ECHO 2026 Science to Action Symposium Summary

Opening Overview: ECHO as a National Translational Child Health Platform

Speaker	Talk Title
Matt Gillman, MD, SM; *Director, ECHO Program*	Welcome
Nse Witherspoon; *Children's Environmental Health Network*	Opening Keynote Address; Protecting Children's Environmental Health: Activating Vital Actions Through the Use of Science

Speakers:

- **Matt Gillman, MD, SM;** *Director, ECHO Program*
- **Nse Witherspoon;** *Children's Environmental Health Network*

The symposium opened with a framing of the NIH-funded Environmental influences on Child Health Outcomes (ECHO) Program as one of the most comprehensive efforts in the United States to understand how early-life environmental exposures shape lifelong health. Dr. Matt Gillman described ECHO not only as a research program but as an intentional bridge between epidemiology, clinical science, and policy action.

ECHO integrates data from approximately 60,000 children followed from before birth through adolescence, alongside historical data from more than 170,000 additional children and caregivers. This large-scale structure allows researchers to examine how environmental exposures— including chemical, physical, biological, nutritional, and social influences—interact over time and across developmental windows.

The program combines two major components: the ECHO Cohort, which focuses on observational research, and the ECHO IDeA States Pediatric Clinical Trials Network (ISPCTN), the only NIH clinical trials network focused on children from rural or underserved communities. Together, they form a platform designed not only to identify risk factors but also to test interventions and improve health outcomes in kids.

Early ECHO findings highlighted throughout the symposium reinforce several consistent patterns. Prenatal exposure to substances such as per- and polyfluoroalkyl substances (PFAS), phthalates, and air pollution has been associated with a range of changes including impaired fetal growth, preterm birth, neurodevelopmental differences, asthma, obesity risk, and changes in blood pressure regulation. Wildfire smoke exposure has been

repeatedly identified as a rapidly growing and under-characterized risk factor, particularly for pregnancy and early childhood.

Keynote speaker Nsedu Witherspoon highlighted the growing impact of environmental factors on children's health, emphasizing that pollution contributes significantly to childhood illness and mortality, while millions of homes continue to contain lead hazards. Children are also widely exposed to toxic chemicals through consumer products and food, contributing to rising rates of cancer, asthma, neurodevelopmental disorders, and other chronic health conditions. Her presentation underscored the growing body of evidence linking environmental exposures to many of the most pressing pediatric health challenges.

A central theme of Ms. Witherspoon's comments was environmental justice. She noted that children in lower-income neighborhoods, people of color, and Tribal communities face disproportionately high exposure to poor air quality, industrial pollution, toxic waste sites, and aging schools and childcare facilities with environmental hazards. She highlighted schools and childcare settings as critical opportunities for intervention, particularly through initiatives. She also discussed climate change as a major threat that intensifies existing risks through worsening air quality, extreme heat, increased exposure to diseases, and mental health impacts associated with disasters and displacement.

The opening framing established a core theme that persisted throughout the day: while the science linking environmental exposures to child health has advanced significantly, there still remain many opportunities to identify systems for translating this knowledge into prevention, regulation, and clinical action.

Session 1: Plastics, Chemicals, and Child Health

Speaker	Talk Title
Philip Landrigan, MD, MSc, FAAP; *Boston College*	Plastics, Petrochemicals, and Children's Health
Sheela Sathyanarayana, MD, MPH; *Seattle Children's Research Institute, University of Washington*	Chemicals in Plastics and Children's Development: What We Know and Don't Know
Veena Singla, PhD; *University of California San Francisco*	Children's Health Concerns Over the Plastics Life Cycle and Opportunities for Action

Dr. Philip Landrigan situated modern plastics within the post–World War II expansion of the chemical industry, noting that global chemical production has increased dramatically and

now includes hundreds of thousands of synthetic compounds, many of which lack full toxicological evaluation.

Dr. Landrigam described that plastics are fossil-fuel-derived materials that contain complex mixtures of additives such as phthalates (for flexibility), bisphenols (for rigidity), flame retardants, stabilizers, and colorants. These additives are not chemically bound in many cases and can migrate into surrounding environments. As a result, exposure occurs through multiple pathways, including food packaging, dust, air, water, and direct consumer product use.

He noted that plastics exposure is ubiquitous, chronic, and cumulative, rather than episodic. Microplastics and nanoplastics have now been detected in human tissues, though measurement methods and health implications remain active areas of research.

Dr. Sheela Sathyanarayana explained that plastics can affect the body through three main biological mechanisms:

- **Endocrine disruption**, in which chemicals interfere with the hormone signals that regulate development, metabolism, and reproduction.
- **Oxidative stress**, which damages cells and DNA through highly reactive molecules known as reactive oxygen species.
- **Inflammation**, which can contribute to chronic disease and alter normal development.

Dr. Sathyanarayana explained that children are especially vulnerable to plastic-related chemicals because exposure begins before birth, their developing bodies are more sensitive to disruption, and behaviors such as crawling and frequent hand-to-mouth activity increase exposure to contaminated dust. She also highlighted puberty as another critical window of vulnerability.

Dr. Sathyanarayana cited evidence from observational cohorts such as ECHO that link prenatal exposure to plastic-associated chemicals with reproductive development changes, altered hormone levels, behavioral differences, attention-related outcomes, and autism-related traits. Importantly, she stressed that cumulative mixtures of chemicals may be more relevant than single exposures in isolation.

Dr. Veena Singla highlighted the inadequacy of current regulatory frameworks. Instead of evaluating related chemicals as a group, they are typically assessed one at a time. As a result, manufacturers often replace a restricted chemical with a similar but insubstantially studied alternative—a practice known as "regrettable substitution." This has led to calls for class-based regulation, where entire groups of chemicals are restricted together.

The panelists noted that exposure pathways in the built environment and food systems are particularly important, with indoor environments as one of the largest sources of exposure due to the extensive use of plastic-based materials in flooring, furniture, insulation, pipes, and packaging systems.

While practical exposure reduction strategies—such as avoiding heating food in plastic and reducing fragranced products—were discussed, speakers emphasized that individual behavior change alone is insufficient without systemic regulatory and industrial reform.

Fireside Chat: Microplastics, Endocrine Disruption, and Systems Change

Speakers
Susanne Brander, PhD; *Pew Charitable Trusts, Safer Chemicals*
Julia Cohen, MPH; *Plastic Pollution Coalition*
Emily Hilz, PhD, *The University of Texas at Austin*

Moderated by Dr. Suzanne Brander, an ecotoxicologist whose research focuses on endocrine disruptors and microplastics, the fireside chat focused on emerging scientific insights into microplastics and endocrine-disrupting chemicals, with emphasis on how these findings challenge conventional toxicology and regulatory systems.

Dr. Emily Hilz highlighted a foundational challenge: many endocrine-disrupting chemicals exhibit nonmonotonic dose-response relationships, meaning that low doses can produce distinct or even stronger biological effects than higher doses. This undermines the traditional assumption that exposure occurs in a linear fashion and complicates efforts to define safe exposure thresholds.

Dr. Hilz also emphasized growing evidence for epigenetic effects, where environmental exposures alter gene expression without changing DNA sequences. These changes may persist over generations, suggesting that chemical exposures could influence not only individuals but also their descendants, with implications for population-level health trajectories.

Julia Cohen argued that the central barrier is no longer scientific uncertainty but translation and action. She emphasized that enough evidence already exists to justify preventive action and that continued demands for absolute certainty can function as a delay

mechanism. She also highlighted the importance of engaging scientists more directly in communication, policy advocacy, and public discourse.

Speakers criticized cycle of regrettable substitutions, where harmful chemicals are replaced with structurally similar compounds (such as BPA being replaced by BPS or BPF) that later raise similar concerns. Speakers advocated moving away from compound-by-compound regulation toward broader chemical class restrictions.

The discussion also addressed limitations of recycling systems. Speakers described "chemical recycling" skeptically, voicing concerns that it may function similarly to incineration and contribute to air and water pollution. Speakers also noted that recycled plastics potentially become more unstable over time due to repeated heating and processing, increasing the likelihood of chemical leaching.

Speakers discussed practical exposure reduction strategies, including use of glass or stainless-steel containers, avoidance of plastic heating, and improved water filtration. However, these were framed explicitly as interim measures rather than long-term solutions.

Session 2 Air Quality — Wildfire Smoke, Indoor Exposure, and Action

Speaker	Talk Title
Catherine Karr, MD, PhD; *University of Washington*	Wildfire Smoke: A Burning Issue for Child Health Scientists, Practitioners, Programs and Policy
Erin Semmens, PhD, MPH; *University of Montana*	Indoor Air Quality, PM2.5, and Respiratory Health in Children
Laura Kate Bender; *American Lung Association*	Translating Air Quality Research into Advocacy

This session addressed air pollution and increasing wildfire activity as a rapidly evolving child health threat.

Dr. Catherine Karr focused on wildfire smoke as one of the fastest-growing environmental health threats facing children. She explained that climate change is increasing both the frequency and intensity of wildfires, while smoke can travel long distances and expose populations far from the fire source. Wildfire smoke contains fine particulate matter (PM2.5), toxic gases, and heavy metals, and emerging evidence suggests that wildfire-

generated particles may be especially harmful because of their high concentration of ultra-fine particles.

Dr. Karr reviewed research linking prenatal wildfire smoke exposure to lower birth weight, increased risk of preterm birth, autism-related developmental outcomes, and possible increases in eczema and other immune-related conditions. She also emphasized that children and pregnant individuals are particularly vulnerable because pollutants can cross the placenta, children breathe more air relative to their body size and developing organs, and their immune systems are more susceptible to environmental exposures. Dr. Karr highlighted the need to better equip healthcare providers to counsel families, noting that recent studies found many families take basic precautions during smoke events but underutilize tools such as air cleaners, masks, and air-quality monitoring resources.

Dr. Erin Semmens addressed indoor air quality, emphasizing that people spend approximately 90% of their time indoors and are exposed to pollution from both outdoor sources and indoor activities such as cooking, wood burning, tobacco use, vaping, candles, and home renovations. She presented findings from the ECHO BREATHE study, which evaluated whether HEPA air filtration could improve recovery among infants hospitalized with bronchiolitis.

The study found that many homes had particulate pollution levels at or above recommended health-based guidelines and that HEPA filtration significantly reduced indoor PM2.5 concentrations. Children living in homes with HEPA filtration experienced roughly five additional symptom-free days, and families that consistently used filters had lower healthcare utilization, suggesting that improving indoor air quality is both feasible and potentially beneficial.

Laura Kate Bender discussed how the American Lung Association translates scientific evidence into public awareness and policy advocacy through initiatives such as the annual State of the Air Report. She highlighted the report's finding that more than four in ten Americans live in areas receiving failing air-quality grades. She noted that while air quality has improved over recent decades due to environmental regulations, climate-driven wildfire smoke is eroding many of those gains.

Ms. Bender emphasized that effective advocacy relies on diverse forms of evidence, including EPA monitoring data, satellite measurements, community sensors, health studies, and personal stories from affected families and healthcare providers.

Across the panel discussion, speakers stressed the importance of preparedness over reaction, the growing concern surrounding ultra-fine particles, lessons that air-quality science offers for emerging issues such as microplastics, and the need for balanced

communication that combines realistic discussion of risks with practical solutions. Speakers concluded that protecting children's health from air pollution will require stronger monitoring systems, improved clinical guidance, effective public communication, community preparedness, and continued policy efforts to reduce pollution at its source.

Cross-Cutting Panel: Trust, Communication, and Science Translation

Speaker	Flash Talk Title
Kimberly Ann Gray, PhD; *National Institute of Environmental Health Sciences, National Institutes of Health*	Moderator
Mindy Bierwag; *Community Medical Center*	Communicating with Parents and Research Participants
Lori Riddle; *Greenaction/GRACE*	Communicating with Advocacy and Indigenous Communities
Sindhu Srinivas, MD, MSCE; *Society for Maternal Fetal Medicine*	Communicating with Health Care Providers and Patients
Shirlee Tan, PhD; *Seattle & King County Public Health Department*	Communicating with Policymakers and Government Officials
Jean Bérubé; *NIH Office of Legislative Policy and Analysis*	Communicating with Policymakers

Moderated by Dr. Kimberly Gray, this panel focused on how environmental health science becomes actionable only when it is effectively communicated and trusted across audiences.

The session's overarching theme was that trust is built through sustained relationships, not one-time messaging.

Mindy Bierwag, representing the research participant voice, and described feeling most engaged when she was treated as a partner, given clear explanations, and provided with feedback on study outcomes. She described compensation, communication, and transparency as critical elements of ethical and effective research design.

Lori Riddle, representing the Indigenous community voice, noted that lived experience is one of the most powerful forms of environmental health communication. She shared personal and generational experiences of exposure-related illness, demonstrating how narrative can translate abstract scientific risk into tangible understanding.

Dr. Sindhu Srinivas, representing the clinician voice, emphasized that risk communication must address both emotional and cognitive dimensions. Patients interpret information through prior beliefs, social influences, and personal experience. As a result, effective communication requires addressing both risks of intervention and risks of non-intervention, rather than presenting data in isolation.

Dr. Shirlee Tan, representing the policy communication voice, noted strategies focused on clarity and brevity. Additionally, Jean Berube, representing the policymaker voice, shared that effective engagement with policymakers requires a small number of prioritized messages, a clear and specific request, and supporting materials that are concise and shareable. She noted that personal narratives were repeatedly identified as more memorable and influential than technical reports alone.

The panel also highlighted barriers including misinformation, overuse of technical language, lack of communication infrastructure in science institutions, and the influence of social media. Creative approaches—such as video, comics, interactive tools, and community-based demonstrations—were presented by the panel as promising strategies for expanding reach and impact.

Closing Remarks: Children's Health as Long-Term Investment

Speaker	Talk Title
Andrew Racine, MD, PhD, FAAP; *American Academy of Pediatrics*	Closing Keynote; Environmental Influences on Child Health: From ECHO Science to Pediatric Care
Matt Gillman, MD, SM; *Director, ECHO Program*	Closing Remarks

The symposium concluded with a keynote by Dr. Andrew Racine, who framed children's health through an economic and investment lens. He argued that investments in early life generate compounding returns over time, while adverse exposures function as negative investments that accumulate disadvantages across the life course.

Dr. Racine emphasized that environmental exposures are not isolated events but structural forces that shape lifelong health, educational attainment, and economic opportunity. Inequities in exposure and resources mean that disadvantaged populations experience more health shocks and fewer protective buffers, leading to widening disparities over generations.

He described the American Academy of Pediatrics as a key translation partner that converts research into clinical guidelines, policy statements, educational tools, and advocacy. Priority areas include PFAS, microplastics, air quality standards for children, epigenetic mechanisms, and evaluation of interventions.

Dr. Gillman's final remarks reinforced the central message of the symposium: scientific evidence alone is insufficient without translation into action. Progress depends on collaboration across researchers, clinicians, policymakers, communities, and participants, with lived experience playing a central role.

Across all sessions, the symposium presented a consistent narrative: environmental exposures in early life—whether from plastics, air pollution, or chemical contaminants—play a major role in shaping lifelong and intergenerational health outcomes. The science linking exposure to harm is increasingly strong, but the dominant challenge is translating that knowledge into prevention, policy, and practice.

The path forward requires not only better evidence but also better systems: class-based chemical regulation, improved exposure monitoring, stronger clinical guidance, more effective communication strategies, and deeper trust between science and communities. Ultimately, the symposium emphasized that protecting children's health is both a moral responsibility and one of the highest-return investments society can make.