that has documented contaminant levels three times higher than previously reported by government monitoring. Lastly, the session will present results from a biomonitoring study that measured 25 metabolites of VOCs in residents living in 'Cancer Alley', the ~130-mile corridor in Louisiana known for its high density of petrochemical facilities. Through this session we aim to 1) improve the availability of data that will provide evidence of reduced exposures to air contaminants from the 'phase out' of fossil fuels and 2) build community capacity to document the impacts of the fossil fuel industry on fenceline communities across the continuum.

[26] Air Pollution and Brain Health: Emerging Evidence on Neurological and Mental Health Outcomes

Air pollution is increasingly recognized as an important environmental risk factor for brain health. Growing epidemiological and experimental evidence suggests that exposure to air pollutants, particularly fine particulate matter (PM2.5), may contribute to a range of neurological and mental health outcomes, including cognitive decline, dementia, stroke, Parkinson's disease, and depression. However, the mechanisms and population-level impacts of these exposures remain incompletely understood.

This session will bring together researchers studying the relationships between air pollution and brain-related diseases across diverse populations and methodological approaches. We invite contributions from epidemiology, toxicology, neuroscience, clinical research, and environmental health that examine the effects of air pollution on neurological and mental health outcomes. Studies using innovative approaches such as neuroimaging, biomarkers, multi-omics, causal inference methods, and machine learning are particularly welcome.

The goal of this session is to highlight emerging evidence on environmental determinants of brain health, foster interdisciplinary discussion, and identify future research priorities for understanding and mitigating the neurological impacts of air pollution.

[27] Bridging the Geo-Health Data Gap: Resources and Approaches to Advance the Integration of Environmental Exposure and Exposomic Data into Epidemiologic and Clinical Research

Research on the health impacts of environmental exposures continues to expand and evolve, yet challenges in effectively using environmental data in response to disasters, health emergencies, and public health research persist. These obstacles include identifying relevant data sets for analysis and accessing, harmonizing, and linking these data from various sources using appropriate tools. Multiple organizations and programs in the United States and Canada are working toward building an ecosystem of publicly accessible tools and resources to further the advancement of environmental data for health research. Beyond expanding the functional toolbox for the research community, these programs are also cultivating a rich community of practice to connect researchers and practitioners in bridging the gaps among the geoscience, exposure, and health fields.

This session will showcase strategies and resources to elevate the ability to find, use, and integrate environmental determinants of health data into health databases and cohorts to advance applied health research. For example, these tools and approaches can be utilized in time-sensitive research for environmental health emergencies, disasters, as well as the newly evolving science of exposomics. Presentations on improving environmental exposure characterization; advancing data analysis methodologies and linkages between environmental and health data; standardizing data and metadata; and promoting the development of tailored training and educational materials are welcome.

[28] Advancing Large-Scale, High-Throughput Chemical Exposome Profiling Through Emerging Analytical and Computational Methods

This session highlights emerging analytical and computational strategies transforming large-scale, high-throughput, and in-depth profiling of the chemical exposome based on biospecimens. Aligned with the ISES 2026 theme "The Exposome in Action," it focuses on methods that expand chemical coverage in biological matrices, improve sensitivity and annotation confidence, increase throughput and reproducibility, and strengthen biological interpretation across population, clinical, and mechanistic studies.

Topics of interest include innovations in integrated high-resolution mass spectrometry workflows optimized for biospecimens; single-run and multimodal profiling strategies; nontargeted and targeted exposomics and; bioinformatic tools for data processing, quantitative normalization; computational annotation and structure elucidation of xenobiotic metabolites; quality control and harmonization across large cohorts; machine learning-enabled feature discovery, dark exposome prediction, and small molecule biotransformation prediction; and multi-omics integration linking chemical exposome data to biological responses and health outcomes.

The session will bridge methodological innovation and real-world application, including large epidemiological cohorts, clinical biomonitoring, and population-level chemical risk prioritization. By convening analytical chemists, computational scientists, and environmental epidemiologists, this session aims to accelerate scalable and reproducible workflows for chemical exposome characterization.

[29] Beyond Hazard Detection: Evaluating and Understanding the Health Risk Implications of Exposures

When a public health concern arises, one of the first steps is to determine whether a hazard is present and the concentration of that hazard. While hazard assessment is essential, communicating the detection of a hazard to stakeholders without also evaluating health risk can result in confusion and uncertainty around whether intervention is needed and how to prioritize resources to most effectively reduce exposure. In this session, we will explain the foundational principles of health risk assessment, which include hazard identification, and also dose-response assessment, exposure assessment, and risk characterization. We will discuss health-based guidance values that can be considered when characterizing risk and explore scenarios where exposure is to multiple hazards or hazard mixtures. We will suggest best practices for risk communication, and offer examples of when communicating the hazard alone without a risk context can result in a misperception of acceptable or unacceptable risk. This session will be useful for exposure scientists seeking an introduction to risk assessment, and also for more experienced exposure and risk assessors who want to stay current on health benchmarks and communication strategies.

[30] Early-Life Environmental Exposures and Lifecourse Maternal-Child Health: Findings from Pooled U.S. ECHO Cohort Sites on Prenatal and Childhood Exposures, Mixtures, and Health Trajectories.

Prenatal and childhood exposures to environmental contaminants can have profound, long-lasting effects on population health. The Environmental influences on Child Health Outcomes (ECHO) Program is a major NIH-funded initiative launched in 2016 that unites large, ongoing pediatric cohort sites across the United States. By pooling rich, data across diverse populations and regions, ECHO produces high-quality science to define how early-life exposures during the prenatal and childhood periods shape maternal health and children's health and development from infancy through adolescence. The program's scale, harmonized data, and collaborative design enable powerful, policy-relevant insights that can drive prevention and improve lifelong outcomes.

This session will showcase findings using pooled data from multiple ECHO cohort sites on prevalent and emerging exposures during critical windows of susceptibility, including air pollution and wildfire smoke, per- and polyfluoroalkyl substances (PFAS), organophosphorus esters (OPEs), and other endocrine-disrupting compounds. Presentations will address maternal outcomes, child neurodevelopment and behavioral trajectories, and pubertal timing and progression. Studies will encompass analyses that include single-chemical assessments and advanced methods to evaluate mixtures and sensitive exposure windows, leveraging ECHO's biospecimens and detailed exposure metrics.

By examining individual chemicals and complex mixtures across geographically and demographically varied cohorts, these studies fill critical data gaps on emerging and prevalent contaminants. The resulting evidence will highlight vulnerable subpopulations and modifiable exposure sources and has the potential to inform clinical guidance, community interventions, and public health policy to better protect maternal and child health across the life course.

[31] Characterizing the Human Exposome to Address Real-World Environmental Exposure Scenarios

The exposome framework has transformed exposure science by enabling comprehensive characterization of environmental exposures across the life course. Advances in high-resolution analytical technologies, computational methods, and large-scale epidemiologic cohorts are now making it possible to systematically profile complex exposure mixtures and identify previously unrecognized environmental determinants of human health.

This session will highlight recent innovations in exposomics characterization and environmental exposure profiling, with a focus on approaches that capture the complexity of real-world exposures and are deeply grounded in a community-driven approach. Presentations will showcase high-resolution analytical platforms, exposome-wide association approaches, and novel computational tools to characterize environmental chemicals, dietary exposures, and other components of the external exposome in human populations. We highly encourage participation from studies that leverage community partnerships and involvement and are addressing community driven challenges.

Topics may include methodological advances in exposome profiling, strategies for identifying chemical mixtures and emerging contaminants, applications of exposomics to investigate environmental drivers of chronic diseases, including cardiometabolic disorders, neurodegeneration, cancer, and maternal and child health outcomes, and communicating and disseminating results to participants and impacted communities. Presentations will also highlight how exposomic data can be integrated with epidemiologic and clinical information to better understand exposure sources, biological responses, and disease risk.

By showcasing emerging methods and applications, this session will demonstrate how exposomics is advancing exposure science, through a community engagement lens, and generating new insights into the environmental factors shaping population health.

[32] Beyond Legacy PFAS: Human Exposure to and Health Effects of Emerging PFAS

Per- and polyfluoroalkyl substances (PFAS) are a class of highly persistent fluorinated organic molecules used extensively in various industrial and consumer products including water-, grease, and stain-repellents, surfactants, lubricants, cosmetics, and aqueous film-forming foams (AFFFs). Perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), commonly referred to as legacy PFAS, have been regulated over the last two decades due to their persistence, bioaccumulation, and toxicity to wildlife and humans. As a result of these restrictions, the production and use of other alternative PFAS have grown. Recently, advances in analytical chemistry have enabled the detection and quantification of novel PFAS in environmental samples and human tissues. However, the accumulation of these emerging PFAS in human fluids and tissues remains poorly characterized. There are significant knowledge gaps related to PFAS exposure sources, toxicokinetics, and health effects.

This session focuses on human exposure to emerging and novel PFAS and current progress towards understanding their health effects. We will highlight recent work identifying novel PFAS and PFAS mixtures in the context of exposure assessment and biomonitoring, as well as studies investigating the toxicokinetics of emerging PFAS, including PFAS precursors and other often-overlooked PFAS sub-classes. Research exploring innovative approaches to characterize the broader PFAS exposome and understanding associated human health outcomes is also of interest.

[33] Po-tate-o, Po-taa-toe: Reconciling the Exposome and Cumulative Impacts with Communities' Needs.

The exposome and cumulative impacts are concepts that both describe the "totality of human exposures." This session will explore how exposure scientists have applied the concept of the exposome or cumulative impacts as a motivating frame for their work with communities by impacted by exposures to environmental hazards. We invite presenters to lean into the challenges of communicating complex scientific concepts and to share insights from the field in how the exposome and cumulative impacts are playing out at all levels of policy and risk assessment practice. Semantics aside –this session will explore community applications of the exposome/cumulative impacts frameworks, highlighting community-engaged research that applies these lenses. Speakers will include academic partners and community members. Abstracts that highlight a policy application or translation component will be prioritized.

[34] Collaborative Approaches to Community-Level Monitoring of VOC and Chemical Exposures

Exposure to VOCs and other hazardous chemicals poses significant health risks and contributes to disparities across communities. These exposures are not uniformly distributed. They cluster within neighborhoods shaped by industrial activity, infrastructure, and socioeconomic conditions. In result, there is a need for exposure assessment strategies that operate at the community level and capture local variability to inform targeted mitigation and remediation. Advances in analytical chemistry support exposome-scale characterization of these exposures across environmental and biological systems. High-resolution mass spectrometry enables comprehensive discovery and profiling of biomarkers, while tandem approaches, (GC-MS/MS, LC-MS/MS), enable sensitive quantification of trace-level species across matrices. Improved chromatographic resolution allows differentiation of isobaric and isomeric compounds with distinct toxicological relevance. Complementary technologies like PTR-TOF-MS provide sub-ppb, real-time VOC detection. When integrated across matrices including air, biofluids (plasma, urine, saliva), and wastewater, these approaches support spatially resolved, population-level assessment of exposures.

This session will highlight collaborative, cross-disciplinary efforts that integrate analytical chemistry, toxicology, epidemiology, and public health to characterize VOC exposures in real-world settings. Presentations will showcase exposure assessment informed by individual-level measurements and extended through neighborhood and sewershed monitoring to define how exposures aggregate into community-level profiles. These data link sources such as consumer products, tobacco, and occupational materials with neighborhood-level signals, identifying sources and spatial differences between communities. By connecting advanced measurement technologies with community-centered study designs and interdisciplinary analysis, this session will translate exposome science into actionable knowledge. These approaches identify high-burden communities, inform targeted interventions, and guide strategies to reduce health disparities.

[35] Emerging Event-Based Environmental Exposures in the Climate Era: Identification, Attribution, and Health Impacts

Exposure science has traditionally focused on chemically defined pollutants such as particulate matter, nitrogen oxides, pesticides, persistent organic pollutants, and heavy metals. However, emerging exposures from extreme events in a changing climate present new challenges. Increasingly, environmental exposures are shaped by extreme events and other event-based environmental stressors, including wildfire smoke plumes, large-scale flooding, tropical cyclones, and compound heat–air pollution episodes. These events are episodic, spatially extensive, and dynamically evolving, often affecting large populations within short time periods and generating complex exposure patterns across regions.

Such exposures present new challenges for exposure science. Identifying event-related exposures requires integrating satellite observations, atmospheric models, and environmental monitoring networks to distinguish event signals from background pollution. Attributing health effects to extreme events is also complicated by overlapping environmental drivers, population vulnerability, and healthcare system responses. Furthermore, standardized approaches for defining, measuring, and comparing event-based exposures across hazards remain limited. This session will highlight emerging advances in identifying, characterizing, and evaluating event-based environmental exposures and their health impacts. By bringing together researchers from exposure science, environmental epidemiology, climate science, and remote sensing, the session aims to foster interdisciplinary dialogue and advance methodological innovation in assessing environmental exposures in the climate era.

[36] Beyond Single Stressors: Tools for Measuring Social Vulnerability and Compounding Environmental Hazards

It is well documented that populations facing social disadvantage are disproportionately exposed to environmental hazards. Yet measuring who is most vulnerable, and to what degree, remains a methodological and conceptual challenge. This session invites talks that advance our understanding of social vulnerability and its intersection with environmental exposure, with the goal of illuminating the pathways that structural inequities amplify environmental harms.

We welcome submissions on three interrelated themes. The first encompasses approaches to measuring systematic disadvantage — including the development, validation, and application of indices related to social vulnerability and novel measures of disadvantage. Talks might address how these tools perform across geographies, populations, and hazard types, as well as their limitations and opportunities for refinement. The second theme centers on methodological innovations in the measurement of exposure to multiple environmental stressors. Emerging tools, including low-cost portable sensors, radar technologies, and real-time mobility data, have substantially improved data collection and enabled finer-grained assessment of environmental exposures across space and time. Lastly, the third theme focuses on populations who are doubly exposed — those experiencing both systematic disadvantaged and elevated environmental exposure burden. Submissions might examine cumulative exposure measurement, disparities in exposure to environmental hazards and how social factors such as race, income, housing, and access to resources modify environmental risk.

[37] Identifying Novel Chemical Stressors Across the Exposome: From Discovery to Health-Relevant Insights

In an era of increasing anthropogenic impact and rapidly evolving chemical landscapes, identifying and characterizing emerging contaminants of concern (COCs) is critical to advancing exposomics and protecting human/ecosystem health. Novel analytical workflows, including non-targeted analysis and high-resolution mass spectrometry, have enabled detection of previously unrecognized chemicals in complex environmental and biological matrices, including entirely novel compounds. Additional expansion of known/predicted chemical inventories, product-use, and associated hazards has expanded dramatically in recent years. However, challenges remain in translating these discoveries into actionable insights for public health and environmental decision-making.

This session will highlight collaborative, interdisciplinary approaches to identifying novel chemical stressors across the exposome and linking exposures to biological effects and health outcomes. We will explore advances in analytical chemistry, environmental toxicology, and biomonitoring, emphasizing data integration across disciplines to support healthier communities. Key topics include:

- Novel analytical techniques, including non-targeted analysis and data-driven approaches (e.g., machine learning)
- Data processing, harmonization, and interpretation strategies, including spectral libraries, artificial intelligence, and exposomic data integration
- Hazard assessments for emerging contaminants, including pharmaceuticals, personal care products, pesticides, industrial chemicals, and their transformation products
- Applications across environmental and biological matrices, including water, soil, air, biota, and human biomonitoring samples

This session will also highlight critical research needs, including data standardization, cross-disciplinary collaboration, and frameworks for linking chemical exposures to biological responses and health-relevant outcomes. It aims to advance the identification of novel stressors within the exposome and accelerate their translation into strategies that promote healthier people and stronger communities.

[38] A Double-Edged Sword: Ethical Artificial Intelligence in Exposure Science

Generative artificial intelligence (AI) and machine learning tools are increasingly being used in exposure science for data collection, data integration, chemical identification, data analysis, and exposome analyses. As these tools move from exploratory applications toward routine use in research and decision-making, it is important for the exposure science community to consider the ethical implications associated with their use.

This session, chaired by members of the ISES Ethics Committee, will examine ethical considerations related to the use of AI in exposure science and provide a forum for discussion of responsible practices. We welcome submissions presenting original research, methodological advances, case studies, and perspectives that address ethical challenges and practical solutions for the responsible use of AI in exposure science. Topics of interest include, but are not limited to:

- Use of AI tools in exposure and health data collection.
- Use of AI tools to visualize and communicate research back to study participants.
- Algorithmic bias, particularly where outputs may not represent highly exposed, rural, or vulnerable populations.
- Oversight approaches for verifying that AI-generated outputs are accurate and reproducible.
- Governance, documentation, and best practices for the development and application of AI tools in exposure science.
- Environmental and public health impacts that may increase exposures associated with data centers.

This session will serve as a starting place for advancing use of AI tools in exposure science while maintaining the integrity of the field and avoiding potential environmental and health impacts.

[39] Data Centers: What We Know and What We Don’t Know about Human Exposures

As demand for cloud computing, artificial intelligence, and digital infrastructure accelerates, data centers are rapidly increasing in number, scale, and geographic distribution. These facilities play a critical role in the modern economy and offer potential benefits to communities and society at large. At the same time, their construction and operation can introduce adverse human exposures that can have consequences for public health. The extent to which energy consumption, water use, backup power generation, changes in air quality, heat releases, and noise associated with data centers can result in local community exposure remains understudied.

This session will highlight emerging research examining the potential exposure pathways and health effects associated with data center infrastructure. Presentations will explore environmental releases associated with facility construction and operation, community-level exposure considerations, and methodological approaches for assessing these impacts. The session will also highlight frameworks for evaluating cumulative exposures and exposome-related methods that integrate environmental, social, economic, and land-use-related factors that affect local community and population health. Ultimately, this session seeks to help position decision-makers, such as industry, governments, and communities, to capitalize on beneficial effects while avoiding adverse ones.

[40] “Hidden Exposures": Rethinking Health Communication for Black Women

In many African sociocultural contexts, women are often socialised into silence, limiting open discussion of health concerns. This contributes to disproportionately high mortality from diseases such as cancer, driven not only by biological factors but by intersecting exposures including information inequality, stigma, cultural norms, financial barriers, and belief systems. Framed within the exposome, these non-biological determinants act as critical drivers of delayed diagnosis and poor outcomes. Addressing them requires intentional, evidence-based strategies to improve health communication, reduce disparities in access to information, and remove systemic barriers to care. As a black woman, I am deeply concerned and desire to hear strategies to help reduce these barriers.

Session topics include:

- Designing Culturally Intelligent Health Communication
- Trust, Mistrust, and the Messenger Effect
- Faith, Belief Systems, and Health Decision-Making
- Cultural Silence, Stigma, and the Politics of Disclosure
- Information Inequality as a Health Risk

[41] Evaluating Report-Back of Research Results: Learning From and Improving How to Share Study Results With Participants

Report-back of research results (RBRR) is a cornerstone of community-engaged research, honoring participants' right-to-know and advancing transparency and ethical partnership. When thoughtfully implemented, RBRR can strengthen environmental health literacy, support informed decision-making, and catalyze action to reduce harmful exposures. However, rigorous evaluation is essential to maximize benefits and minimize potential harm. Using quantitative, qualitative, and participatory approaches, this session examines emerging frameworks to assess impacts on knowledge, self-efficacy, agency, behavior, and equity. By identifying how and under what conditions RBRR is most effective, we aim to advance ethical, community-centered environmental health research.

[42] Data-Driven Approaches to Improve Realism in Exposure Assessment

Exposure assessments are expected to reflect how people are actually exposed in real life. However, many current approaches rely on simplified assumptions about habits and practices of users, chemical occurrence and characteristics of populations. Improving the realism of exposure estimates remains a key challenge for research, industry and regulatory applications.

This session will explore recent developments that aim to better represent real-world exposure conditions. We invite contributions that incorporate updated behavioural information, improved occurrence or concentration data, and more representative population modelling, including variability across demographics and life stages. We particularly encourage studies that move beyond default conservative assumptions and explore how realistic data can refines exposure estimates. Topics of interest include the use of consumer diaries, integration of multiple data sources, probabilistic approaches, and methods to characterise variability and uncertainty. Contributions focusing on infants and children or other underrepresented groups are also welcome.

The goal of this session is to highlight practical advances that improve the credibility and applicability of exposure assessments. By focusing on how improved data and modelling approaches can provide estimates that are more realistic, the session aims to support more robust and transparent use of exposure science in health-related decision-making.

[43] Integrating Public Data to Underscore Exposure Trends

Traditional exposure science often relies on localized primary data collection, yet the digital age has ushered in a new era of big data in environmental health. This session explores the availability, accessibility, and utility of large-scale, public-facing consumer and environmental databases that serve as vital tools for documenting real life exposures. By synthesizing millions of state, federal, and third-party records, these datasets provide a high-resolution view of cumulative, population-level contaminant exposures and exposure mixtures that individual studies may miss.

This session invites abstracts that demonstrate how large-scale environmental or consumer databases complement traditional biomonitoring or epidemiological findings or present innovative methodologies for aggregating disparate data sources. This session will highlight the intersection of data science and risk communication, translating complex environmental datasets into actionable insights for the public and policymakers.

By bringing together researchers, data scientists, and advocates, this session aims to bridge the gap between massive data repositories and practical health interventions, showcasing how aggregated digital resources are reshaping the landscape of exposure assessment.

[44] Oil and Gas Development, Climate Change, and the Exposome: Pathways, Populations, and Policy

Oil and gas extraction, processing, and transportation activities release a complex mixture of chemical contaminants — including volatile organic compounds, polycyclic aromatic hydrocarbons, oxides of nitrogen, metals, radionuclides, PFAS, endocrine-disrupting compounds, and particulate matter — into air, water, and soil. Communities living near these operations, often underserved and with limited regulatory protection, face multi-pathway cumulative exposures that span the full exposome and are often exacerbated by climate impacts. Despite the scale, geographic breadth and rapid growth of oil and gas development in North America and globally, characterizing these exposures and linking them to health outcomes remains a critical challenge for the field of exposure science.

This session will bring together emerging and established research at the intersection of oil and gas impacts, climate change, environmental exposure assessment, and population health. Topics could span a range of exposure pathways, including: ambient and indoor air quality in communities near oil and gas facilities; contamination of surface water and groundwater; endocrine-disrupting chemical exposures; and exposure through traditional and Indigenous food systems affected by industrial contamination.

Methodological contributions are also welcome, including advances in biomonitoring, spatial modeling, and community-engaged research approaches — particularly those developed in partnership with rural, Indigenous, or otherwise marginalized communities bearing disproportionate exposure burdens. Together, contributions to this session could reflect the growing need for coordinated, transdisciplinary science to inform protective policies around oil and gas development.

[45] The European Chapter of the International Society of Exposure Science: Developing and Advancing Exposure Science.

Exposure science plays a pivotal role in understanding human interaction with various stressors and evaluating associated health risks. To advance these activities in Europe, the European Regional Chapter of the International Society of Exposure Science (ISES Europe) was established in 2017. Through strategic stakeholder consultation, ISES Europe subsequently developed the 'European Exposure Science Strategy 2020-2030', a roadmap designed to advance exposure science, foster knowledge generation and enhance policy uptake. To support the implementation of this strategy, several Working Groups (WGs) were established.

The current activities and key achievements of these WG's include the development of strategy papers across key priority areas, producing Exposure Science training materials and the 'This is exposure science' series; creation of the Minimum Information Requirements guidance for HBM, the FAIR environment and health research registry (FAIREHR) platform, and the BASIC Guides for occupational biomonitoring, promoting harmonization of terminology and the GEM Exposure Model Repository. The WGs will also outline the future ambitions to build a multidisciplinary network of experts and foster collaborations. Furthermore, the session will highlight the importance of stakeholder involvement at various levels (EU Agencies, EU Member States, European Commission) as being crucial to move exposure science to a higher level of use in regulatory risk assessment for key legislation (REACH, OSOA initiative).

Overall, this session will highlight key outcomes and future actions to pursue strategic objectives. It will conclude with a plenary discussion, focusing on collaborative stakeholder efforts, priority setting and timelines to support continued advancement of exposure science in Europe and beyond.

[46] Unlocking the Chemical Exposome: Advances and Pitfalls in Non-Targeted Analysis

The exposome concept—capturing the totality of environmental exposures across the life course—has transformed how scientists investigate links between the environment and health. Yet, characterizing organic chemical exposures remains a formidable analytical challenge, requiring methods capable of detecting thousands of known and unknown compounds in complex biological and environmental matrices. This session will critically examine the current state of non-targeted analysis (NTA) as a cornerstone of chemical exposome research.

We will highlight innovations in high-resolution mass spectrometry-based workflows, computational methods for structure elucidation, and cheminformatics tools that are rapidly expanding coverage of chemical space and enabling hypothesis-generating discovery. Case studies will demonstrate how NTA is being applied in exposure science, epidemiology, and toxicology to identify emerging contaminants, characterize complex mixtures, and support exposome-wide association studies.

At the same time, speakers will address critical bottlenecks that constrain interpretation and translation. These include challenges in chemical identification confidence, quantification, data harmonization, and reproducibility across laboratories. The session will also examine issues of false positives, database biases, and the gap between detection and toxicological relevance.

By bringing together perspectives from analytical chemistry, bioinformatics, and exposure science, this session will move beyond technical advances to focus on a critical question: how can NTA data be made interpretable, comparable, and actionable?

Attendees will gain a balanced perspective on the current state of NTA, key needs for improving reliability and scalability, and strategies to integrate NTA into exposure assessment, epidemiology, and risk frameworks to better characterize the chemical exposome and inform public health action.

[47] Advancing Precision Environmental Health in Rural and Underserved Communities

This session will highlight research advancing precision environmental health in rural and underserved communities, with a particular emphasis on air pollution exposures and related health outcomes. We welcome studies examining respiratory, sleep, cardiometabolic, neurological, and other health outcomes, as well as work advancing exposure assessment through sensors, wearables, geospatial methods, and community-engaged approaches. Topics may include indoor and outdoor air pollution, exposure timing, vulnerable populations, data-sparse settings, and scalable interventions that support healthier people and stronger communities.

[48] From Exposure to Impact: Decoding the Health Burden of PM2.5 and PM10 in Vulnerable Communities Through an Exposomic Lens.

Air pollution remains a leading environmental determinant of health, with fine particulate matter (PM2.5 and PM10) disproportionately affecting vulnerable populations across diverse geographic and socio-economic contexts. Despite advances in exposure science, critical gaps persist in translating complex exposure patterns into actionable health insights, particularly for at-risk communities in both urban and rural settings.

This session aligns with The Exposome in Action by integrating interdisciplinary approaches to examine how cumulative and context-specific exposures to particulate matter shape measurable health outcomes. It will bring together experts in environmental epidemiology, exposure assessment, and biological sciences to present complementary perspectives on exposure gradients, underlying mechanisms such as inflammation and oxidative stress, and emerging exposomic methods for data integration.

Through a structured sequence of presentations and discussion, the session will highlight how multi-level data—ranging from environmental monitoring to biomarkers—can be leveraged to better understand and address health disparities. Particular emphasis will be placed on translating scientific evidence into policy-relevant insights and community-level interventions.

By fostering collaboration across disciplines, this session aims to move beyond characterization of risk toward actionable solutions, contributing to healthier populations and more resilient communities. Attendees will gain practical insight into applying exposomic frameworks to advance research, inform decision-making, and reduce the burden of air pollution on vulnerable groups.

[49] Exposure-Reducing Intervention Studies: Moving Towards Solutions

Intervention studies are essential for moving exposure science beyond identifying problems toward identifying and implementing solutions that reduce harmful exposures. While exposure studies have been highly effective at characterizing where and how exposures occur, intervention research tests actionable strategies to prevent or mitigate exposures. Exposure-reducing interventions can occur at multiple levels: from supporting individual behavior change (e.g., safer consumer product choices), to leveraging community infrastructure and programs (e.g., institutional practices), and to informing policies and regulations that reduce population-level exposures. This session will highlight approaches for evaluating both the effectiveness of intervention to mitigate exposures and implementation strategies that support success in real-world settings. Presentations will address key elements of intervention research, including study design, meaningful community engagement, and analytical methods to assess changes in exposure and related outcomes over time. The session will also explore how implementation science frameworks can help researchers understand feasibility, adoptions, and sustainability across different contexts.

[50] Micro- and Nanoplastics and Human Health: Advancing Exposomics by Integrating Laboratory Sciences, Exposure Science, and Public Health Translation

Micro- and nanoplastics (MNPs) are ubiquitous in the environment. Despite the growing number of scientific publications, epidemiologic inference and public health decision-making remain constrained by limited integration across disciplines. Thus, this session brings together four complementary presentations that collectively address these challenges and outline a coherent path forward for the design and implementation of robust environmental epidemiology and toxicology studies.

The session begins with a synthesis of state-of-the-science reviews illustrating the exponential growth of MNP research and highlighting current gaps in hazard identification, exposure assessment, and risk characterization. Building on this foundation, the second presentation focuses on MNPs in freshwater matrices as a critical exposure pathway, summarizing data needs and methodological limitations that impede accurate estimates of human exposure. The third presentation introduces efforts to develop and validate a robust pyrolysis–GC/MS analytical workflow for polymer-specific identification in complex biological matrices, addressing a key bottleneck in biomonitoring, exposure assessment, and toxicology. The final presentation demonstrates how ATSDR's toxicological frameworks and interactive data visualization tools can synthesize heterogeneous evidence across polymers, chemicals, exposure routes, and health endpoints to inform epidemiologic study design and public health prioritization.

This session will be of interest to exposure scientists, laboratorians, epidemiologists, toxicologists, environmental health practitioners, and health professionals seeking the translation of the evolving MNP science into actionable items for protecting public health.

[51] Beyond Mitigating Exposure Levels: Interactions Between Environmental Pollutants and Non-Environmental Factors in Human Health

Environmental pollutants pose a major threat to human health. Although eliminating exposure sources and reducing emissions are, in theory, the most effective strategies for protecting population health, these approaches are often difficult to implement in practice because of limited alternatives and the long half-lives of many chemicals and toxicants, which allow pollutants to persist in the environment and remain widely detectable in humans. Emerging research suggests that personal nutritional status, psychosocial conditions, and other non-environmental factors may interact with environmental pollutants to influence health outcomes, offering new perspectives for reducing pollutant-related harm.

This session will highlight whether and how non-environmental factors, such as diet and nutrition, socioeconomic conditions, and psychological stress, modify the health effects of environmental pollutants across the lifespan. Presentations will showcase epidemiologic studies examining the biological impacts of combined exposures, from population-level patterns to molecular mechanisms. Topics will include current analytical frameworks, novel statistical methods for evaluating co-exposure and interaction effects, case studies on pollutant interactions with psychological stressors, the modifying role of nutritional status in pollutant-related health outcomes, and community-based or clinical interventions aimed at mitigating adverse effects.

By bridging environmental health, nutritional science, psychology, epidemiology, and toxicology, this session will create opportunities to examine current epidemiologic evidence on co-exposure effects and discuss emerging precision environmental health strategies to reduce the harmful effects of environmental pollutants and promote both population and individual health.

[53] Integrating External and Internal Environmental Stressors – How Real-world Exposome Influences Human Health

The transition of exposome from a theoretical framework to a functional tool necessitates a shift toward robust, integrated analytical frameworks. While the conceptual appeal of capturing lifelong exposures is promising, practical implementation has been limited by its high dimensionality. This session highlights recent methodological advancements designed to bridge these gaps by harmonizing high-dimensional external stressors, ranging from geospatial satellite data and social determinants to point-source chemical mixtures, with internal biological signatures derived from high-resolution mass spectrometry. The integration of external and internal exposomics expands exposure assessment coverage, which aligns with the conceptual context of exposome, highlighting its necessity in real-world study.

In this session, we will propose a generalized workflow moving beyond simple mixture-centered risk assessments. Such workflow has a specifical emphasis on quality controls regarding exposomic data collection and generating for standardized operation, transparent and rationale decision-makings during data processing, and rigorous analytical pipeline. We will focus on the development of analytical strategies that combine hypothesis-generating discovery with independent validation, leveraging mixture analysis and machine learning modeling to address the inherent collinearity nature of environmental variables. By linking external triggers to internal multi-omics perturbations, this framework provides an overview of the biological "fingerprint" by these influences.

The session will also showcase exposomics studies in vulnerable and minority populations who have been exposed to higher levels of exposomic stressors and heightened health risks. These results will transform the exposome into a practical, evidence-based instrument informing public health interventions and clarifying the complex relationships between environmental exposures and long-term health outcomes.

[54] Untangling the Evidence: Hair Products and Health

Hair products (e.g., shampoo, hair oil, hair relaxer) and hair extensions (i.e., synthetic or human hair added for protection or style) are notable sources of exposure to chemicals of concern including endocrine disrupting chemicals, metals, and carcinogens. Hair routines in the United States vary based on multi-level factors including cultural norms, beauty standards, and hair texture. A growing body of exposure assessment and epidemiological evidence has demonstrated how hair product and extension use may contribute to well documented inequities in exposure and reproductive/cardiometabolic health outcomes. Since hair products and hair extensions are modifiable sources of exposure to environmental chemicals, it is critical that we work towards identifying community-informed, multi-level interventions. This session will feature key actors working on inequities in hair product exposure and health. This session will begin with findings from exposure assessment analyses examining the chemical composition of hair products and/or extensions used by communities of color. Next, the session will transition to epidemiological findings including an analysis reporting on the association between hair product use (relaxers and dyes) during pregnancy and birth outcomes among a large birth cohort in NYC. In addition to consumer exposure, findings on occupational exposure to hair products among salon workers will also be presented. Lastly, the session will present work aiming to identify key chemicals of concern related to different hair treatments that have been demonstrated to be harmful to health and potential alternatives (i.e., relaxers and silk press).

[55] Beyond Publishing Papers: Leveraging Data to Transform Markets and Shift Policies Toward Safer Solutions

Large-scale and systematic reduction of harmful chemicals requires translating our scientific findings beyond peer-reviewed research. By leveraging both empirical and publicly available data as well as other non-traditional data sources, scientists and practitioners can impact state and federal policy, corporate responsibility, marketplace change, and consumer preferences/behaviors.

This session invites abstracts on use of data beyond peer-reviewed publication, aimed to protect public health and limit or eliminate toxic chemical body burden by driving safer alternatives and solutions. Examples could include creation of publicly available databases, promotion of consumer education, community engaged research, citizen science, and ultimately applications of data that can be linked to successful or innovative attempts at supporting new regulations, state/federal policies, or market interventions. Submissions of diverse formats, including curation of original datasets, white papers, and non-profit reports that demonstrate a clear link between data transparency, consumer impact and the reduction of chemical body burdens are encouraged, as are submissions from both traditional (e.g., academia, government) and especially non-traditional organizations (e.g., community groups).

[56] Beyond the Surface: Exposure and Health Implications of Chemical UV Filters

Sunscreen is one of the primary tools for preventing skin cancer and managing UV radiation exposure; yet it is also a source of potential chronic chemical exposure. Biomonitoring studies report the systemic absorption of common UV filters, highlighting previously underestimated exposure to chemicals. While internal exposure is well-documented, health implications remain a subject of ongoing investigation. Further, less is known about other ingredients commonly found in sunscreen products.

This session invites exposure and epidemiological studies that document exposure to ingredients in sunscreens in biomonitoring studies, assess the pharmacokinetics of UV filters, human health impacts of chemical exposures in sunscreens, and/or communicate complex risk-benefit data to diverse communities to improve our understanding of chemical ingredient pathways.

[57] Complex Exposures From Emerging Nicotine Delivery Devices and Their Implications on the Exposome: Linking Product Design, User Behavior, and Chemical Mixtures

Emerging nicotine delivery devices—including e-cigarettes, heated products, and tobacco-free nicotine systems—are rapidly evolving in design and global use patterns. Within an exposome framework, these products represent complex and dynamic exposure sources shaped by device characteristics, user behaviors, and sociocultural contexts. Evidence shows that variability in device design (e.g., power, materials, formulations) and use behaviors (e.g., puffing patterns, frequency) leads to differential exposures to harmful and potentially harmful constituents (HPHCs), including metals, aldehydes, and nicotine. This session will bring together interdisciplinary perspectives to examine how product design and real-world use intersect to influence internal dose and potential health risk, particularly in the context of chronic, low-dose inhalation exposures. Presenters will integrate findings across laboratory, clinical, and population-based studies to characterize exposure profiles across diverse product types and user populations globally. This session will highlight opportunities for collaborative science to inform targeted interventions, regulatory strategies, and risk communication efforts.

[58] Integrating Mechanistic Mixture Toxicology and Exposome Science to Advance Environmental Health Research

Environmental health research is increasingly recognizing that real-world exposures occur as complex mixtures that vary across space, time, and populations. At the same time, advances in exposure science, environmental epidemiology, and mechanistic toxicology are generating new opportunities to better understand how these mixtures influence biological response and disease risk. Bridging these disciplines remains a critical challenge for translating emerging data streams into actionable environmental health insights.

This session will highlight integrative approaches that connect external exposure assessment with mechanistic evidence from new approach methodologies (NAMs), including high-content phenotypic profiling, transcriptomics, and in vitro bioassays. Contributions addressing quantitative mixture modeling, derivation of biologically informed points of departure, and integration of exposure prediction models with biological response metrics are particularly encouraged. Applications spanning human populations, wildlife, and ecosystem health are welcome, reflecting a One Health perspective on environmental risk.

By fostering dialogue among exposure scientists, epidemiologists, toxicologists, and computational researchers, this session aims to advance frameworks that improve interpretation of mixture effects and support evidence-based environmental health decision-making. The session will emphasize methodological innovation, interdisciplinary collaboration, and translational relevance to policy and public health.

[59] Ensuring Healthy Indoor Environments in Schools in a Changing Climate

Millions of children and adolescents worldwide spend 6-10 hours daily in school buildings, where they are exposed to a complex mixture of environmental stressors, including extreme temperatures, particulate matter, carbon dioxide, and respiratory infectious pathogens. These exposures do not occur in isolation but co-occur and interact within dynamic indoor environments shaped by building characteristics, occupant behavior, and external conditions. This complexity underscores the need for a holistic understanding of school-based exposures and for sustainable, coordinated intervention strategies that can efficiently address multiple environmental stressors.

Additionally, schools are facing increasing disruptions due to climate-related events such as wildfires and extreme heat, which exacerbate exposures and challenge the ability to maintain healthy environments. Building on these foundations, schools across the world are adopting a variety of strategies, including climate resilience plans and exposure mitigation interventions, to reduce the health and learning challenges. However, these efforts often address stressors individually, rather than the combined nature of real-world exposures.

This session will explore the latest research in understanding school-based exposures across multiple environmental stressors and interventions. Topics will include integrated approaches to characterizing indoor exposure profiles, climate-adaptive exposure mitigation strategies, and real-world experiences of schools managing extreme heat and wildfire-related air quality challenges. We will also discuss the need for frameworks that capture the complexity and variability of exposures in school environments. Finally, we will discuss how emerging exposure science approaches can support decision-making in school communities, and help bridge the gap between current practice and the multifaceted exposure challenges that schools are facing.

[60] Temperature Data Products: What Is the Right Data Product for Your Health Study?

Over 20% of the earth's land mass is set to cross one or more critical climate temperature thresholds by 2100. Even small shifts in the climate across these specific thresholds can produce abrupt and highly consequential changes to arid ecosystems. These changes in average climate will be accompanied by increases in extreme weather events, hotter and more frequent extreme heat days, and increasing droughts with heavier and more sporadic rainfall events. Despite the growth of academic literature addressing heat impacts on human health across the life span, there remains great variability in how heat is represented in exposure and epidemiological studies. Extreme heat may be represented using percentile values, wet-bulb temperature, heat index, absolute temperature, surface temperature and more. There remain few guidelines for how to select the proper heat product for a study, let alone comprehensive knowledge of how these choices impact findings and our knowledge of the health effects of extreme heat.

This session invites speakers to present their research and activities related to the themes of 1) selecting data products to represent heat; 2) methods for modeling extreme heat; 3) geospatial techniques for quantifying extreme heat; 4) biases introduced through selection of data products and modeling methods; and 5) limitations of current metrics for representing extreme heat. While focused on extreme heat, we anticipate broad interest for the exposure science, environmental health, and biomedical research community as the session themes are cross-cutting and applicable to many areas globally.

[61] Using Exposure Research to Inform Climate Action in Cities

Exposure science offers many methods, tools, and frameworks to understand the impact of climate change in cities and inform solutions. This field of research could be key in guiding policy action to better adapt to the new environment, but it can be difficult for science and policy to effectively meet. In this session, we invite presentations on research that exemplifies how exposure science can be effectively used to engage with policy makers, municipal staff, and community-based organizations in order to drive climate policy action. Topics may include but are not limited to, the use of environmental monitoring networks to answer specific local policy questions, the process of building models for a specific purpose with input from relevant stakeholders, translation of results into metrics and benchmarks that can be used in devising or evaluating climate polices, and more. We invite researchers and practitioners engaging with policy at all scales of governance: local, national and international. This session aims to advance the use of exposure science as an essential tool in catalyzing climate policy action.

[62] Plastics and Plastic-Related Chemical Exposures in Asia-Pacific: Current Evidence and Emerging Health Risks

The Asia-Pacific region is a global hotspot for plastic production, consumption, and environmental release, resulting in widespread human exposure to plastics and plastic-related chemicals. Microplastics and associated compounds, including phthalates, bisphenols, and other endocrine-disrupting chemicals, are increasingly detected in environmental media and human biomonitoring studies across the region.

This session will bring together leading researchers from Japan, Taiwan, South Korea, and Australia to present recent advances in exposure assessment, biomonitoring, and epidemiological evidence. Speakers will highlight population-level exposure patterns and potential health impacts spanning developmental, metabolic, and endocrine outcomes.

The session will synthesize current evidence on exposure sources and pathways, identify regional disparities and vulnerable populations, and discuss methodological challenges in mixture analysis and exposure characterization. It will also address critical research gaps and policy implications relevant to the Asia-Pacific context. By integrating multidisciplinary perspectives, this session aims to advance understanding of plastic-related exposures and inform future research and risk assessment strategies in the region.

[63] Pure Earth and the Partnership for a Lead-Free Future: Using Exposure Science to Reduce Lead Exposure in 21+ Low and Middle Income Countries

In 2024, based on evidence indicating that lead exposure is re-increasing in low- and middle-income countries (LMICs) around the world from a variety of exposure sources, UNICEF launched the Partnership for a Lead-Free Future during the United Nations General Assembly. In response, philanthropic organizations have committed well over $100 million to tackling the problem. Pure Earth, an award-winning non-governmental organization (NGO) that has been working on reducing exposure to toxics in LMICs for over 20 years, is leading a major portion of this initiative in collaboration with several partners. This session will begin with a summary of the initiative, the associated scientific challenges, and opportunities for ISES members to be involved. Subsequent presentations will focus on research, both specific and methodological, on identifying the principal "upstream" and "downstream" sources of lead exposure in a variety of populations and associated mitigation strategies.

[64] Global Air Pollution Exposure in a Changing Climate and Society: Evidence Across Diverse and Understudied Regions

Air pollution exposure is evolving under changing climatic, environmental, and societal conditions, including urbanization, land-use change, demographic shifts, energy transitions, and extreme events. Although scientific advances have been made in well-studied settings, substantial evidence gaps remain in many regions where air pollution exposure is insufficiently characterized. This session will bring together studies that examine air pollution exposure in a global context or generate new evidence from diverse and understudied regions.

We invite contributions that improve our understanding of how changing environmental and societal conditions influence air pollution exposure across populations, locations, and time. Relevant topics include exposure assessment using ground-based, satellite-based, or integrated approaches; source apportionment; wildfire and dust storm impacts; urban/rural air pollution; exposure inequity; and policy-relevant analyses. Studies may present methodological developments, regional applications, or exposure-focused evidence with implications for public health, particularly by highlighting findings from regions historically underrepresented in the literature.

[65] Biomonitoring of National and Regional Populations: Translations to Public Health Interventions and Regulatory Efforts.

National and regional human biomonitoring programs assess chemical exposure to inform protective public health measures; understand temporal, demographic, and regional trends and disparities; and create data for understanding links to health effects. These programs develop key information on the general population, but also vulnerable populations and more highly exposed occupational or demographic groups.

This session will explore national human biomonitoring programs from the development of national HBM frameworks to emerging results from programs on regional and national efforts across continents to better assess their populations, focusing specifically on metals, PFAS, and pesticides, as well as identifying future prospects and chemical priorities. Furthermore, it will demonstrate how these programs utilise findings and translate them into interventions and regulatory efforts. This will include input from long-existing (e.g. Germany's long-standing program) and newly developed national human biomonitoring programmes and programmes involved in the EU Partnership for the Assessment of Risks from Chemicals (PARC) initiative. By highlighting the unique power of biomonitoring programs to track both legacy compounds and rapidly emerging contaminants, the session will show how sustained monitoring provides essential continuity for detecting trends and informing timely public health actions.

In this session, participants will exchange insights, address challenges, and explore the strengths of population biomonitoring, showing how collaborations with governmental entities can further chemical exposure research and surveillance.

[66] How to Build and Maintain a Sustainable and Stronger Community Through Academic Partnerships.

Community-academic partnerships need to be built with trust and mutual respect, focusing on shared visions and common goals. The kindness and goodwill of a community should never be taken for granted. Academic partners are responsible for fostering open communication, transparency, and a genuine commitment to understanding the community's perspectives and goals. Respect must be given to the expertise and lived experiences of community partners, recognizing their deep knowledge of their community. Community partnerships can be very challenging and patience, honesty and transparency, sustainability and commitment are paramount for a successful and long-term collaboration. In contrast, there are also certain actions and behaviors that can halt the engagement before it begins or severe an already formed partnership. Such conducts are infrequently discussed and will be brought to light in this session. Some examples include, the "Savior syndrome" approach, broken promises, focusing on deficits of the community rather than their strengths and resiliency. This session will consider several aspects essential for thriving, long-term community-academic partnerships, and challenges and stumbling blocks that can be encountered along the journey. The topics of discussion include engagement and recruitment, building trust, working with community scientists in exposure assessment, community report back, and sustainability. Speakers will include both academic partners and community members.

[67] Firefighter Exposures at the Wildland Urban Interface (WUI)

Wildfires increasingly occur at the wildland–urban interface (WUI), where burning vegetation intersects with homes, vehicles, and other built materials. As a result, firefighters responding to WUI incidents are exposed to complex mixtures of combustion products derived not only from biomass but also from plastics, electronics, building materials, and consumer products. These fires generate diverse hazardous chemicals including toxic gases such as benzene, hydrogen cyanide, and hydrogen chloride and semi-volatile organic compounds such as polycyclic aromatic hydrocarbons (PAHs), flame retardants, and plastic additives.

Compared with structural firefighting, many wildland firefighters operate without respiratory protection such as self-contained breathing apparatus, potentially increasing inhalation and dermal exposures during suppression activities. The WUI environment also introduces emerging exposure sources, including combustion of modern materials such as lithium-ion batteries and electric vehicles, which can emit highly toxic gases (e.g., hydrogen fluoride and hydrogen chloride) and particle-bound contaminants. At the same time, growing attention has focused on firefighter personal protective equipment (PPE) as both a protective barrier and a potential contributor to chemical exposure through contaminated gear, off-gassing, or persistent chemical treatments.

This session will highlight recent advances in characterizing firefighter exposures at the WUI, including personal exposure monitoring, biomonitoring, and non-targeted chemical analysis approaches. Presentations will address emerging contaminants, the role of PPE and decontamination practices, and the implications of exposure to complex chemical mixtures. This session will identify critical knowledge gaps and research priorities needed to better understand and mitigate firefighter exposures in the rapidly evolving WUI fire environment.

[68] From Lived Experience to Measured Exposure: Reimagining the Exposome Through Community-Driven Science

Advancing the exposome requires more than comprehensive measurement—the meaningful integration of lived experience, community knowledge, and translational science is critical. This session explores how community-engaged approaches are redefining exposure science by bridging real-world conditions with participatory methods across exposure media and the built environment. Presentations will highlight how participatory frameworks can improve the identification, characterization, communication, and mitigation of complex exposure mixtures, including metals, PFAS, and microplastics. Speakers will examine how integrating tools such as participant driven sample collection, passive sampling, and non-targeted analysis with community partnerships enhance data relevance, equity, and actionability. This session will also address persistent challenges in exposure science, including drinking water quality risk factors, the role of extreme weather in exposure risk, understanding cumulative risks, and social determinants of health. By connecting environmental measurements with risk communication, a more complete and actionable understanding of the exposome is revealed. Attendees will gain practical insights into designing collaborative studies, translating findings into policy and practice, and building durable partnerships that strengthen both scientific rigor and community impact.

[69] Integrated Assessment of Bioavailability of Substances in Solid (Complex) Matrices

Bioavailability is a central concept in human and environmental hazard and risk assessment for chemicals embedded into solid matrices. It underpins materials hazard classification, evaluations of bioaccumulation potential, and safety assessments for sensitive end-uses. Defined as the rate and extent to which an agent is absorbed by an organism and becomes available for metabolism or interaction with biologically relevant receptors, bioavailability encompasses both release from a medium and subsequent absorption into biological systems (IPCS Risk Assessment Terminology, 2004).

Despite its importance, the practical application of bioavailability remains hindered, largely due to the lack of harmonized approaches to integrating bioavailability metrics into chemical risk assessments. Divergent terminology across regulatory frameworks (e.g. bioavailability, bioaccessibility, biocompatibility) further complicates its interpretation and use. Consequently, regulators often default to conservative assumptions for 100% bioavailability. With increasingly stringent regulatory expectations—particularly for non-intentionally added substances in contact-sensitive applications and materials containing recycled content—robust quantitative approaches to demonstrate negligible bioavailability become essential. This need is pivotal for complex substances or constituents embedded into solid matrices (e.g. polymers) and aligns with the broader shift toward exposure-driven testing and reduced reliance on animal studies.

This session will highlight recent advances in applying the bioavailability concept in chemical risk assessment. Topics include advanced diffusion and migration modeling for chemicals in solid matrices and exploratory ADME-data analysis and QSAR tools revealing uptake determinants for complex substances. Regulatory case studies will demonstrate practical use of the bioavailability concept, and discussions will identify key methodological gaps and further research priorities.

[70] Advancing Statistical Methods in Exposure Science for Public and Environmental Health

Advancing technology and novel study designs are rapidly changing the type and scale of data in exposure science. New innovations in research are generating high-dimensional mixture data, sensor and biomonitoring technology, and advances in computational statistics and predictive modeling. Increasingly, research designs combine environmental sampling, biomonitoring, and behavior data, creating new opportunities to explore the impact of environmental exposures on the health of individuals and communities. Novel analytic techniques are required to leverage these data into actionable, evidence-based recommendations for individuals, communities, policy makers, and other stakeholders.

Exposure science faces statistical challenges of using real-world data that include measurement error, missing and misspecified data, correlated mixtures, and spatial-temporal misalignment. Additionally, the field confronts causal inference and interpretability challenges in translating evidence into public health, regulatory, and policy recommendations. These challenges require advanced statistical and computational methods that are both scientifically rigorous and practically actionable.

This session encourages both methodological and applied research that advances the statistical foundations of exposure science, particularly with implications for population health, environmental justice, and regulatory decision-making. Topics of interest include but are not limited to high-dimensional mixture and exposome methods, multi-pathway exposure models, models integrating causal frameworks, and models integrating exposure and behavioral pathways.

[71] Leveraging HBM Efforts in Europe: Harmonisation, Data Integration and Communication in PARC

Understanding human exposure to chemicals has advanced significantly through large-scale human biomonitoring (HBM) and harmonised European efforts. However, translating exposure data into societal impact remains a critical challenge. This session intends to show how cutting-edge exposure science can be effectively connected to communication, stakeholder engagement, citizens awareness raising and policy uptake.

Building on recent advances within the Partnership for Assessment of Risks from Chemicals (PARC), the session will host presentations that highlight the integrated approach that promotes PARC across Europe, including progresses in harmonised human biomonitoring, environmental monitoring, and development and integration of innovative analytical and data harmonisation approaches in support of risk assessment and early warning system.

Complementing this scientific perspective, the session aims also to address the importance of communicating and disseminating exposure knowledge in collaboration with stakeholders. Experiences from managing stakeholder forums, international collaboration platforms, and developing citizen engagement activities will be presented to illustrate how exposure science can gain visibility, relevance, and trust through a well-designed communication strategy. In addition, the session will include the presentation of approaches to strengthen synergies across international initiatives and increase global outreach to avoid work overlap, promote a more efficient use of science resources, and support a smoother translation of exposure data into policy and practice.

Ultimately, this session expects to foster the dialogue between scientists, policymakers, and communication experts to advance a more integrated and impactful exposure science, as required by the One Substance One Assessment Regulation that was adopted by EU early 2026.

[72] Chemical Exposures From Food and Agricultural Sources: Monitoring, Risk Assessment & Research Needs in Latin America

The sources, extent, and consequences of children's exposure to contaminants like heavy metals and pesticides in Latin America are receiving increased attention from citizens, scientists, and governments. Foods and agricultural production are a key source of exposure to both types of contaminants. Despite growing concern, the evidence base is still inadequate to understand the presence of contaminants in foods or the extent of children's exposure from agricultural production across sociocultural settings in Latin America. There is also little understanding of the associated health risks across childhood. For foods specifically, the risk-benefit ratio of consuming nutrient-dense foods that may also contain contaminants is seriously understudied. Furthermore, dietary and agricultural contaminant exposures have not received their due attention within the exposome framework, which accounts for multiple sources of chemicals. Presentations on dietary and agricultural exposures to various contaminants have been part of past ISES meetings, but a comprehensive, updated treatment of these interconnected topics is critically needed, particularly for the Latin American context. Currently, children's chemical exposures from foods, diets, and agriculture represent a gap in environmental exposure and epidemiological studies in vulnerable populations. We propose a session consisting of 5 talks on the monitoring and risk assessment related to exposure to heavy metals and pesticides through foods and agriculture. Based on ongoing research in select Latin American countries, and focusing on children, we will examine emerging evidence, describe methods and their potential applications, and outline a research agenda for the near future.

[73] PARC Advances in Human Biomonitoring and Risk Assessment in Europe: From HBM4EU Foundations Towards the OSOA Framework

The European Partnership for the Assessment of Risks from Chemicals (PARC) is generating new evidence, methods, and integrated approaches to strengthen chemical risk assessment across Europe. This session highlights recent advances in geospatial exposure modelling, exposure–effect analyses, integrative risk assessment, and harmonised HBM data collection. The session opens with new results from the HBM4EU project. The first applies geospatial modelling to identify environmental determinants and potential sources of exposure for substances largely driven by environmental pathways, including PFAS, PAHs, pesticides, arsenic species and cadmium. External environmental indicators—such as air and soil pollution, land-cover characteristics, traffic proxies and industrial activity—are linked to human biomarker data via a newly developed privacy-preserving tool. Next, pooled European exposure–effect analyses applying advanced mixture modelling and mediation approaches using effect markers such as 8-hydroxy-2'-deoxyguanosine, hormones, kisspeptin and brain-derived neurotrophic factor will be presented. A third contribution highlights progress within PARC toward a harmonised European approach to integrative exposure and risk assessment, in close collaboration with national institutes and European agencies. It summarises advances in aggregate exposure assessment, Europe-wide mixture risk assessment strategies, and linking exposure data with population health metrics to estimate environmental burden of disease. The session then turns to emerging data from the PARC Aligned Studies, outlining study design, harmonised data collection and key research questions. A concluding presentation from the European Environment Agency will consider the future of HBM in Europe, including its role within the One Substance, One Assessment legislative framework.

[74] Translational Exposomics for Precision Prevention and Public Health Enhancement

Understanding how the totality of environmental exposures across the life course drives disease requires moving beyond single-agent paradigms toward integrative, systems-level frameworks. This session showcases how translational exposomics — the discipline bridging exposome characterization with actionable health outcomes — can deliver precision prevention strategies and strengthen community health. Drawing on large-scale European initiatives (HEALS, ENVESOME, URBANOME, EXPOHEALTHNET) and transatlantic research at Yale and the National Hellenic Research Foundation and Aristotle University of Thessaloniki, we present an end-to-end pipeline linking external exposure assessment through wearables, remote sensing, and agent-based models with internal exposome profiling via multi-omics (genomics, epigenomics, metabolomics, proteomics). Physiologically based biokinetic modeling coupled with Bayesian inversion methods connects ambient exposures to internal doses, while exposome-wide association studies and adverse outcome pathway networks elucidate causal mechanisms linking pollutant mixtures to non-communicable diseases. We highlight how gene-environment interactions and socio-economic disparities shape susceptibility, emphasizing vulnerable populations across Urban Living Labs in Europe, the USA and beyond. A central theme is the role of artificial intelligence in accelerating translational exposomics: machine learning for multi-omics data integration and biomarker discovery, deep learning for high-dimensional exposure pattern recognition, and AI-powered decision support systems for risk stratification and personalized health coaching. Equally critical, we address data equity principles ensuring that AI-driven tools reduce rather than amplify health disparities. The session fosters collaborative dialogue among exposure scientists, biostatisticians, molecular toxicologists, and public health practitioners, charting a path from mechanistic discovery to evidence-based policy and community-level interventions for healthier populations.

[75] AI-Driven Integration of Genomic and Exposome Data for Precision Cancer Prevention: From Combined Risk Scores to Clinical Translation

Cancer risk arises from the interplay between inherited polygenic susceptibility and cumulative environmental exposures across the life course. Polygenic risk scores (PRS) consistently stratify populations into meaningful gradients of relative risk, yet their predictive gains remain modest when used in isolation. Combined Risk Scores (CRS) that integrate PRS with exposome-derived environmental, behavioural, and clinical variables offer a more comprehensive framework for precision cancer prevention. This session examines the evidence base, methodological challenges, and translational pathways for CRS across major cancer sites. We critically assess the etiologic architecture underlying gene-exposome interactions, including the multiplicative risk model as a pragmatic default, while highlighting where cancer-specific departures and exposure heterogeneity demand more nuanced approaches. A central focus is the distinction between etiologic association and predictive performance — strong risk gradients do not automatically translate into clinically meaningful discrimination or calibration gains, and external validation across ancestries remains limited. The session then charts the AI-driven evolution of CRS: from static, linear models toward dynamic, multimodal, and causally interpretable frameworks. Key topics include deep learning for integrating multi-omics and imaging data with exposome variables, federated learning for privacy-preserving model training across diverse populations, causal AI enabling counterfactual reasoning for personalized prevention, and fairness-aware algorithms addressing ancestry bias and health equity. Drawing on ecological and evolutionary perspectives from cancer biology alongside systems-level exposome science, we bring complementary expertise spanning computational exposure assessment, translational oncology, and molecular toxicology. The session will identify priorities for transforming CRS from research instruments into validated, equitable tools for cancer screening and prevention.

[76] Exploring Thermal Runaway Exposure Characteristics, Environmental Impacts, and Health Consequences

Lithium-ion (Li-ion) cells and batteries are widely used for energy storage in consumer products, including large scale battery energy storage systems, portable electronics, and electric vehicles (EVs). However, Li-ion systems can enter a state of thermal runaway (TR) due to mechanical damage or overheating, an uncontrollable self-heating state of the Li-ion cell, generating smoke and fire hazards. A wide array of harmful constituents has been identified in Li-ion TR events including formaldehyde, acidic gases, volatile organic compounds, heavy metals and particulates, while the human health remains widely unknown. This session positions itself to be a crucial platform for convening experts approaching TR events from a variety of unique viewpoints. Through a collection of presentations, experts will highlight research findings associated with TR exposure metrics and the health implications of those exposures to allow for a holistic understanding of the consequences of Li-ion TR event exposures. The session will highlight the TR events within exposome framework from Li-ion cells and full-EVs, and the integration of these TR events as part of the wildland urban interface continuum. Furthermore, the session will feature a discussion of the new hazard Li-ion batteries and EV vehicles bring to the fire service and recommendations associated with controlling these events and their potential environmental and human health impact. Through presentations and discussions, attendees will gain insights into the most recent advances in research aimed at uncovering the human health hazard that exists due to the prevalence of Li-ion systems use and the resulting rise in TR events.

[77] AI in Exposure Science and Risk Assessment - Applications and Limitations

The growth of AI and its applicability is of considerable international interest. AI application across exposure science and human health risk assessment is diverse and expanding incorporating objective elements of decision-making. Early adoption is promising particularly with large and complex data sets but is currently limited across subjective elements. This session seeks to present the latest information on applications but also highlight limitations and uncertainties for the unwary.

[78] From Risk Assessment to Health-Based Interpretation of Human Biomonitoring Data: A Case Study on Inorganic Arsenic

Human biomonitoring (HBM) is a cornerstone of exposure science, providing direct evidence of chemical exposures in populations. By its nature, HBM aligns closely with the exposome concept, as it integrates all routes and sources of exposure. A key ongoing challenge is how to translate risk assessment, based on external exposure, into practical, health-based tools for interpreting HBM data. Such interpretation is essential to support risk management, epidemiological research, and public health policy. Human biomonitoring health-based guidance values (HBMGVs) address this need by enabling comparisons between measured biomarker concentrations and toxicity benchmarks derived from risk assessments conducted by different agencies. Building on the work of the ISES International Human Biomonitoring (i-HBM) Working Group, including the development of the HB2GV Dashboard, this session uses inorganic arsenic as a timely case study. Recent updates to the U.S. EPA IRIS assessment for inorganic arsenic, alongside international evaluations such as those from WHO/JECFA, have important implications for biomonitoring. These developments highlight both opportunities and challenges in deriving and applying HBMGVs, particularly with respect to analytical methods, uncertainty, and differences in approaches across jurisdictions.

This session will bring together experts from government, academia, and international organizations to explore how advances in analytical methods and evolving risk assessment approaches are shaping biomonitoring guidance values and the interpretation of population-level health risks. Through focused presentations and discussion, the session aims to promote more consistent, transparent, and actionable interpretation of HBM data for public health decision-making.

[79] Advancing Exposure Forensics for Environmental Health Protection

Exposure forensics involves the study how anthropogenic chemicals and their transformation products move through the environment, enter human or ecological receptors, and potentially contribute to downstream health risks. Exposure forensics approaches can have relevance to characterization of public health risks, development of mitigation strategies, and assignment of legal liability. This session will highlight innovative scientific approaches that strengthen our ability to identify contaminant sources, reconstruct exposure pathways, and characterize the risks associated with environmental chemicals and mixtures. Presentations may explore methods for tracing pollutants from environmental monitoring data back to their origins via use of source profiling or source apportionment techniques, including integration of metadata such as chemical use or emissions information. Other topics of interest include advances in linking biomonitoring results to parent exposures and upstream sources, development of chemical source fingerprints including applications of non-targeted analysis (NTA) to reveal previously unrecognized contaminants or source signatures, and computational innovations for profiling the risk associated with observed source profiles. Together, these talks will showcase how exposure forensics can provide actionable insights for environmental health science, regulatory decision-making, and community protection.

[80] Quantifying Ambient Ethylene Oxide Exposure in the General Population: Defining the Research Gaps and Proposing a Path Forward

Ethylene oxide (EtO) is a newly reclassified human carcinogen that significantly increases the risk of multiple types of cancer. Despite its carcinogenic potential, EtO is globally produced and used due to its indispensable properties as a sterilizing agent for medical devices and as an industrial intermediate in the manufacture of solvents, detergents, and adhesives. To date, the cancer risk posed by EtO to the general population from ambient community exposure remains poorly understood. Such a gap is not only due to limited data on exposure but also because EtO emissions are more common among socially and economically disadvantaged groups. Recent advances in high-sensitivity monitoring instrumentation and dispersion modeling have improved our ability to measure ambient EtO concentrations. Yet substantial knowledge gaps remain. These include: (1) accurately quantifying fugitive emissions, particularly near detection limits; (2) disentangling contributions from multiple sources; (3) characterizing secondary formation mechanisms; and (4) establishing reliable background concentration baselines.

The proposed session aims to convene researchers and regulatory scientists to identify these and additional key challenges. Presentations will feature the latest ambient monitoring results from at least two urban communities, followed by a discussion on methodological barriers and priority research needs. The session highlights the research needs surrounding the characterization of EtO in communities, particularly for those living near the facility fenceline, cancer epidemiology, and regulatory recommendations.

Presenters and discussants will co-author a workshop paper that synthesizes key findings and outlines a coordinated research agenda to advance understanding of population-level EtO exposure and inform protective actions.

[81] Exposure Sciences to Unravel the Microbiological Environment: From Methods to Applications

Understanding human exposure to environmental microbiological hazards is essential for preventing infectious diseases and managing emerging public health threats. This session will explore how exposure science can advance the characterization, quantification, and management of microbiological risks across diverse environments. We welcome contributions addressing innovative methods to characterise exposures to environmental microbiological risks, including advances in sampling strategies that provide insights into sampling collection, storage, and optimization of analytical workflows. Studies investigating determinants of exposure to microbiological risks, including environmental, climatic, behavioural, and sociodemographic factors are particularly encouraged.

The session will also focus on the characterization of microbiological hotspots, including healthcare settings, urban environments, food related systems, and water-related ecosystems, as well as the analysis of environmental microbiomes and their drivers. Special attention will be given to research on environmental exposure to antimicrobial resistance genes, an area of growing global concern. We also invite contributions demonstrating the application of environmental microbiological surveillance systems to monitor exposure and inform public health interventions. Additionally, we encourage presentations on tools and frameworks to assess and manage microbiological risks, particularly in critical situations such as outbreaks and pandemics. By bridging methodological innovation and real-world application, this session aims to foster interdisciplinary dialogue and advance the role of exposure science in understanding and mitigating microbiological risks in a changing environment.