



Integrating Multiscale Geospatial Environmental Data into Large Population Health Studies

June 15, 2021 (all times are Eastern Daylight Time)

10:00 Welcome and Opening Remarks

Welcome and introduction: Yuxia Cui, Ph.D., National Institute of Environmental Health Sciences

Opening remarks: Rick Woychik, Ph.D., Director, National Institute of Environmental Health Sciences

Opening remarks: Carolyn Hutter, Ph.D., Director, Division of Genome Sciences at the National Human Genome Research Institute

10:20 Keynote Presentations – Moderator: Sri Nadadur, Ph.D. (30 min per talk + Q/A)

Gene-Environment Interactions in a High Dimensional Omics World

Duncan Thomas, Ph.D., University of Southern California

Who, What, When, Where: Geospatial Exposure Assessment Technologies for Air Pollution

Joshua Apte, Ph.D., University of California, Berkeley

11:30 Break – 30 min

12:00 Session 1: Geospatial Technologies and Human Health – Moderator: Bonnie Joubert, Ph.D. (15 min per talk + Q/A)

Session Overview:

Assessing the environmental exposures of an individual is critical for understanding the environmental contributions to individual health and disease outcomes. This session will demonstrate how recent advances in geospatial technologies can be leveraged to understand the health impacts of a variety of environmental factors, including but not limited to air pollution, water contamination, social and built environment.

Overview of the NASEM Workshop on Leveraging Advances in Remote Geospatial Technologies to Inform Precision Environmental Health Decisions

Susan Anenberg, Ph.D., M.S., George Washington University

Incorporating Geospatial Data to Estimate Lifetime Exposure to Environmental Contaminants: Application and Challenges in Studies of Cancer

Rena Jones, Ph.D., M.S., National Cancer Institute

Applications of Geospatial Methods to Study Neighborhoods and Health Disparities

Dustin Duncan, Sc.D., Columbia University

Advancing Environmental Exposure Assessment with Personal Air Pollution and Geolocation Monitoring in Human Health Studies

Rima Habre, Sc.D., University of Southern California

Emerging Satellite Instruments and Products for Estimating Air Pollution Exposure

Yang Liu, Ph.D., M.S., Emory University

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Using NASA Earth Observation Satellites to Enhance Health and Air Quality Application

John Haynes, M.S., National Aeronautics and Space Administration

2:00 Break – 30 min

2:30 **Session 2: Measurement Error, Spatiotemporal Modeling, and Mobility** – Moderator: Kyle Messier, Ph.D.
(15 min per talk, followed by panel discussion)

Session Overview:

Error and uncertainty occur through many mechanisms in geospatial modeling such as exposure aggregation, missing covariates, and failure to account for time-activity patterns. This session will feature 3 talks discussing approaches to spatiotemporal modeling of environmental exposure and risk with respect to the sources and control of uncertainty.

Multi-Pollutant Measurement Error in Long-Term Air Pollution Epidemiology Studies: Concepts and Correction Methods

Adam Szpiro, Ph.D., Sc.M., University of Washington

Are Better Geospatial Models Enough? Additional Data and Methods Needed to Support Causal Inference

Perry Hystad, Ph.D., M.S., Oregon State University

Considerations for Geospatial Modeling of Water-based Exposures in the United States

Maria Argos, Ph.D., University of Illinois Chicago

Panel Discussion: Adam Szpiro, Ph.D., Sc.M.; Perry Hystad, Ph.D., M.S.; Maria Argos, Ph.D.; Rena Jones, Ph.D., M.S.; Dustin Duncan Sc.D.

4:00 **Day 1 Wrap-up:** Richard Kwok, Ph.D.

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10:00 Welcome to Day 2 – David Balshaw, Ph.D.

10:05 Keynote Presentation – Moderator: David Balshaw, Ph.D.
(30 min + Q/A)

Mapping Our Health: an Exposome Approach

Roel Vermeulen, Ph.D., Utrecht University

10:40 Session 3: “Big Data” and Analytical Considerations – Moderator: Chris Duncan, Ph.D.
(15 min per talk, followed by panel discussion)

Session Overview:

This session will address some of the fundamental issues and challenges related to integrating multiscale and diverse geospatial environmental data with complex personal health outcome data. The three talks will each cover different aspects of the data integration including novel computational methods and models, potential solutions to privacy protection and gene environment interactions.

Leveraging Images and Audio Data as a Resource for Exposure Science and Environmental Health

Scott Weichenthal, Ph.D., McGill University

Decentralized, Efficient, and Secure High Resolution Spatiotemporal Exposure Assessment at Scale

Cole Brokamp, Ph.D., Cincinnati Children's Hospital Medical Center

Geospatial Exposure in the Personalized Environment and Genes Study

Alison Motsinger-Reif, Ph.D., National Institute of Environmental Health Sciences

Panel Discussion: Scott Weichenthal, Ph.D.; Cole Brokamp, Ph.D.; Alison Motsinger-Reif, Ph.D.; Susan Anenberg, Ph.D. M.S.; Yang Liu, Ph.D., M.S.

12:00 Break – 45 min

12:45 Keynote Presentation – Moderator: Michelle Heacock, Ph.D.
(30 min + Q/A)

Integrating Geospatial Environmental Data into Large Molecular Studies in Human Populations – Opportunities and Challenges

Andrea Baccarelli, M.D., Ph.D., Columbia University

1:20 Session 4: Perspectives from Population Health Studies – Moderator: Richard Kwok, Ph.D.
(10 min per talk)

Session Overview:

Insights into the interplay between genomics and the environment require interdisciplinary partnerships, coordination, and communication. This session will feature 6 talks from representatives from large population health studies to share their research goals, perspectives on their study needs, challenges, and opportunities for incorporating geospatial environmental data into their research.

Geospatial Perspectives from the Environmental Influences on Child Health Outcomes (ECHO) Program

Rima Habre, Sc.D., University of Southern California

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International Common Disease Alliance: Working Together to Accelerate Common Complex Disease Discovery and Translation

Rachel Liao, Ph.D., Broad Institute of MIT and Harvard

The NIH All of Us Research Program: Status, Design Considerations, and Data Linkages

Lew Berman, Ph.D., M.S., All of Us Research Program at The National Institutes of Health.

The International HundredK+ Cohorts Consortium: Accelerating Science, Advancing Health

Geoff Ginsburg, M.D., Ph.D., Duke University

GxE for Toxicology – From Fish to Human

Ewan Birney, Ph.D., CBE, FRS, FMedSci, The European Molecular Biology Laboratory

Multiscale Geospatial Environmental Data in the Nurses' Health Studies: Exposomic Approaches and Next Directions in Mobile Health and Deep Learning

Peter James, Sc.D., Harvard

2:30 Break – 15 min

2:45 Panel Discussion: How to Go Forward from Here – Moderator: Gary Miller, Ph.D., Columbia University

Panelists will be a combination of speakers from the previous sessions to cover a range of expertise and will incorporate discussion and topics from the audience.

3:45 Meeting Wrap-up: David Balshaw, Ph.D.

4:00 Workshop Adjourns

The workshop is organized by the NIEHS Workshop planning committee:

Yuxia Cui, Ph.D. (co-chair); Richard Kwok, Ph.D. (co-chair); David Balshaw, Ph.D.; Chris Duncan, Ph.D.; Michelle Heacock, Ph.D.; Bonnie Joubert, Ph.D.; Kyle Messier, Ph.D.; and Sri Nadadur, Ph.D.