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Dear Symposium Participants,

It is with great pleasure and excitement that we welcome you to *Strengthening Environmental Justice Research and Decision Making: A Symposium on the Science of Disproportionate Environmental Health Impacts.* For over a year we have worked to organize this symposium and to bring together a diverse set of expert panels, speakers, and participants, premised on the recognition that the issue of environmental justice and environmental health equity in U.S. Environmental Protection Agency (EPA) decision making requires a broadening of the dialogue and the sources of scholarship, knowledge, and expertise that are brought to the table. Multiple factors, including social, political, psychosocial, economic, physical, chemical, and biological determinants, contribute to disproportionate human health or environmental impacts. Therefore, diverse expertise, including environmental public health scientists, environmental and social epidemiologists, medical anthropologists, geographers, biostatisticians, population health scientists, toxicologists, social scientists, policy analysts, and community experts with interests in media-specific pollution, disparities in environmental disease burdens, children's environmental health, environmental justice, etc., are needed at the table to weave their perspectives together to better inform environmental health policy and environmental regulatory decision making to achieve environmental justice and environmental health equity.

For this Symposium we are focused on EPA's regulatory decision making because the regulatory development process at EPA is currently undergoing significant change to assure that all decisions incorporate environmental justice. The Symposium **is purposed to lay the groundwork for developing a systematic and scientifically defensible approach for incorporating environmental justice concerns into EPA's decision-making process.** Your input during this Symposium will help:

- Identify opportunities to modify EPA's analytical frameworks to incorporate consideration of disproportionate impacts.
- Inform the collection of data and development of analytical methods and conceptual models for assessing and incorporating disproportionate impacts into decision making.
- Inform activities to enhance the regulatory development process, including meaningful participation of stakeholders.

The topic of incorporating environmental justice concerns in regulatory decision making is not new. In fact, in March 1990, the participants in the Conference on Race and the Incidence of Environmental Hazards at the University of Michigan wrote a letter to the heads of the Department of Health and Human Services, EPA, and the Council on Environmental Quality to discuss the following, among other recommendations, "require, on a demonstration basis, that racial and socioeconomic equity considerations be included in Regulatory Impact Assessments...and include a racial and socioeconomic dimension in geographic studies of environmental risk." That memo resulted in a meeting with then-EPA Administrator, William K. Reilly. Administrator Reilly subsequently created the Environmental Equity Workgroup, a precursor event to the creation of EPA's Office of Environmental Justice. We hope that the discussions at this Symposium lead to environmental justice and equity considerations in regulatory decision-making becoming standard practice.

The support and contributions of many people made this Symposium possible. We would like to thank all the Symposium Sponsors (see Sponsors tab), members of the Symposium Planning Committee (see Planning Committee tab) and our Contributing Experts (see Contributing Experts tab). We also would like to thank the individuals who have worked behind to scenes to ensure the success of the Symposium and all other related efforts. Specifically, we thank Tina Conley, with the National Center for Environmental Research (NCER) in ORD, and Maria Smith, with The Scientific Consulting Group, Inc., for leading the meeting logistics planning and execution. We thank Deborah Weinstock, with

MDB Inc., for her contributions to meeting logistics, and Arlene Rosenbaum, with ICF International, and Michael Callahan, with MDB, Inc., for coordinating the technical papers. We would like to especially thank the following individuals for coordinating travel arrangements: Stella Spyropoulos, Executive Assistant in NCER; Betty Jo Miller, Office of Administrative and Research Support (OARS) Travel Division Director in ORD; Susan Pearce, OARS, Travel Management Division RTP Team Lead, ORD; Ann Fisher-Durrah, travel coordinator with the Office of Children's Health Protection; Kelly Maguire and Natalie Durham with the EPA National Center for Environmental Economics; Sherry Baron with the National Institute for Occupational Safety and Health; and Liam O'Fallon and Kate Ryan with the National Institute of Environmental Health Sciences.

On behalf of the Symposium Planning Committee, we wish you a successful meeting and constructive dialogue,

Devon Payne-Sturges, Dr.P.H.
Assistant Center Director for Human Health
National Center for Environmental Research
EPA

Onyemaechi Nweke, Dr.P.H.
Physical Scientist
Office of Environmental Justice
EPA

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Strengthening Environmental Justice Research and Decision Making: A Symposium on the Science of Disproportionate Environmental Health Impacts

March 17 - 19, 2010

Walter E. Washington Convention Center
Washington, DC

AGENDA

March 17, 2010

7:30 – 8:30 a.m. **Registration**

8:30 – 8:50 a.m. **Opening and Welcome Session (Room 151AB)**

Paul Anastas, Assistant Administrator, Office of Research and Development, EPA

Speakers: **Lisa P. Jackson**, Administrator, EPA ***introduced by*** **Peggy Shepard**, Executive Director, WeACT

8:50 – 10:45 a.m. **Plenary 1: Overarching Issues for Environmental Justice—Community Perspectives (Room 151AB)**

Master of Ceremonies and Moderator: **Brian Smedley**, Vice President and Director, Health Policy Institute, Joint Center for Political and Economic Studies

Keynote Speaker: **Diane Takvorian**, Executive Director, Environmental Health Coalition

Panel Speakers:
Gary R. Grant, Executive Director, Concerned Citizens of Tillery
Monique Harden, Co-Director and Attorney, Advocates for Environmental Human Rights
Romel Pascual, Director of Environment, Office of Mayor Antonio Villaraigosa
James Ransom, Chief, St. Regis Mohawk Tribal Council
Mathy Stanislaus, Assistant Administrator, Office of Solid Waste and Emergency Response, EPA

10:45 – 11:00 a.m. **Break**

11:00 – 11:30 a.m. **Overview/Purpose of the Symposium (Room 151AB)**

Master of Ceremonies: **Brian Smedley**, Vice President and Director, Health Policy Institute, Joint Center for Political and Economic Studies

- Review impetus for the symposium
- Outline focal issues for the symposium and expectations

11:30 – 1:00 p.m. **Luncheon Featuring Keynote Speaker (Room 147AB)**

Race, Place, and Environmental Justice: Looking Back, Looking Forward
Manuel Pastor, Professor, University of Southern California

Sponsored by the Joint Center for Political and Economic Studies supported by a generous grant from the W.K. Kellogg Foundation

1:00 – 2:30 p.m. **Concurrent Breakout Sessions**

- State-of-the-Science Commissioned Paper Panel: Proximity (Room 150A)
  Purpose: To explore and define how proximity to environmental health hazards and their sources contributes to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision-making process.

  Session Chair/Speaker: **Juliana Maantay**, Professor, Department of Environmental, Geographic and Geological Sciences, Lehman College, The City University of New York
  Speakers: **Jayajit Chakraborty**, Associate Professor, Department of Geography, University of South Florida
  Jean Brender, Associate Dean for Research and Professor, Department of Epidemiology and Biostatistics, Texas A&M University
  Discussants: **Roger Kim,** Executive Director, Asian Pacific Environmental Network
  Peter Langlois, Senior Epidemiologist, Texas Department of State Health Services

- State-of-the-Science Commissioned Paper Panel: Multiple and Cumulative Impacts/Effects (Room 150B)
  Purpose: To explore the contribution of exposure to multiple and cumulative environmental stressors to adverse environmental and health impacts, and also to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision-making process.

  Session Chair/Speaker: **Stephen H. Linder**, School of Public Health, University of Texas
  Speakers: **Amy D. Kyle**, Associate Professor, Environmental Health Sciences, School of Public Health, University of California, Berkeley
  Gary Ginsberg, Toxicologist, Division of Environmental Epidemiology and Occupational Health, Connecticut Department of Public Health
  Discussants: **James Ransom**, Chief, St. Regis Mohawk Tribal Council
  Rita Schoeny, Office of Science and Technology, Office of Water, EPA

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1:00 – 2:30 p.m. **Concurrent Breakout Sessions (continued)**

- State-of-the-Science Commissioned Paper Panel: Susceptibility and Vulnerability (Room 152A)
  Purpose: To explore the relationship between vulnerability/susceptibility factors (including social factors) and disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations. In particular, summarize how vulnerability modifies the relationship between environmental agents and health impacts and discuss opportunities to incorporate this information quantitatively into environmental risk assessment and the policy decision-making process.

  Session Chair/Speaker: **Joel Schwartz**, Professor of Environmental Epidemiology, Harvard School of Public Health
  Speakers: **David Bellinger**, Professor, Department of Environmental Health, Harvard University and Senior Research Associate in Neurology, Children's Hospital, Boston
  Thomas A. Glass, Associate Professor, Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health and Faculty Associate, Johns Hopkins Population Center
  Discussants: **Wilma Subra,** Subra Company, Louisiana
  Sally Darney, National Program Director for Human Health, EPA

- State-of-the-Science Commissioned Paper Panel: Unique Exposures (Room 152B)
  Purpose: To elucidate how unique exposure pathways contribute to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision- making process.

  Session Chair/Speaker: **Joanna Burger**, Division of Life Sciences, Rutgers University
  Speakers: **Michael Gochfeld**, Environmental and Occupational Medicine, University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, Rutgers University
  Daniel Kass, Acting Deputy Commissioner, Environmental Health, New York City Department of Health and Mental Hygiene
  Discussants: **Earl Hatley,** Local Environmental Action Demanded, Oklahoma
  Michael S. Metzger, Chief, Risk Assessment Branch, Health Effects Division, Office of Pesticide Programs, EPA

2:30 – 3:00 p.m. **Break/Poster Setup**

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3:00 – 5:00 p.m.

Concurrent Data and Methodology Sessions

3:00 – 3:40 p.m. Poster Review

3:40 – 5:00 p.m. Presentation and Discussion—Participants discuss the posters as a panel; focus is on methods, data sources, and results as related to methods.

- Data and Methodology Needs: Proximity (Poster Discussion Format) (Room 150A)

  Purpose: The purpose of this session is to explore methodological approaches used in proximity analysis, environmental and health effects studies using such approaches as the development and application of novel proximity measures, and the application of proximity analysis in environmental policy decision making.

  Session Co-Chairs:

  Brad Schultz, Chief, Exposure Modeling Research Branch, National Exposure Research Laboratory, EPA
  Robin Saha, Associate Professor, Environmental Health, Justice and Policy, University of Montana

  Poster Presenters:

  Troy Abel, Assistant Professor of Environmental Policy, Department of Environmental Studies, Western Washington University
  Mark Corrales, Regulatory Policy Analyst, Office of Policy, Economics, and Innovation, Office of the Administrator, EPA
  Mary Collins, Bren School of Environmental Sciences and Management, University of California, Santa Barbara
  Angela Gilbert, University of South Florida
  William McDonnell, Assistant Professor of Pediatrics, Adjunct Professor of Law, Department of Pediatrics, University of Utah and Director, Center for Children's Environmental Health Law and Policy
  Arlene Rosenbaum, Technical Director, ICF International

- Data and Methodology Needs: Multiple and Cumulative Impacts/Effects (Poster Discussion Format) (Room 152AB)

  Purpose: The purpose of this session is to explore data needs and methodological approaches for assessing cumulative impacts/burdens/exposures/risks among minority, low-income, tribal, and other population groups. This session also explores the development and application of novel cumulative impact measures, and the application of information on cumulative impact/risk analysis in environmental/environmental health policy decision making.

  Session Co-Chairs:

  Russ Lopez, Senior Research Associate, Kitty and Michael Dukakis Center for Urban and Regional Policy, Northeastern University
  Irene Dankwa-Mullan, Acting Director, Office of Innovation and Program Coordination, National Center on Minority Health and Health Disparities, National Institutes of Health (NIH)

  Poster Presenters:

  Daniel Axelrad, Office of the Administrator, Office of Policy, Economics, and Innovation, EPA
  Patricia Murphy, ROE Health Coordinator, National Center for Environmental Assessment, EPA
  Hilton Kelley, National Environmental Justice Advisory Council/Member/Community In-Power and Development Association Inc.
  John Prochaska, Center to Eliminate Health Disparities, University of Texas Medical Branch - Galveston
  Danelle Lobdell, Chief (Acting), Epidemiology Branch, National Health and Environmental Effects Research Laboratory, EPA
  Sarah Sharpe, Environmental Health Director/Coordinator, Fresno Metro Ministry/San Joaquin Valley Cumulative Health Impact Project

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March 17, 2010 (continued)

3:00 – 5:00 p.m. **Concurrent Data and Methodology Sessions (continued)**

- Data and Methodology Needs: Susceptibility and Vulnerability (Poster Discussion Format) (Room 150B)
  Purpose: The purpose of this session is to explore methodological and data needs for incorporating vulnerability considerations into decision-making frameworks such as risk assessment, health impact assessment, etc. Specifically, this session includes an overview of data and methods for identifying vulnerable/susceptible populations.

  Session Co-Chairs:
  Maureen O'Neill, Children's Health Coordinator, Region 2, EPA
  Terry Wesley, Environmental Justice Coordinator, Region 2, EPA

  Poster Presenters:
  Jane Clougherty, Senior Air Quality Scientist, New York City Department of Health and Mental Hygiene and Research Associate, Department of Environmental Health, Harvard School of Public Health
  Tamara Saltman, Policy Analyst, Office of Air Quality, Planning and Standards, EPA
  Sacoby Wilson, Research Assistant Professor, Institute for Families in Societies, University of South Carolina
  Sue M. Moodie, Department of Environmental Health, Johns Hopkins School of Public Health
  Keeve Nachman, Director, Farming for the Future Program, Bloomberg School of Public Health, Johns Hopkins Center for a Livable Future

- Data and Methodology Needs: Unique Exposures (Poster Discussion Format) (152B)
  Purpose: Some individuals, communities, and population groups may experience unique environmental exposures due to socioeconomic status, occupation, geographic location, life stage, or cultural practices. In this session, presenters will highlight data sources, methods, approaches, frameworks, and analytical tools for incorporating information on uniquely exposed populations in environmental/environmental health policy and regulatory decision making.

  Session Co-Chairs:
  Roseanne Lorenzana, Science Liaison, Region 10, EPA
  Max Weintraub, Lead-Based Paint Enforcement Coordinator, Region 9, EPA

  Poster Presenters:
  Christine Chaisson, Director, The LifeLine Group
  Roseanne Lorenzana, Science Liaison, Region 10, EPA
  David Richardson, University of North Carolina at Chapel Hill
  Vi Waghiyi, Environmental Health and Justice Program Director, Alaska Community Action on Toxics

5:00 p.m. **Adjournment – Day 1**

March 18, 2010

8:00 – 8:30 a.m. **Registration**

8:30 – 8:45 a.m. **Remarks by Ron Sims, Deputy Secretary of the U.S. Department of Housing and Urban Development**

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8:45 – 10:15 a.m. **Plenary 2: Health Disparities and the Environment (Room 151AB)**

Session Panel Moderator: **Harold Zenick**, Director, National Health and Environmental Effects Research Laboratory, EPA

Panel Speakers:
The Honorable Donna M. Christensen, United States Virgin Islands Delegate to Congress
Paula Braveman, Professor, Department of Family and Community Medicine, School of Medicine, and Director, Center on Social Disparities in Health, University of California, San Francisco
Rachel Morello-Frosch, Associate Professor, Department of Environmental Science, Policy and Management, College of Natural Resources, and School of Public Health, University of California, Berkeley
Howard Frumkin, Special Assistant to the Director for Climate Change and Health, Centers for Disease Control and Prevention (CDC)
John Ruffin, Director, National Center on Minority Health and Health Disparities, NIH

10:15 – 10:30 a.m. **Break**

10:30 – 12:00 p.m. **Concurrent Breakout Sessions**

- State-of-the-Science Commissioned Paper Panel: Psychosocial Stress (Room 150A)
  Purpose: To explore how psychosocial stress contributes to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision-making process.

  Session Chair/Speaker: **Pamela Tucker**, Division of Toxicology and Environmental Medicine, Agency for Toxic Substances and Disease Registry, CDC

  Speakers:
  Bruce McEwen, Professor and Head of the Harold and Milliken Hatch Laboratory of Neuroendocrinology, Rockefeller University
  Charlton Coles, Agency for Toxic Substances and Disease Registry, CDC
  Steven Couch, Agency for Toxic Substances and Disease Registry, CDC
  Deborah Cory-Slechta, Professor, Department of Environmental Medicine, University of Rochester School of Medicine and Dentistry

  Discussants:
  Mark Mitchell, President, Connecticut Coalition for Environmental Justice
  Jane Clougherty, Senior Air Quality Scientist, New York City Department of Health, and Mental Hygiene Research Associate, Department of Environmental Health, Harvard School of Public Health

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10:30 – 12:00 p.m. **Concurrent Breakout Sessions**

- State-of-the-Science Commissioned Paper Panel: Physical Infrastructure (Room 150B)
  Purpose: To elucidate how physical infrastructure/built environment contributes to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision- making process.

  Session Chair/Speaker: **David Jacobs**, National Center for Healthy Housing
  Speakers: **Rajiv Bhatia**, Director, Occupational and Environmental Health, San Francisco Department of Public Health and University of California, San Francisco
  Jim VanDerslice, Associate Professor and Associate Division Chief, Division of Public Health, Department of Family and Preventive Medicine, University of Utah
  Discussants: **Laurel Firestone,** Community Water Center, Visalia, CA
  Corine Li, Manager, Drinking Water Office, Region 9, EPA

- State-of-the-Science Commissioned Paper Panel: Community Capacity To Participate in Environmental Decision Making (Room 152A)
  Purpose: To explore the relationship between community capacity to participate in the public policy decision-making process and disproportionate environmental health impact among ethnic and racial minority and disadvantaged populations and how this information can be incorporated into the environmental policy decision-making process.

  Session Chair/Speaker: **Nicholas Freudenberg**, Distinguished Professor and Director, Department of Public Health, Hunter College of the City University of New York
  Speakers: **Barbara Israel**, Professor, Department of Health Behavior and Health Education, School of Public Health, University of Michigan
  Manuel Pastor, Professor of Geography and American Studies and Ethnicity, University of Southern California
  Discussants: **Peggy Shepard**, Executive Director, WeACT
  Suzanne Wells, Chief, Superfund Community Involvement and Program Initiatives Branch, EPA

- Investigating How Physical and Social Environments Jointly Contribute to Health Disparities: Concepts and Methods from Social Epidemiology (Room 152B)
  Purpose: To introduce and illustrate analytical methods relevant to investigating the joint contributions of physical and social environments to health disparities and discuss how these approaches can enhance our understanding of upstream factors contributing to inequities in environmental health and inform prevention strategies.

  Session Chair: **Ana V. Diez-Roux**, Professor, Epidemiology, and Director, Center for Integrative Approaches to Health Disparities, Center for Social Epidemiology and Population Health, Robert Wood Johnson Health and Society Scholars Program, and Institute for Social Research, University of Michigan School of Public Health
  Speakers: **Mahasin S. Mujahid**, Assistant Professor of Epidemiology, Martin Sisters Endowed Chair in Medical Research and Public Health, School of Public Health, University of California, Berkeley
  Basile Chaix, Faculty of Medicine, University Pierre et Marie Curie-Paris, Saint-Antoine
  Theresa L. Osypuk, Assistant Professor, Bouve College of Health Sciences, Northeastern University

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March 18, 2010 (continued)

12:00 – 1:00 p.m. **Lunch (on your own)/Poster Setup**

1:00 – 3:00 p.m. **Concurrent Data and Methodology Sessions and Community-Based Tools Session**

1:00 – 1:40 p.m. *Poster Review*

1:40 – 3:00 p.m. *Presentation and Discussion*—Participants discuss the posters as a panel; focus is on methods, data sources, and results as related to methods

- Data and Methodology Needs: Psychosocial Stress (Poster Discussion Format) (Room 152A)

  Purpose: The purpose of this session is to explore approaches for measuring psychosocial stress/hazards at the community and individual levels, and also methodological approaches for incorporating information on psychosocial stressors in analytical and decision frameworks (e.g., risk assessment, health impacts assessment).

  Session Co-Chairs:
  Deborah Segal, Environmental Health Scientist, National Center for Environmental Assessment, EPA
  Maggie Breville, Environmental Health Scientist, National Center for Environmental Research, EPA

  Poster Presenters:
  Jessie Carr, Mailman School of Public Health, Columbia University
  Jane Clougherty, Harvard School of Public Health and New York City Department of Health
  Richard Salkowe, Department of Geography, University of South Florida
  Ami Zota, Program on Reproductive Health and Environment, University of California, San Francisco

- Data and Methodology Needs: Physical Infrastructure (Poster Discussion Format) (Room 152B)

  Purpose: The quality of physical infrastructure in a community, such as poor housing or poorly maintained public buildings (e.g., schools), is a significant factor that may contribute to making a community more vulnerable to environmental hazards. In this session, we explore the types of data and methods for incorporating information on the contributions of physical infrastructure/built environment to disproportionate impacts in regulatory analytical and decision frameworks.

  Session Co-Chairs:
  Sharon D. Beard, Industrial Hygienist/Program Administrator, Worker Education and Training Branch, National Institute of Environmental Health Sciences, NIH
  Anikah Salim, Association of Schools of Public Health Fellow, National Center for Environmental Research, EPA

  Poster Presenters:
  Gary Adamkiewicz, Research Scientist, Department of Environmental Health, Harvard School of Public Health
  Christopher Heaney, Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill
  Rhona Julien, Environmental Health Scientist, Region 1, EPA
  Gretchen Kroeger, Children's Environmental Health Initiative, Nicholas School of the Environment, Duke University
  Max Weintraub, EPA
  Sacoby Wilson, Research Assistant Professor, Institute for Families in Societies, University of South Carolina

1:00 – 3:00 p.m. **Concurrent Data and Methodology Sessions and Community-Based Tools Session (continued)**

- Data and Methodology Needs: Community Capacity To Participate in Environmental Decision Making (Poster Discussion Format) (150B)
  Purpose: The purpose of this session is to explore approaches for enhancing community capacity in the decision-making process, and also to identify data or indicators to design better public involvement processes in decision making.

  Session Co-Chairs:
  Liam R. O'Fallon, National Institute of Environmental Health Sciences, NIH
  Yolanda Anita Sanchez, Environmental Scientist, Superfund Community Involvement and Program Initiatives Branch, EPA

  Poster Presenters:
  Diane Ballerino-Regan, Occupational Safety and Health Administration, Office of Occupational Medicine Resident/Duke University
  Steven Fischbach, Community Lawyer, Rhode Island Legal Services
  Claire Franklin, The LifeLine Group
  Myra Immings, Community Planner, Planning and Program Development, Atlanta Regional Office, Federal Transit Administration
  Don Yellowman, President, Forgotten People Community Development Corporation
  Marsha Monestersky, Program Director, Forgotten People Community Development Corporation

- Panel Session: Community-Based Tools for Assessing Disproportionate Impacts (150A)
  Purpose: To showcase a variety of community-based/GIS-based assessment tools and discuss opportunities for implementing/utilizing these tools to help agencies and communities reduce or prevent disproportionate environmental health impacts.

  Session Chair/Speaker: **Paul English**, Branch Science Advisor, Environmental Health Investigations Branch, California Department of Public Health

  Speakers:
  Steve Anderson, Office of Climate and Energy, New Jersey Department of Environmental Protection
  Maria Franco-Spera, Environmental Justice Coordinator, New Jersey Department of Environmental Protection
  James Sadd, Professor of Environmental Science, Occidental College
  Valerie Zartarian, National Exposure Research Laboratory, EPA
  Reginald Harris, Senior Toxicologist/Regional Environmental Justice Coordinator, Office of Enforcement, Compliance and Environmental Justice, EPA
  Andrew Schulman, Office of Enforcement and Compliance Assurance, EPA

3:00 – 3:15 p.m. **Break**

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3:15 – 5:00 p.m. **Concurrent Breakout Sessions**

- Legal Authorities for Incorporating Environmental Justice/Disproportionate Impacts Considerations Into EPA's Decision Making (Room 150A)
  Purpose: Given the importance of the law in achieving environmental justice, this panel will explore the application of legal authorities to address disproportionate health and environmental impacts in EPA's regulatory decision-making process. Opportunities for considering disproportionate impacts in the context of rulemaking, permitting, enforcement, and state compliance will be discussed. Further, emerging non-regulatory approaches will be explored as vehicles for addressing disproportionate burdens of environmental exposures, vulnerabilities, and health impacts.

  Session Chair: **Suzi Ruhl**, Senior Policy Advisor, Office of Environmental Justice, EPA
  Speakers: **Vernice Miller-Travis,** Vice Chair, Maryland State Commission on Environmental Justice and Sustainable Communities
  Sheila Foster, Albert A. Walsh Professor of Law, Fordham University School of Law, NY
  Carol Ann Siciliano, Associate General Counsel, Office of General Counsel, EPA
  Dean Suagee, Hobbs, Straus, Dean & Walker, LLP
  Nicholas Targ, Partner, Holland & Knight, LLP
  Kenneth J. Warren, Hangley Aronchick Segal & Pudlin
  Patrice L. Simms, Deputy Assistant Attorney General, Environment and Natural Resources Division, U.S. Department of Justice

- Analytical Frameworks for Assessing and Addressing Environmental Health Impacts To Inform Decision Making (Room 150B)
  Purpose: Presenters will provide an overview of decision-making frameworks, such as Health Impact Assessment, Global Burden of Disease, and Health Equity Screens, that explicitly allow for meaningful participation and consideration of multiple risk factors. Examples of applications of these frameworks in decision making will be discussed and also how they have been used to address issues of equity.

  Session Chair/Speaker: **Rajiv Bhatia**, Director, Occupational and Environmental Health, San Francisco Department of Public Health
  Speakers: **Jonathan Heller**, Director and Co-Founder, Health Impact Partners
  Ngozi T. Oleru, Director, Environmental Public Health Division, Public Health Seattle/King County
  Aaron J. Cohen, Principal Scientist, Health Effects Institute

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3:15 – 5:00 p.m. **Concurrent Breakout Sessions (continued)**

- Incorporating and Addressing Environmental Justice/Disproportionate Impacts in EPA's Decision-Making Process Using a Risk Assessment Framework (Room 152A)
  Purpose: Risk assessment is EPA's primary science-based framework for decision making. Risk assessment informs decision making at EPA in multiple ways, including prioritization of decisions, rules/standard setting, cleanup of sites, permitting, enforcement, other policy decisions, and program planning. This session includes examples of how environmental justice concerns or disproportionate environmental health impacts/risks have been addressed or incorporated in risk assessment approaches

  Session Chair: **Stan Barone**, Office of Research and Development, National Center for Environmental Research, EPA
  Speakers: **Marie Lynn Miranda**, Associate Professor, Environmental Sciences and Policy, Duke University
  Debbie Lowe Liang, Region 9, EPA
  Rachel Morello-Frosch, Associate Professor, Environmental Science, Policy and Management, University of California, Berkeley
  Matthew Small, Region 9, EPA
  Zachary Pekar, Office of Air and Radiation, EPA

- Incorporating and Addressing Environmental Justice/Disproportionate Impacts in EPA's Decision-Making Process Using an Economic Analysis Framework (Room 152B)
  Purpose: The panel provides an overview of the use of economic analysis in EPA's rule-making analysis, as well as a discussion of how economists approach the analysis of disproportionate impacts. The session begins with an overview of the traditional tools for benefit-cost analysis and analyzing *efficiency*. Then, the session also will discuss how economists consider *equity* followed by a case-study analysis from a recent regulation. The panel concludes with alternative methods for analyzing distributional considerations in benefits analysis.

  Session Chair/Speaker: **Kelly B. Maguire**, Economist, National Center for Environmental Economics, EPA
  Speakers: **Charles Griffiths**, Senior Economist, National Center for Environmental Economics, EPA
  Maureen Cropper, Professor of Economics, University of Maryland
  Jonathan Levy, Mark and Catherine Winkler Associate Professor of Environmental Health and Risk Assessment, Harvard School of Public Health
  Erica Sasser, Office of Air Quality, Planning, and Standards, EPA
  Henry Roman, Industrial Economics

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March 18, 2010 (continued)

3:15 – 5:00 p.m. **Concurrent Breakout Sessions (continued)**

- Late Breaking Policy Analysis and Program Evaluation Session (Room 151AB)

  Session Chairs: **Keeve E. Nachman**, Director, Farming for the Future Program, Bloomberg School of Public Health, Johns Hopkins Center for a Livable Future
  Felicia Eaves, Special Projects Coordinator, Joint Center for Political and Economic Studies

  Speakers: **Richard D. Schulterbrandt Gragg III**, Associate Professor/Associate Director, Environmental Sciences Institute, Director, Center for Environmental Equity and Justice (CEEJ), Florida A&M University
  Leah R. Williams, Department of Health Promotion, Education, and Behavior, Norman J. Arnold School of Public Health, University of South Carolina
  Heather Tanana, Quinney College of Law, University of Utah
  Martha Keating, Children's Environmental Health Initiative, Duke University
  Katie Lundquist, Department of Civil Engineering, University of Minnesota

5:00 – 7:00 p.m. **Screening of the Documentary *Unnatural Causes* and Reception (Room 151AB)**
Sponsored by the Joint Center for Political and Economic Studies supported by a generous grant from the W.K. Kellogg Foundation

7:00 p.m. **Adjournment – Day 2**

March 19, 2010

8:00 – 8:15 a.m. **Remarks by Michelle DePass, Assistant Administrator, Office of International Affairs, EPA (Room 151AB)**

Review of Day 2 (Room 151AB)

Master of Ceremonies: **Brian Smedley**, Vice President and Director, Health Policy Institute, Joint Center for Political and Economic Studies

8:15 – 9:30 a.m. **Plenary 3: Research and Data Needs for Assessing and Addressing Disproportionate Environmental Health Impacts Among Minority and Disadvantaged Populations (Room 151AB)**

Session Panel Moderator: **Sherry Baron**, Coordinator for Priority Populations and Health Disparities, National Institute for Occupational Safety and Health, CDC

Speakers: **Gwen W. Collman**, Interim Director, Division of Extramural Research and Training, National Institute of Environmental Health Sciences, NIH
Jennifer D. Parker, Office of Analysis and Epidemiology, National Center for Health Statistics, CDC
Steve Wing, Associate Professor, Epidemiology, Gillings School of Global Public Health, University of North Carolina School of Public Health
Ana V. Diez-Roux, Professor, Epidemiology, School of Public Health, University of Michigan, and Director, Center for Integrative Approaches to Health Disparities
Gail C. Christopher, Vice President, W.K. Kellogg Foundation

9:30 – 10:00 a.m. **Break**

March 19, 2010 (continued)

10:00 – 11:30 a.m. **Plenary 4: Incorporating the Concept of Disproportionate Environmental Health Impacts in "Regulatory Development" at EPA: Analytical Challenges and Opportunities (Room 151AB)**

Session Panel Moderator: **Amy D. Kyle**, School of Public Health, University of California, Berkeley

Speakers:
Sam Harper, Assistant Professor, Department of Epidemiology, Biostatistics and Occupational Health, McGill University
Jonathan Levy, Mark and Catherine Winkler Associate Professor of Environmental Health and Risk Assessment, Harvard School of Public Health
Alex Scott-Samuel, Director, IMPACT - International Health Impact Assessment Consortium, University of Liverpool
Zachary Pekar, Office of Air and Radiation, EPA

11:30 – 12:30 p.m. **Plenary 5: Next Steps and Future Needs to Inform Policy Directions and Research (Room 151AB)**

Master of Ceremonies: **Brian Smedley**, Vice President and Director, Health Policy Institute, Joint Center for Political and Economic Studies

Speakers:
Lisa Garcia, Senior Advisor to the EPA Administrator for Environmental Justice, U.S. Environmental Protection Agency (EPA)**,**
Kevin Teichman, Deputy Assistant Administrator for Science, Office of Research and Development, EPA
Lisa Heinzerling, Associate Administrator, Office of Policy, Economics, and Innovation, EPA
Cynthia Giles, Assistant Administrator, Office of Enforcement and Compliance Assurance, EPA
Mathy Stanislaus, Assistant Administrator, Office of Solid Waste and Emergency Response, EPA
Peter Grevatt, Director, Office of Children's Health Protection and Environmental Education

12:30 p.m. **Adjournment**

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Symposium Structure and Themes

The Symposium is organized by three themes:

Theme #1: Understanding contributors to disproportionate environmental health impacts to facilitate their consideration in decision making
Multiple aspects of where we live, learn, work, and play can contribute to disproportionate environmental and health impacts. These aspects can include biological, chemical, physical, social, and cultural dimensions as well as others. Several sessions at the Symposium will focus on commissioned technical papers and poster discussion sessions to examine factors that may result in disproportionate environmental health impacts among minority and low-income populations. These factors include, but are not limited to:

1. Proximity to environmental hazards;
2. Susceptibility/vulnerability;
3. Unique exposure pathways;
4. Multiple and cumulative environmental burdens;
5. Community capacity to participate in the decision-making process;
6. Physical infrastructure; and
7. Chronic exposure to stress and the implications for health outcomes related to exposure to environmental hazards.

Theme #2: Informing policy and decision making to protect environmental health
EPA works to achieve its mission to protect human health and the environment through a variety of actions and decisions. Examples include regulatory activities (e.g., standard setting, permitting, enforcement, information/data collection, site clean-up). Other actions include programmatic activities, policy-making, scientific research, outreach, and education. For the most part, the Symposium will focus on addressing disproportionate environmental health impacts within the regulatory decision-making context.

EPA typically applies a variety of analytical approaches such as human health risk analysis, technology feasibility studies, and cost-benefit analysis, which provide the necessary inputs (e.g., health effects, costs and benefits estimates) to support regulatory decision making. A number of sessions at the Symposium will explore existing legal, decision, and analytical frameworks, including those used by EPA, to identify opportunities to incorporate consideration of environmental justice in environmental regulatory decision making.

Theme #3: Informing research to advance policy
Research and data are necessary to make effective decisions and policies. Research can help identify contributing factors to disproportionate environmental health impacts for minority and low-income populations, and also highlight opportunities to address these disparities. Research also is important in validating conceptual models and developing analytical methods for assessing and addressing disproportionate environmental health impacts. Data gaps and research needs are a common thread through several sessions at the Symposium. Three sessions in particular provide ample opportunity for focused discussions about the types of data and research that are needed to facilitate the incorporation of environmental justice considerations in decision making.

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Symposium Sessions That Relate to **Theme #1: Understanding contributors to disproportionate environmental health impacts to facilitate their consideration in decision making**

March 17, 2010

1:00 – 2:30 p.m. **Concurrent Breakout Sessions**

- State-of-the-Science Commissioned Paper Panel: Proximity (Room 150A)
  Purpose: To explore and define how proximity to environmental health hazards and their sources contributes to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision-making process.

  Session Chair/Speaker: **Juliana Maantay**, Professor, Department of Environmental, Geographic and Geological Sciences, Lehman College, The City University of New York
  Speakers: **Jayajit Chakraborty**, Associate Professor, Department of Geography, University of South Florida
  Jean Brender, Associate Dean for Research and Professor, Department of Epidemiology and Biostatistics, Texas A&M University
  Discussants: **Roger Kim,** Executive Director, Asian Pacific Environmental Network
  Peter Langlois, Senior Epidemiologist, Texas Department of State Health Services

- State-of-the-Science Commissioned Paper Panel: Multiple and Cumulative Impacts/Effects (Room 150B)
  Purpose: To explore the contribution of exposure to multiple and cumulative environmental stressors to adverse environmental and health impacts, and also to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision-making process.

  Session Chair/Speaker: **Stephen H. Linder**, School of Public Health, University of Texas
  Speakers: **Amy D. Kyle**, Associate Professor, Environmental Health Sciences, School of Public Health, University of California, Berkeley
  Gary Ginsberg, Toxicologist, Division of Environmental Epidemiology and Occupational Health, Connecticut Department of Public Health
  Discussants: **James Ransom**, Chief, St. Regis Mohawk Tribal Council
  Rita Schoeny, Office of Science and Technology, Office of Water, EPA

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1:00 – 2:30 p.m. **Concurrent Breakout Sessions (continued)**

- State-of-the-Science Commissioned Paper Panel: Susceptibility and Vulnerability (Room 152A)
  Purpose: To explore the relationship between vulnerability/susceptibility factors (including social factors) and disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations. In particular, summarize how vulnerability modifies the relationship between environmental agents and health impacts and discuss opportunities to incorporate this information quantitatively into environmental risk assessment and the policy decision-making process.

Session Chair/Speaker:	**Joel Schwartz**, Professor of Environmental Epidemiology, Harvard School of Public Health
Speakers:	**David Bellinger**, Professor, Department of Environmental Health, Harvard University and Senior Research Associate in Neurology, Children's Hospital, Boston
	Thomas A. Glass, Associate Professor, Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health and Faculty Associate, Johns Hopkins Population Center
Discussants:	**Wilma Subra,** Subra Company, Louisiana
	Sally Darney, National Program Director for Human Health, EPA

- State-of-the-Science Commissioned Paper Panel: Unique Exposures (Room 152B)
  Purpose: To elucidate how unique exposure pathways contribute to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision- making process.

Session Chair/Speaker:	**Joanna Burger**, Division of Life Sciences, Rutgers University
Speakers:	**Michael Gochfeld**, Environmental and Occupational Medicine, University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, Rutgers University
	Daniel Kass, Acting Deputy Commissioner, Environmental Health, New York City Department of Health and Mental Hygiene
Discussants:	**Earl Hatley,** Local Environmental Action Demanded, Oklahoma
	Michael S. Metzger, Chief, Risk Assessment Branch, Health Effects Division, Office of Pesticide Programs, EPA

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March 17, 2010 (continued)

3:00 – 5:00 p.m.

Concurrent Data and Methodology Sessions

3:00 – 3:40 p.m. Poster Review

3:40 – 5:00 p.m. Presentation and Discussion—Participants discuss the posters as a panel; focus is on methods, data sources, and results as related to methods.

- Data and Methodology Needs: Proximity (Poster Discussion Format) (Room 150A)

  Purpose: The purpose of this session is to explore methodological approaches used in proximity analysis, environmental and health effects studies using such approaches as the development and application of novel proximity measures, and the application of proximity analysis in environmental policy decision making.

  Session Co-Chairs:
  Brad Schultz, Chief, Exposure Modeling Research Branch, National Exposure Research Laboratory, EPA
  Robin Saha, Associate Professor, Environmental Health, Justice and Policy, University of Montana

  Poster Presenters:
  Troy Abel, Assistant Professor of Environmental Policy, Department of Environmental Studies, Western Washington University
  Mark Corrales, Regulatory Policy Analyst, Office of Policy, Economics, and Innovation, Office of the Administrator, EPA
  Mary Collins, Bren School of Environmental Sciences and Management, University of California, Santa Barbara
  Angela Gilbert, University of South Florida
  William McDonnell, Assistant Professor of Pediatrics, Adjunct Professor of Law, Department of Pediatrics, University of Utah and Director, Center for Children's Environmental Health Law and Policy
  Arlene Rosenbaum, Technical Director, ICF International

- Data and Methodology Needs: Multiple and Cumulative Impacts/Effects (Poster Discussion Format) (Room 152AB)

  Purpose: The purpose of this session is to explore data needs and methodological approaches for assessing cumulative impacts/burdens/exposures/risks among minority, low-income, tribal, and other population groups. This session also explores the development and application of novel cumulative impact measures, and the application of information on cumulative impact/risk analysis in environmental/environmental health policy decision making.

  Session Co-Chairs:
  Russ Lopez, Senior Research Associate, Kitty and Michael Dukakis Center for Urban and Regional Policy, Northeastern University
  Irene Dankwa-Mullan, Acting Director, Office of Innovation and Program Coordination, National Center on Minority Health and Health Disparities, National Institutes of Health (NIH)

  Poster Presenters:
  Daniel Axelrad, Office of the Administrator, Office of Policy, Economics, and Innovation, EPA
  Patricia Murphy, ROE Health Coordinator, National Center for Environmental Assessment, EPA
  Hilton Kelley, National Environmental Justice Advisory Council/Member/Community In-Power and Development Association Inc.
  John Prochaska, Center to Eliminate Health Disparities, University of Texas Medical Branch – Galveston

3:00 – 5:00 p.m.

Concurrent Data and Methodology Sessions (continued)

- Data and Methodology Needs: Multiple and Cumulative Impacts/Effects (Poster Discussion Format) (Room 152AB) (continued)

  Danelle Lobdell, Chief (Acting), Epidemiology Branch, National Health and Environmental Effects Research Laboratory, EPA
  Sarah Sharpe, Environmental Health Director/Coordinator, Fresno Metro Ministry/San Joaquin Valley Cumulative Health Impact Project

- Data and Methodology Needs: Susceptibility and Vulnerability (Poster Discussion Format) (Room 150B)
  Purpose: The purpose of this session is to explore methodological and data needs for incorporating vulnerability considerations into decision-making frameworks such as risk assessment, health impact assessment, etc. Specifically, this session includes an overview of data and methods for identifying vulnerable/susceptible populations.

  Session Co-Chairs:
  Maureen O'Neill, Children's Health Coordinator, Region 2, EPA
  Terry Wesley, Environmental Justice Coordinator, Region 2, EPA

  Poster Presenters:
  Jane Clougherty, Senior Air Quality Scientist, New York City Department of Health and Mental Hygiene and Research Associate, Department of Environmental Health, Harvard School of Public Health
  Tamara Saltman, Policy Analyst, Office of Air Quality, Planning and Standards, EPA
  Sacoby Wilson, Research Assistant Professor, Institute for Families in Societies, University of South Carolina
  Sue M. Moodie, Department of Environmental Health, Johns Hopkins School of Public Health
  Keeve Nachman, Director, Farming for the Future Program, Bloomberg School of Public Health, Johns Hopkins Center for a Livable Future

- Data and Methodology Needs: Unique Exposures (Poster Discussion Format) (152B)
  Purpose: Some individuals, communities, and population groups may experience unique environmental exposures due to socioeconomic status, occupation, geographic location, life stage, or cultural practices. In this session, presenters will highlight data sources, methods, approaches, frameworks, and analytical tools for incorporating information on uniquely exposed populations in environmental/environmental health policy and regulatory decision making.

  Session Co-Chairs:
  Roseanne Lorenzana, Science Liaison, Region 10, EPA
  Max Weintraub, Lead-Based Paint Enforcement Coordinator, Region 9, EPA

  Poster Presenters:
  Christine Chaisson, Director, The LifeLine Group
  Roseanne Lorenzana, Science Liaison, Region 10, EPA
  David Richardson, University of North Carolina at Chapel Hill
  Vi Waghiyi, Environmental Health and Justice Program Director, Alaska Community Action on Toxics

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10:30 – 12:00 p.m. **Concurrent Breakout Sessions**

- State-of-the-Science Commissioned Paper Panel: Psychosocial Stress (Room 150A)
  Purpose: To explore how psychosocial stress contributes to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision-making process.

Session Chair/Speaker:	**Pamela Tucker**, Division of Toxicology and Environmental Medicine, Agency for Toxic Substances and Disease Registry, CDC
Speakers:	**Bruce McEwen**, Professor and Head of the Harold and Milliken Hatch Laboratory of Neuroendocrinology, Rockefeller University **Charlton Coles**, Agency for Toxic Substances and Disease Registry, CDC **Steven Couch**, Agency for Toxic Substances and Disease Registry, CDC **Deborah Cory-Slechta**, Professor, Department of Environmental Medicine, University of Rochester School of Medicine and Dentistry
Discussants:	**Mark Mitchell**, President, Connecticut Coalition for Environmental Justice **Jane Clougherty,** Senior Air Quality Scientist, New York City Department of Health, and Mental Hygiene Research Associate, Department of Environmental Health, Harvard School of Public Health

- State-of-the-Science Commissioned Paper Panel: Physical Infrastructure (Room 150B)
  Purpose: To elucidate how physical infrastructure/built environment contributes to disparities in environmental health impacts among ethnic and racial minority and disadvantaged populations and discuss opportunities to incorporate this information into the environmental policy decision- making process.

Session Chair/Speaker:	**David Jacobs**, National Center for Healthy Housing
Speakers:	**Rajiv Bhatia**, Director, Occupational and Environmental Health, San Francisco Department of Public Health and University of California, San Francisco **Jim VanDerslice**, Associate Professor and Associate Division Chief, Division of Public Health, Department of Family and Preventive Medicine, University of Utah
Discussants:	**Laurel Firestone,** Community Water Center, Visalia, CA **Corine Li**, Manager, Drinking Water Office, Region 9, EPA

10:30 – 12:00 p.m. **Concurrent Breakout Sessions**

- State-of-the-Science Commissioned Paper Panel: Community Capacity To Participate in Environmental Decision Making (Room 152A)
  Purpose: To explore the relationship between community capacity to participate in the public policy decision-making process and disproportionate environmental health impact among ethnic and racial minority and disadvantaged populations and how this information can be incorporated into the environmental policy decision-making process.

  Session Chair/Speaker: **Nicholas Freudenberg**, Distinguished Professor and Director, Department of Public Health, Hunter College of the City University of New York
  Speakers: **Barbara Israel**, Professor, Department of Health Behavior and Health Education, School of Public Health, University of Michigan
  Manuel Pastor, Professor of Geography and American Studies and Ethnicity, University of Southern California
  Discussants: **Peggy Shepard**, Executive Director, WeACT
  Suzanne Wells, Chief, Superfund Community Involvement and Program Initiatives Branch, EPA

- Investigating How Physical and Social Environments Jointly Contribute to Health Disparities: Concepts and Methods from Social Epidemiology (Room 152B)
  Purpose: To introduce and illustrate analytical methods relevant to investigating the joint contributions of physical and social environments to health disparities and discuss how these approaches can enhance our understanding of upstream factors contributing to inequities in environmental health and inform prevention strategies.

  Session Chair: **Ana V. Diez-Roux**, Professor, Epidemiology, and Director, Center for Integrative Approaches to Health Disparities, Center for Social Epidemiology and Population Health, Robert Wood Johnson Health and Society Scholars Program, and Institute for Social Research, University of Michigan School of Public Health
  Speakers: **Mahasin S. Mujahid**, Assistant Professor of Epidemiology, Martin Sisters Endowed Chair in Medical Research and Public Health, School of Public Health, University of California, Berkeley
  Basile Chaix, Faculty of Medicine, University Pierre et Marie Curie-Paris, Saint-Antoine
  Theresa L. Osypuk, Assistant Professor, Bouve College of Health Sciences, Northeastern University

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1:00 – 3:00 p.m. **Concurrent Data and Methodology Sessions and Community-Based Tools Session**

1:00 – 1:40 p.m. *Poster Review*
1:40 – 3:00 p.m. *Presentation and Discussion*—Participants discuss the posters as a panel; focus is on methods, data sources, and results as related to methods

- Data and Methodology Needs: Psychosocial Stress (Poster Discussion Format) (Room 152A)
  Purpose: The purpose of this session is to explore approaches for measuring psychosocial stress/hazards at the community and individual levels, and also methodological approaches for incorporating information on psychosocial stressors in analytical and decision frameworks (e.g., risk assessment, health impacts assessment)**.**

  Session Co-Chairs:
  Deborah Segal, Environmental Health Scientist, National Center for Environmental Assessment, EPA
  Maggie Breville, Environmental Health Scientist, National Center for Environmental Research, EPA

  Poster Presenters:
  Jessie Carr, Mailman School of Public Health, Columbia University
  Jane Clougherty, Harvard School of Public Health and New York City Department of Health
  Richard Salkowe, Department of Geography, University of South Florida
  Ami Zota, Program on Reproductive Health and Environment, University of California, San Francisco

- Data and Methodology Needs: Physical Infrastructure (Poster Discussion Format) (Room 152B)
  Purpose: The quality of physical infrastructure in a community, such as poor housing or poorly maintained public buildings (e.g., schools), is a significant factor that may contribute to making a community more vulnerable to environmental hazards. In this session, we explore the types of data and methods for incorporating information on the contributions of physical infrastructure/built environment to disproportionate impacts in regulatory analytical and decision frameworks.

  Session Co-Chairs:
  Sharon D. Beard, Industrial Hygienist/Program Administrator, Worker Education and Training Branch, National Institute of Environmental Health Sciences, NIH
  Anikah Salim, Association of Schools of Public Health Fellow, National Center for Environmental Research, EPA

  Poster Presenters:
  Gary Adamkiewicz, Research Scientist, Department of Environmental Health, Harvard School of Public Health
  Christopher Heaney, Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill
  Rhona Julien, Environmental Health Scientist, Region 1, EPA
  Gretchen Kroeger, Children's Environmental Health Initiative, Nicholas School of the Environment, Duke University
  Max Weintraub, EPA
  Sacoby Wilson, Research Assistant Professor, Institute for Families in Societies, University of South Carolina

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1:00 – 3:00 p.m. **Concurrent Data and Methodology Sessions and Community-Based Tools Session (continued)**

- Data and Methodology Needs: Community Capacity To Participate in Environmental Decision Making (Poster Discussion Format) (150B)
  Purpose: The purpose of this session is to explore approaches for enhancing community capacity in the decision-making process, and also to identify data or indicators to design better public involvement processes in decision making.

  Session Co-Chairs:
  Liam R. O'Fallon, National Institute of Environmental Health Sciences, NIH
  Yolanda Anita Sanchez, Environmental Scientist, Superfund Community Involvement and Program Initiatives Branch, EPA

  Poster Presenters:
  Diane Ballerino-Regan, Occupational Safety and Health Administration, Office of Occupational Medicine Resident/Duke University
  Steven Fischbach, Community Lawyer, Rhode Island Legal Services
  Claire Franklin, The LifeLine Group
  Myra Immings, Community Planner, Planning and Program Development, Atlanta Regional Office, Federal Transit Administration
  Don Yellowman, President, Forgotten People Community Development Corporation
  Marsha Monestersky, Program Director, Forgotten People Community Development Corporation

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Symposium Sessions That Relate to **Theme #2: Informing policy and decision making to protect environmental health**

March 18, 2010

3:15 – 5:00 p.m.

Concurrent Breakout Sessions

- Legal Authorities for Incorporating Environmental Justice/Disproportionate Impacts Considerations Into EPA's Decision Making (Room 150A)

  Purpose: Given the importance of the law in achieving environmental justice, this panel will explore the application of legal authorities to address disproportionate health and environmental impacts in EPA's regulatory decision-making process. Opportunities for considering disproportionate impacts in the context of rulemaking, permitting, enforcement, and state compliance will be discussed. Further, emerging non-regulatory approaches will be explored as vehicles for addressing disproportionate burdens of environmental exposures, vulnerabilities, and health impacts.

  Session Chair: **Suzi Ruhl**, Senior Policy Advisor, Office of Environmental Justice, EPA

  Speakers: **Vernice Miller-Travis,** Vice Chair, Maryland State Commission on Environmental Justice and Sustainable Communities
  Sheila Foster, Albert A. Walsh Professor of Law, Fordham University School of Law, NY
  Carol Ann Siciliano, Associate General Counsel, Office of General Counsel, EPA
  Dean Suagee, Hobbs, Straus, Dean & Walker, LLP
  Nicholas Targ, Partner, Holland & Knight, LLP
  Kenneth J. Warren, Hangley Aronchick Segal & Pudlin
  Patrice L. Simms, Deputy Assistant Attorney General, Environment and Natural Resources Division, U.S. Department of Justice

- Analytical Frameworks for Assessing and Addressing Environmental Health Impacts To Inform Decision Making (Room 150B)

  Purpose: Presenters will provide an overview of decision-making frameworks, such as Health Impact Assessment, Global Burden of Disease, and Health Equity Screens, that explicitly allow for meaningful participation and consideration of multiple risk factors. Examples of applications of these frameworks in decision making will be discussed and also how they have been used to address issues of equity.

  Session Chair/Speaker: **Rajiv Bhatia**, Director, Occupational and Environmental Health, San Francisco Department of Public Health

  Speakers**:** **Jonathan Heller**, Director and Co-Founder, Health Impact Partners
  Ngozi T. Oleru, Director, Environmental Public Health Division, Public Health Seattle/King County
  Aaron J. Cohen, Principal Scientist, Health Effects Institute

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3:15 – 5:00 p.m. **Concurrent Breakout Sessions (continued)**

- Incorporating and Addressing Environmental Justice/Disproportionate Impacts in EPA's Decision-Making Process Using a Risk Assessment Framework (Room 152A)

  Purpose: Risk assessment is EPA's primary science-based framework for decision making. Risk assessment informs decision making at EPA in multiple ways, including prioritization of decisions, rules/standard setting, cleanup of sites, permitting, enforcement, other policy decisions, and program planning. This session includes examples of how environmental justice concerns or disproportionate environmental health impacts/risks have been addressed or incorporated in risk assessment approaches

  Session Chair: **Stan Barone**, Office of Research and Development, National Center for Environmental Research, EPA
  Speakers: **Marie Lynn Miranda**, Associate Professor, Environmental Sciences and Policy, Duke University
  Debbie Lowe Liang, Region 9, EPA
  Rachel Morello-Frosch, Associate Professor, Environmental Science, Policy and Management, University of California, Berkeley
  Matthew Small, Region 9, EPA
  Zachary Pekar, Office of Air and Radiation, EPA

- Incorporating and Addressing Environmental Justice/Disproportionate Impacts in EPA's Decision-Making Process Using an Economic Analysis Framework (Room 152B)

  Purpose: The panel provides an overview of the use of economic analysis in EPA's rule-making analysis, as well as a discussion of how economists approach the analysis of disproportionate impacts. The session begins with an overview of the traditional tools for benefit-cost analysis and analyzing *efficiency*. Then, the session also will discuss how economists consider *equity* followed by a case-study analysis from a recent regulation. The panel concludes with alternative methods for analyzing distributional considerations in benefits analysis.

  Session Chair/Speaker: **Kelly B. Maguire**, Economist, National Center for Environmental Economics, EPA
  Speakers: **Charles Griffiths**, Senior Economist, National Center for Environmental Economics, EPA
  Maureen Cropper, Professor of Economics, University of Maryland
  Jonathan Levy, Mark and Catherine Winkler Associate Professor of Environmental Health and Risk Assessment, Harvard School of Public Health
  Erica Sasser, Office of Air Quality, Planning, and Standards, EPA
  Henry Roman, Industrial Economics

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3:15 – 5:00 p.m. **Concurrent Breakout Sessions (continued)**

- Late Breaking Policy Analysis and Program Evaluation Session (Room 151AB)
  Session Chairs: **Keeve E. Nachman**, Director, Farming for the Future Program, Bloomberg School of Public Health, Johns Hopkins Center for a Livable Future
  Felicia Eaves, Special Projects Coordinator, Joint Center for Political and Economic Studies
  Speakers: **Richard D. Schulterbrandt Gragg III**, Associate Professor/Associate Director, Environmental Sciences Institute, Director, Center for Environmental Equity and Justice (CEEJ), Florida A&M University
  Leah R. Williams, Department of Health Promotion, Education, and Behavior, Norman J. Arnold School of Public Health, University of South Carolina
  Heather Tanana, Quinney College of Law, University of Utah
  Martha Keating, Children's Environmental Health Initiative, Duke University
  Katie Lundquist, Department of Civil Engineering, University of Minnesota

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Symposium Sessions That Relate to **Theme #3: Informing research to advance policy**

March 18, 2010

8:45 – 10:15 a.m. **Plenary 2: Health Disparities and the Environment (Room 151AB)**

Session Panel Moderator: **Harold Zenick**, Director, National Health and Environmental Effects Research Laboratory, EPA

Panel Speakers:
The Honorable Donna M. Christensen, United States Virgin Islands Delegate to Congress
Paula Braveman, Professor, Department of Family and Community Medicine, School of Medicine, and Director, Center on Social Disparities in Health, University of California, San Francisco
Rachel Morello-Frosch, Associate Professor, Department of Environmental Science, Policy and Management, College of Natural Resources, and School of Public Health, University of California, Berkeley
Howard Frumkin, Special Assistant to the Director for Climate Change and Health, Centers for Disease Control and Prevention (CDC)
John Ruffin, Director, National Center on Minority Health and Health Disparities, NIH

10:30 – 12:00 p.m. **Concurrent Breakout Sessions**

- Investigating How Physical and Social Environments Jointly Contribute to Health Disparities: Concepts and Methods from Social Epidemiology (Room 152B)
  Purpose: To introduce and illustrate analytical methods relevant to investigating the joint contributions of physical and social environments to health disparities and discuss how these approaches can enhance our understanding of upstream factors contributing to inequities in environmental health and inform prevention strategies.

  Session Chair: **Ana V. Diez-Roux**, Professor, Epidemiology, and Director, Center for Integrative Approaches to Health Disparities, Center for Social Epidemiology and Population Health, Robert Wood Johnson Health and Society Scholars Program, and Institute for Social Research, University of Michigan School of Public Health

  Speakers:
  Mahasin S. Mujahid, Assistant Professor of Epidemiology, Martin Sisters Endowed Chair in Medical Research and Public Health, School of Public Health, University of California, Berkeley
  Basile Chaix, Faculty of Medicine, University Pierre et Marie Curie-Paris, Saint-Antoine
  Theresa L. Osypuk, Assistant Professor, Bouve College of Health Sciences, Northeastern University

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March 19, 2010

8:15 – 9:30 a.m.

Plenary 3: Research and Data Needs for Assessing and Addressing Disproportionate Environmental Health Impacts Among Minority and Disadvantaged Populations (Room 151AB)

Session Panel Moderator: **Sherry Baron**, Coordinator for Priority Populations and Health Disparities, National Institute for Occupational Safety and Health, CDC

Speakers:
Gwen W. Collman, Interim Director, Division of Extramural Research and Training, National Institute of Environmental Health Sciences, NIH
Jennifer D. Parker, Office of Analysis and Epidemiology, National Center for Health Statistics, CDC
Steve Wing, Associate Professor, Epidemiology, Gillings School of Global Public Health, University of North Carolina School of Public Health
Ana V. Diez-Roux, Professor, Epidemiology, School of Public Health, University of Michigan, and Director, Center for Integrative Approaches to Health Disparities
Gail C. Christopher, Vice President, W.K. Kellogg Foundation

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Symposium Background and Overview

The U.S. Environmental Protection Agency's (EPA) Administrator, Lisa Jackson, has made the inclusion of environmental justice (EJ) principles in all EPA actions a priority. This technical Symposium will serve as a platform to stimulate innovative, bold thinking and foster discussions about critical topics and approaches to achieve this goal.

EPA's mission to protect human health and the environment embodies shared objectives with other sectors, including organizations at the local, regional, national, and international levels. EPA works to achieve its mission to protect human health and the environment through a variety of actions and decisions. Examples include regulatory activities (e.g., standard setting, permitting, enforcement, information/data collection, site cleanup). Other actions include programmatic activities, policy making, scientific research, outreach, and education. Executive Order 12898, issued by President Clinton in 1994, requires EPA (and other federal agencies) to "identify disproportionately high and adverse human health or environmental effects on minority and low-income populations that may result from their programs, policies, and activities, and take action to address such disparities." EPA's mission supports the goals of identifying, analyzing, and generating evidence-based and sound information to address disadvantages and disparate impacts among specific groups within the U.S. population regarding their health and the environment. However, a more systematic and consistent approach is desired.

Multiple aspects of the physical environment in which we live, learn, work, and play can put certain groups of people "at higher risk." Also, individuals and groups may experience disadvantages related to their gender, lifestage, socioeconomic status, race, ethnicity, disability, education, and other aspects of their diverse backgrounds. This complex interaction between the physical environment and other conditions of social disadvantage contributes to known social disparities in environmental health outcomes.

The EPA Office of Environmental Justice published a white paper in 2007 that describes "factors or conditions that EPA staff may look for when seeking to incorporate environmental justice considerations in a particular regulatory decision." These factors are prevalent among minority and low-income populations and also are associated with environmental health impacts or disparities in environmental health impacts. Therefore, these factors may help EPA staff identify conditions in which minority and/or low-income communities may be exposed disproportionately to environmental harms and risks. These factors are:

1. Proximity to what can be considered "environmental hazards" or, more specifically, risks, threats, or hazards to health and the environment;
2. Susceptibilities and vulnerabilities;
3. Pathways of exposure to environmental pollutants that are unique;
4. Multiple and cumulative pollutant exposures/health impacts that may create disadvantages to specific individuals and groups;
5. Community capacity to participate in the EPA decision-making process;
6. Physical infrastructure; and
7. Chronic exposure to stress and the implications for health outcomes related to exposure to environmental hazards.

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Disproportionate environmental health impacts/burdens in populations may result from one or more of the above factors or other factors/conditions not stated. For the purposes of this Symposium, the term "impact" refers broadly to consequences on human health and the environment that may be described by both qualitative and quantitative measures along the "environmental health continuum," from source of hazards or presence of hazard to exposure to health effect. The concept of disproportionate environmental health impacts and burdens refers to the finding that some populations systematically experience higher levels of exposure to environmental hazards, with related health risks, health impacts, and reduced quality of the physical environment, than the general population. This perspective recognizes that multiple factors, including social, psychosocial, economic, physical, chemical, and biological determinants, may contribute to disproportionate human health or environmental impacts. Therefore, population-level disparities in these burdens and health impacts may be attributable to one or more combinations of inequities related to harmful exposures or differentials in the ability to withstand or mitigate harms.

About the Symposium

At this Symposium, EPA aims to stimulate innovative, bold thinking and foster discussions on incorporating EJ considerations into EPA decision making and creating a baseline of understanding to inform discussions about the next steps.

Symposium participants will examine the current state-of-the-science for factors associated with environmental health disparities, determine additional factors that should be considered, discuss types of data and methods for analyzing these factors, and discuss the implications for incorporating these factors into decision making. Participants will examine the evidence on social determinants of environmental health disparities or disproportionate impacts. In addition, participants also will explore current and alternative analytical and decision frameworks to identify opportunities to incorporate consideration of EJ into environmental decision making at EPA to mitigate and prevent environmental health disparities. Data gaps and research needs are a common thread throughout the Symposium.

This Symposium is the first in a series of activities needed to advance EPA Administrator Lisa Jackson's priority to include EJ principles in all of EPA's decisions.

Objectives

The objectives of this Symposium are to:

1. **Describe the current state-of-the-science** for factors associated with environmental health disparities to help understand how to incorporate these factors into decision making, and describe evidence of the **contribution of social determinants to environmental health disparities** or disproportionate impacts.

2. **Explore a variety of frameworks, analytical tools, and methods** for assessing the environmental health impacts of environmental programs, policies, and activities on disadvantaged populations (e.g., minority and low-income populations) and identify opportunities to apply these frameworks, methods, and tools in environmental decision making.

3. **Identify short-term and long-term preliminary goals** that could serve as a blueprint for an **action agenda, including research and data needs** that are necessary to ensure that EJ concerns and social disparities in environmental health are incorporated into EPA's decisions.

Outcomes

The anticipated outcomes from this Symposium are:

1. **Publications,** including scientific papers and technical reports, from **the conversations** or presentations at this Symposium.

2. Short-term and long-term preliminary goals that could serve as a blueprint for an **action agenda, including research and data needs.**

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Symposium Planning Committee Members

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Specifically, NCER's Human Health Research Science To Achieve Results (STAR) program's competitive, peer-reviewed grants program funds an array of outstanding grantees that fill unique needs for exposures in science, epidemiologic, and community-based participatory research on environmental public health outcomes of great concern. We fund independent research on a wide variety of environmental and health issues such as children's environmental health, interpretation of biomarkers of exposures, identification of early indicators of disease resulting from exposures to environmental toxicants, development of public health outcome indicators, role of sociodemographic contextual factors and social stressors in exposures to environmental contaminants and cumulative risks, and impacts of global climate change environmental contamination on tribal communities and traditional practices. For more information, please visit: http://www.epa.gov/ncer

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EPA established the Office of Children's Health Protection (OCHP) in 1997 to support the Agency as it embraced the 1996 *National Agenda to Protect Children's Health from Environmental Threats* and the 1997 Executive Order 13045: *Protection of Children's Health from Environmental Health Risks and Safety Risks*. The mission of EPA's Children's Office is to make the health protection of children a fundamental goal of public health and environmental protection in the United States and around the world. Ensuring that our children are protected from exposure to unsafe levels of toxins and pollution or other environmental threats in their homes, schools, or anywhere else is central to EPA's work. Children face greater threats from environmental pollutants than adults because of differences in their physiology, activity patterns, and development. Not all children are the same: we

continue to see disparities in exposures and health outcomes among the poor, African American, Latino, and other ethnic minorities. For more information, please visit: http://yosemite.epa.gov/ochp/ochpweb.nsf/content/homepage.htm.

The National Health and Environmental Effects Research Laboratory

As part of EPA's Office of Research and Development (ORD), the National Health and Environmental Effects Research Laboratory (NHEERL) is the Agency's focal point for scientific research on the effects of contaminants and environmental stressors on human health and ecosystem integrity. The Laboratory's mission embraces three objectives: (1) Perform human health and ecological effects research of the highest scientific quality in support of the science needs of the Agency; (2) Demonstrate leadership in identifying, studying, and resolving important environmental health and ecological effects issues and in influencing the national environmental research agenda; and (3) Provide scientific and technical assistance to EPA Program and Regional Offices and to local, state, regional, national, and international governments and organizations. Pursuit of these objectives undergirds NHEERL's contribution to ORD being recognized as a premier environmental research organization. For more information, please visit: www.epa.gov/nheerl

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The Johns Hopkins Center for a Livable Future (CLF) is a not-for-profit organization within the Johns Hopkins Bloomberg School of Public Health. The CLF promotes research and develops and communicates information about the complex interrelationships among water, diet, food production, environment, and human health while advancing an ecological perspective in reducing threats to the health of the public. It also promotes policies that protect health, the global environment, and the ability to sustain life for future generations. Central to the mission of the CLF are both the impacts of industrial food animal production on rural and farming communities and the consequences of diminished access to safe and nutritious food among disadvantaged persons. For more information, please visit: http://www.jhsph.edu/clf

American Public Health Association

The American Public Health Association (APHA) is the oldest and most diverse organization of public health professionals in the world and has been working to improve public health since 1872. The Association aims to protect all Americans, their families, and their communities from preventable, serious health threats and strives to assure that community-based health promotion and

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disease prevention activities and preventive health services are universally accessible in the United States. APHA represents a broad array of health professionals and others who care about their own health and the health of their communities. More information is available at www.apha.org.

National Institute for Occupational Safety and Health

The National Institute for Occupational Safety and Health (NIOSH) is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH's mission is to generate new knowledge in the field of occupational safety and health and to transfer that knowledge into practice for the betterment of workers. To accomplish this mission, NIOSH conducts scientific research, develops guidance and authoritative recommendations, disseminates information, and responds to requests for workplace health-hazard evaluations. NIOSH provides national and world leadership to prevent work-related illness, injury, disability, and death by gathering information, conducting scientific research, and translating the knowledge gained into products and services, including scientific information products, training videos, and recommendations for improving safety and health in the workplace. One of NIOSH's current emphases is on conducting research and developing materials to eliminate health disparities arising from disproportionate risks at the workplace for low-wage, minority, immigrant, older, younger, and other higher risk worker groups. For more information, please visit: http://www.cdc.gov/niosh.

National Center for Environmental Health

The Centers for Disease Control and Prevention's National Center for Environmental Health (NCEH) plans, directs, and coordinates a national program to maintain and improve the health of the American people by promoting a healthy environment and by preventing premature death and avoidable illness and disability caused by non-infectious, non-occupational environmental and related factors. NCEH is especially committed to safeguarding the health of populations that are particularly vulnerable to certain environmental hazards—children, the elderly, and people with disabilities. NCEH seeks to achieve its mission through science, service, and leadership. It conducts research in the laboratory and in the field to investigate the effects of the environment on health and tracks and evaluates environment-related health problems through surveillance systems. NCEH also helps domestic and international agencies and organizations prepare for and respond to natural, technologic, humanitarian, and terrorism-related environmental emergencies. On the basis of research and surveillance results, NCEH works with partners to protect human health. Interventions range from responding to emergencies, educating and training various audiences, and developing new standards and guidelines to helping formulate public policy. NCEH strives to protect health over the entire lifespan. NCEH works to promote optimal fetal, infant, and child development, including preventing birth defects and developmental disabilities, and enhance health and quality of life and prevent secondary conditions among children, adolescents, and adults with disabilities. For more information please visit: http://www.cdc.gov/nceh

Agency for Toxic Substances and Disease Registry

The Agency for Toxic Substances and Disease Registry (ATSDR), based in Atlanta, Georgia, is a federal public health agency of the U.S. Department of Health and Human Services (DHHS). ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and disease-related exposures to toxic substances. Since the discovery of contamination in New York State's Love Canal first brought the problem of hazardous wastes to national attention in the 1970s, thousands of

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hazardous sites have been identified around the country. Formally organized in 1985, ATSDR was created by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), more commonly known as the Superfund law. The Superfund program is responsible for finding and cleaning up the most dangerous hazardous waste sites in the country. EPA currently targets more than 1,200 National Priorities List (NPL) sites for cleanup. ATSDR is the lead federal public health agency responsible for determining human health effects associated with toxic exposures, preventing continued exposures, and mitigating associated human health risks at these NPL sites and others throughout the country. ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is directed by congressional mandate to perform specific functions concerning the effect on public health of hazardous substances in the environment. These functions include public health assessments of waste sites, health consultations concerning specific hazardous substances, health surveillance and registries, response to emergency releases of hazardous substances, applied research in support of public health assessments, information development and dissemination, and education and training concerning hazardous substances. For more information, please visit: http://www.atsdr.cdc.gov

The National Institute of Environmental Health Sciences

The National Institute of Environmental Health Sciences (NIEHS), located in Research Triangle Park, North Carolina, is one of 27 research institutes and centers that comprise the National Institutes of Health (NIH), DHHS. The mission of the NIEHS is to reduce the burden of human illness and disability by understanding how the environment influences the development and progression of human disease. NIEHS research focuses on diseases that have a strong environmental component and a high or increasing prevalence in the U.S. population. Using integrated teams of scientists from varied and relevant disciplines, NIEHS can address complex hypotheses by more effectively identifying environmental health hazards and coupling this information with new tools to better understand the causes of disease. This knowledge is then translated into public health initiatives and policies that can have immediate and profound impacts on people's health. For more information, please visit: http://www.niehs.nih.gov

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The mission of OMH is to improve and protect the health of racial and ethnic minority populations through the development and coordination of health policies and programs. OMH serves as the Federal lead for eliminating health disparities for racial and ethnic minorities. For more information please visit: http://minorityhealth.hhs.gov

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Environmental Justice: From the Ground Up

Diane Takvorian
Environmental Health Coalition, National City, CA

Low-income communities of color long have struggled with discriminatory land use and regulatory practices and are plagued by the all-too-familiar problems of substandard housing, overcrowded schools, a lack of social services, and poor jobs. Also typical is the preponderance of polluting industries in residential and commercial neighborhoods—thanks to mixed-use zoning, which allowed auto body and chrome plating shops, chemical supply houses, and woodworking and painting companies to locate adjacent to homes, schools, and parks—and lead contamination in the aging houses. It is not uncommon to see residential areas opened up for industrial development, houses located next to freeways and toxic polluters, and new freeway development and truck routes targeted at these communities. All of these factors diminish health, safety, and quality of life.

The question is—do our communities have the power to change these practices and revitalize our neighborhoods? How can we leverage our needs against those of corporations, developers, and decision-makers who ignore or envision the future of our communities differently?

This presentation will offer models of community empowerment, leadership development, and policy advocacy that have achieved some measure of environmental justice in the San Diego/Tijuana region, where the Environmental Health Coalition has worked for 30 years. I also will focus on the challenges and need for systemic change. A community-centric approach that recognizes the unique needs and priorities of each area, empowers community members to envision their own future, and provides them with the resources and regulations to achieve that vision is critical to achieving our goal of justice in every community.

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Proximity to Environmental Hazards: Environmental Justice and Adverse Health Outcomes

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Objectives: The goal of this paper is to explore and answer the question: "Does proximity to environmental hazards result in adverse health outcomes and account for health disparities, and if so, *how* does proximity contribute to disproportionate environmental health impacts? A substantive literature review and critique covering the salient research on these topics during the past two decades, including some earlier seminal works on the subject, was undertaken to answer this question. This paper provides an overview of the connections between proximity to hazards and environmental health justice; reviews and evaluates the range of methodological approaches that have been used to measure and assess the relationship between proximity to hazards and environmental justice; reports on the findings of numerous research studies that examine the relationship between proximity to hazards and adverse health outcomes, such as adverse pregnancy outcomes, cancer (primarily childhood cancer), cardiovascular and respiratory illnesses, end-stage renal disease, and diabetes; discusses limitations of spatial epidemiology; and offers some recommendations as to future research, improvements in methodological approaches, and data needs to achieve more definitive results for guiding policy-making, regulatory changes, and public health decisions.

Relevance: Previous research demonstrates the existence of an uneven geographic distribution of environmental health hazards, and potentially disproportionate exposure to environmental risk in the United States, resulting in racial/ethnic minority and lower income communities bearing the highest burdens which, in turn, might contribute to the health disparities that have been noted extensively by public health officials and medical researchers. That these health and quality-of-life impacts are visited disproportionately on the most vulnerable populations, those least likely to be able to combat them effectively, renders these impacts even more detrimental to the public's health, and the need for remedy even more urgent.

Summary of Findings: The majority of reviewed studies show that both race/ethnicity and socioeconomic status (SES) predicted a disproportionate spatial distribution of environmental burdens. When these two suites of variables were compared, SES variables pointed to more significant risks of exposure than race; however, race tended to be predictive of disproportion even when controlling for SES. Research on the impacts of proximity to environmental hazards on the health of residential populations shows that there are increased risks for central nervous system defects (including neural tube defects), congenital heart defects, chromosomal anomalies, low birth weight, and small-for-gestational-age for populations that live close to hazardous waste sites. Several studies also noted maternal residence near active sites with chemical emissions to be associated with fetal deaths, infant deaths, low birth weight, central nervous system defects, oral clefts, heart defects, renal dysplasia, and chromosomal anomalies. Residential proximity to pesticide applications or waste sites containing these chemicals was associated with fetal deaths, limb malformations, and neural tube defects. In several studies, women who lived near highways were more likely to have preterm births and low-birth-weight offspring. Studies also found an association between risk of childhood cancer and residential proximity to industrial facilities, highly trafficked roads, nuclear power plants, pesticide applications, and gasoline stations or automobile repair shops, although these positive associations were not consistently found. Results from the studies

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reviewed suggest that residential proximity to both stationary sources of air pollution (TRIs, NEIs, HAPs, petroleum refineries, etc.) and, with a few exceptions, heavily trafficked roads, is significantly associated with asthma hospitalizations. In addition, exposure to mobile sources of air pollution increases the occurrence of chronic respiratory symptoms by exacerbating asthma. The studies reviewed also suggest that there is a significant association between residential exposure to combined sources of air pollution and stroke mortality. Although there is some evidence linking residential proximity to hazardous waste sites and PCB toxicity, end-stage renal disease, and diabetes, the dearth of literature on these health outcomes makes definitive conclusions difficult. Only a few studies examined whether disproportionate risks of adverse health outcomes with respect to proximity to environmental hazards were present by race/ethnicity or SES, and findings of these studies tended to be inconsistent.

Recommendations: Based on our review of existing research and our analysis of the evidence for disparities by race/ethnicity and income in relation to proximity to environmental hazards, the adverse health outcomes for populations in close proximity to environmental hazards, and acknowledging the health disparities generally experienced by communities of color and lower income communities, we recommend the following: that these factors be given serious consideration in the decision-making process by governmental environmental and health agencies regarding the siting of environmentally burdensome facilities and land uses, in regulatory and enforcement efforts concerning pollution, and in the active promotion of environmental health justice and environmental health protection. We also offer several technical recommendations regarding improvements in analytical methods, data, and research emphasis to more definitively connect proximity to environmental hazards, exposure of vulnerable populations, and adverse health outcomes.

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The Importance of Rigorous Analytical Strategies for Elucidating Cumulative Risk Burdens and Disproportionate Effects

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The history of cumulative assessment of effects from exposures to harmful agents in the environment dates back at least several decades, and these assessments were notably complex and combined multiple chemical classes and modes of action with a range of plausible health effects (NRC, 2009). The legacy of these efforts can be seen in the recent Menzie et al. (2007) summary of practical approaches to cumulative assessment. Under the rubric of vulnerability, differentiation among subpopulations at risk extends beyond epidemiologic notions of susceptibility and resilience to include nonchemical stressors as important factors in how risk cumulates in community settings. Much less is known about how the effects of these stressors actually accumulate or whether some process analogous to interaction occurs. It is not surprising then that, as a 2009 NRC report notes, no cumulative risk assessment by the U.S. Environmental Protection Agency has formally employed non-chemical stressors (NRC, 2009).

What do we currently know about aggregate and cumulative health impacts, and how do we apply this knowledge to cumulative risk assessment? The peer-reviewed science tells us that there is clear and convincing scientific evidence that either simultaneous or sequential exposure to multiple environmental agents, including biological, chemical, physical, and psychosocial stressors, can, under the right circumstances, modify the toxic effects of these same agents acting alone. A diversity of biologic mechanisms that occur inside the body may alter toxicity from concurrent exposure to two or more environmental agents so that their combined adverse health effects are either greater than or less than the sum of adverse effects from each individual agent acting separately. There is also no question that people are routinely exposed during their everyday activities to a diverse and ever-changing concoction of multiple environmental stressors.

Assessment of cumulative risk from exposure to environmental mixtures is hindered in most cases by lack of information on the magnitude, duration, frequency, and timing of exposure to multiple stressors; insufficient data on whether mixture-related effects are antagonistic, synergistic, or additive at real-world exposure levels; and inadequate knowledge and understanding about interactive mechanisms of toxicity among mixture components. As complicated as it is to evaluate interactive effects of chemical mixtures, even simple ones, the degree of difficulty increases dramatically when we attempt to include non-chemical stressors in our analysis.

The models and analytical frameworks for understanding biological mechanisms are simply more developed and offer firmer guidance for empirical investigations than the frameworks currently applied to social and contextual factors that are proposed under EPA's current cumulative risk paradigm. Any given theory may be equally compatible with a wide range of empirical results; and conversely, the same data may support rival theories. In practice this means that one's commitment to a given set of theoretical assumptions, or to the selection of a particular model, cannot depend exclusively on empirical evidence. Other forms of justification and analysis are also required. Similarly, when a model or framework is deployed to make sense of empirical results, underlying concepts and assumptions should be scrutinized in judging its adequacy and appropriateness. We adopt this perspective in the subsequent comparison and assessment of approaches to cumulating non-chemical and chemical stressors.

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Although the peer-reviewed science tells us that cumulative impacts will occur from exposure to multiple stressors, and available data bases tell us that these impacts will lead to disproportionate health effects in many cases, the practice of cumulative risk assessment in communities (i.e., how to interpret the data and reach conclusions) is a nascent science. There is as yet no widely accepted single conceptual framework for community cumulative risk assessment. This leaves us currently with the situation that the framework chosen will make a difference in how data are generated and interpreted, and how conclusions from the assessment can be drawn and interpreted. This situation leaves us with the following "take home messages":

- There are at least three frameworks relevant to understanding and measuring cumulative risk.
- Each is relatively well developed and supported by empirical findings.
- They share many of the same measurement indicators, but:
- Pathways, causal ordering, inferences, and interpretations are distinctive to each.
- The researcher's chosen (or default) framework matters for how empirical results are generated and interpreted.
- The framework in use should be acknowledged explicitly and subject to some accountability criteria.
- A framework should be subject to revision and possible rejection on both empirical and conceptual grounds.
- The estimation and understanding of cumulative risk has to begin with an evaluative consideration of frameworks.

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Addressing Cumulative Impacts in Communities Through Public Policy Actions in Environmental Protection

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People experience environmental exposures in particular contexts, including communities where they live. Communities vary enormously in combinations of environmental agents present. Moreover, communities and individuals vary in their vulnerability to stressors and resilience to respond. The term "cumulative impacts" refers to consideration of multiple stressors, community and individual vulnerability, the interaction of environmental factors with other health determinants, and justice or equity concerns. In environmental protection, predominant approaches to assessing the significance of environmental contaminants for public policy action focus on single contaminants. Dose-response models that quantitatively characterize relationships between exposures or doses of environmental agents and frequency of adverse health outcomes are both the dominant technical paradigm and metaphor. The policy assumption is that individual chemicals are managed to avoid exposures that pose appreciable or significant risks. However, evidence suggests that this assumption is not always true. Consequently, it is important to consider when combined burdens from multiple stressors require other approaches. Common elements that can be assessed with regard to communities and considered in making decisions include: sources, agents, media, and people. This can be done more qualitatively when data are limited and more quantitatively when data are extensive. These elements map onto key concepts in the underlying statutory frameworks for environmental protection. This can begin to link public policy actions taken by environmental protection agencies and cumulative impacts in communities by elucidating situations in which the assumption of control of individual agents is not met or when inequalities occur and consideration of additional actions therefore is warranted.

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The Importance of Background Exposures and Disease Burden in Human Health Risk Assessment

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The examples of fine particulate matter, lead, ozone, and mercury suggest that the difficulty in identifying a population threshold is because there is a wide variety in thresholds across the population. Even low levels of exposure may trigger an adverse reaction in highly vulnerable individuals. Life stage, genetics, disease processes, and concomitant exposures likely contribute to this variability and thus are important factors in dose-response assessment. Risk assessment has yet to incorporate these host vulnerability factors except to some degree for children's cancer risk. The National Academy of Sciences Silver Book (Science and Decisions, 2009) provides a framework for analyzing how background exposures and disease processes can be driving influences on health risk. At low environmental exposures, chemicals are more likely to interact with the etiology of common diseases rather than have an independent health effect. Animal models and epidemiology studies of chemical-disease interaction are needed to understand how particular agents may increase the population's disease burden and how those with diseases are more susceptible to toxic effects. Assessment of multiple chemical exposures needs to focus on the variety of target organs that can be impacted by each chemical rather than the single endpoint focus now used. These considerations will enable risk assessment to better predict risk across the range of susceptibility in the population.

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Differential Vulnerability and Susceptibility: Expanding the Scope of Risk Assessment

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Objectives: The central paradigm for U.S. Environmental Protection Agency standard-setting is risk assessment. This paradigm has served public health well for decades. However, gaps have emerged in the fabric of this framework, causing some authors to begin to challenge certain underlying assumptions. With two goals in mind, we examine six related assumptions. First, our overall aim is to extend the risk assessment approach by examining, both conceptually and methodologically, how differential vulnerability and susceptibility across population groups can be better integrated into the risk assessment process. Second, we illustrate these issues, focusing on two specific examples: lead and air pollution.

Relevance: Addressing inequities in health risks and health outcomes will require an extension of the risk assessment paradigm. Currently, methods and approaches are available for considering differential risk and vulnerability, but have not yet found their way into widespread usage. Our proposed extension is intended to increase the precision and effectiveness of risk assessment generally, and to provide additional policy tools to help target resources to achieve greater equity in the health status of populations.

Summary of Findings: We identify and discuss six assumptions implicit in standard risk-assessment models. For convenience, we label these: (1) risk independence, (2) risk averaging, (3) risk uniformity, (4) risk non-transferability, (5) risk synchrony, and (6) risk accumulation and chaining. The literature on lead and air pollution is reviewed to illustrate how these assumptions might be modified to take account of differential risk and vulnerability. Our main finding is that differential risk and vulnerability is a critically important but neglected area within risk assessment. However, a wide range of methodological and conceptual tools now is available for addressing these gaps.

Recommendations: If continued progress is to be made in explicating these complex phenomena, future studies of toxicant exposure-risk relationships must invest the resources necessary to measure contextual and individual-level factors that might modify these relationships. In most cases we do not know which subgroups are the most vulnerable or, if we do, subgroups are defined very broadly. We advocate defining vulnerable subgroups with greater specificity. We urge investigators to gather additional data necessary to identify factors that modify vulnerability. To characterize more fully the bases of inter-individual differences in vulnerability, we recommend several methodological approaches that go beyond simple interaction terms to consider multilevel and cross-level structures. In essence, we argue for moving beyond the reliance on standard uncertainty factors and working to explicitly unpack the "black box" that represents variability in vulnerability.

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Outliers Matter in Environmental Justice: Unique Exposure Pathways and Disproportionate Exposures in Low-Income, Minority, Native American, and Other Populations

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The human health risk assessment paradigm includes consideration of individuals at the 95th or even 99th percentile of risk, but does not adequately account for those with unique exposures or pathways or those with extremely high exposures (> 99th percentile). In this paper we: (1) review exposure pathways normally examined by risk assessors in the exposure assessment phase calling attention to outliers; (2) provide a framework for identifying unique pathways; (3) identify and discuss populations with high end exposures and unique exposure pathways (such as children, Native Americans, urban poor) whose risks from combined exposures (chemical, physical, psychosocial) are likely underestimated by current risk assessment practices; and (4) examine how these contribute to health disparities. It is critical to identify and assess these exposures and pathways because they lead to poor environmental health, particularly if the burdens fall disproportionately on low-income populations, urban communities, minorities, and Native Americans. Attending to the identification of risk factors for these environmental justice communities will lead to improving risk assessment, improving public health, and decreasing environmental inequities in our health care system.

We present a conceptual model for risk assessors to consider when gathering information that could lead to unusual, unique, and excessive exposures that builds on the exposure matrix of inhalation, dermal, ingestion, and injection. We discuss unusual exposure scenarios that should be considered when conducting risk assessments for a neighborhood, community, or other population (whether defined by ethnicity, income level, or other factor). Exposure pathways for inhalation include exposure from factories, volatile household pesticides, sweat baths for American Indians, cultural uses of mercury, and volatile contaminants from showers. Dermal exposures include cosmetics or medicines, showering or swimming, and contaminants on clothes. Unusual ingestion scenarios include self-caught fish or shellfish, wildlife, or bird eggs; wild herbs, berries, and roots; high one-meal exposures; and soil ingested by children or adults. Injection includes intentional injection of plant or animal extracts, and tattoos. Some of the above are included in risk assessments, but without addressing the uncommon high exposures.

Given the matrix of exposure routes and pathways, there are several groups that are particularly vulnerable and are apt to have unusual, unique, or excessive exposures, including children, Native Americans, subsistence or game/sport fishers, rural populations (including farm workers and migrant workers), and the urban poor. Often, individuals and communities fall into several of these categories. While children, rural residents, or urban residents are not necessarily exposed to unusual or unique exposure pathways, they can be so exposed when their economic or minority status leaves them vulnerable.

We conclude that there is scientific evidence that unique exposure pathways and unusual behaviors can significantly add to the hazardous exposures for various populations. Most of these pathways fall outside the conventional methods of exposure assessment and evaluation of risk as practiced by EPA. The impact of these unusual pathways is greater in minority and low-income populations, which also experience

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multiple stressors. A concerted effort needs to be made to capture these data and translate this information into guidelines for risk assessors. Decision-makers need to be aware of what questions to ask about the exposures and risks. A conceptual model for these exposures is presented in this paper as a matrix of routes and pathways of exposure. We discuss several ways in which exposure assessment and risk assessment can be expanded to enhance protection of these outlier populations.

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Biomonitoring as a Policy Lever: A Case Study of Mercury and Pesticide Surveillance in New York City

Daniel Kass
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In 2004, New York City (NYC) conducted a population-based environmental biomonitoring study to characterize exposures to selected biomarkers and to inform the choice and conduct of public health and policy actions to reduce exposures. The survey collected and analyzed urine and blood to evaluate inorganic and organic mercury and urinary metabolites of organophosphorus and pyrethroid pesticides.

Levels of inorganic mercury among those born in the Dominican Republic were higher than others, largely attributable to the use of illegally imported mercury-containing skin-lightening creams. Total mercury was three times higher in NYC than the United States, with population differences within NYC largely explained by varying frequency of fish consumption. Pesticide exposures were similarly higher in NYC than in the United States.

Biomonitoring led NYC to actions that included the embargo of products, expanded intergovernmental oversight of mercury in fish, public and healthcare provider education campaigns, and local efforts to restrict the use and availability of pesticides. The presentation will discuss a policy framework to explain why environmental biomonitoring results appear to influence public policy readily.

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The Environment, Health, and Justice

Paula Braveman
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When most of us think of environmental health, we think about preventing or minimizing health damage from exposure to toxic substances or physically unsafe conditions. Environmental justice (EJ) has meant addressing the markedly disproportionate exposure to toxic or unsafe physical conditions experienced by poor communities, particularly poor people of color. In the past two decades, however, knowledge has accumulated indicating that a wider range of features of the contexts where people live, work, learn, and play powerfully shape a population's health overall and disparities in health by race or social class. Much is unknown, but we now understand how many features of social and physical environments, traditionally outside the purview of environmental health—for example, features affected by policies on child care, education, or income—are likely to affect health and health disparities through plausible pathways and biological mechanisms. In the United States, initiatives addressing health disparities often have focused primarily on racial disparities in medical care, with less emphasis on social class and nonmedical factors. Concern for both EJ and health disparities rests on the notion of social justice, which has a basis in ethical and human rights principles; these principles in turn direct our attention to a broader range of potential determinants of health and well-being than typically have been considered within mainstream environmental health or health disparities initiatives. This presentation will discuss links and distinctions between environmental health, EJ, health, and health disparities, and the need for broader and more interrelated concepts of each.

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Moving Upstream To Advance Environmental Justice: Examining Cumulative Impacts and Political Economy of Place

Rachel Morello-Frosch
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There has been a surge of scientific inquiry into disparities in environmental hazards among diverse communities in the United States. Much of the evidence points to a general pattern of disproportionate exposures to toxics among communities of color and the poor, with racial differences often persisting across economic strata. Although results have implications for environmental decision-making, most of these analyses are limited to illustrating how inequities in hazard exposures are spread across the landscape, while shedding little light on their origins, the reasons for their persistence, and the cumulative impacts of environmental and non-environmental stressors. Examining how political economy of place shapes distributions of people, pollution, and associated health implications is important to address the fundamental causes of environmental health inequalities. A multidisciplinary approach to theorizing the dynamic of environmental discrimination and a synthesis of the science on the cumulative impacts of multiple environmental and social stressors can provide a new framework for future policy-making and community engagement to achieve environmental justice.

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Health Disparities and the Environment

Howard Frumkin
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Health disparities exist with respect to many environmental exposures—both dangerous exposures such as toxic chemicals, polluted air, and neighborhood incivilities, and healthy exposures such as parks, public transit, and healthy food choices. Moreover, disproportionate environmental exposures rarely occur in isolation; they coexist with social, economic, and biomedical burdens. The Public Health approach to these disparities relies on several core functions of public health, including data collection and surveillance, analysis of exposure pathways, identification of vulnerable populations, empowering communities, communication, and protective policies. This discussion will introduce each public health function and provide examples from the work of the National Center for Environmental Health and the Agency for Toxic Substances and Disease Registry.

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The Science of Disproportionate Environmental Health Impacts and Health Disparities Research

John Ruffin
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What level of enhanced social, economic, and physical environment factors is required to narrow the health disparity gap within populations and communities? What tools are needed to identify and measure effective interventions to mitigate the disproportionate biological and non-biological determinants that contribute to disproportionately high and adverse human health or environmental impacts? How much disease burden can be prevented through healthier environments? What are the implications for health disparities research? These questions lie at the heart of our national and global efforts to address the root causes of health disparities through improved research—using the full range of science advances, policies, interventions, and technologies in our store of knowledge.

Many health disparities research studies traditionally have examined the aggregate disease burden or risk of death, disease, or disability attributed to factors such as race and ethnicity, geography (e.g., rural versus urban), and economics (e.g., poverty and low socioeconomic status). The work of social, behavioral, and environmental researchers has provided new perspectives to the health disparities field, emphasizing the need for translational and transdisciplinary approaches. This presentation examines these issues and implications for strengthening environmental justice research. We describe the evolving knowledge about social, economic, and physical environment-health interactions and how this can be used to inform policy interventions. We provide promising practices, such as translational collaborative approaches and community-based participatory research approaches, that can support the design of effective public health strategies to reduce corresponding disproportionate environmental health impacts.

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Community Stress and Psychosocial Hazards

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Exposure to hazardous materials often is the highest in locations occupied by people of lower income and education, and usually members of minority groups. Because of factors in these neighborhoods such as crowding, poor quality housing, inadequate access to healthy food and recreational opportunities, family turmoil, and violence, there is considerable ongoing stress in such communities. These factors collectively have adverse effects on health; and there is growing evidence that they interact with exposure to toxic elements in the environment, such as air pollution, to worsen health outcomes. During the last 40 years, there has been quite a bit of research documenting the existence of excess levels of psychosocial stress in communities affected by chronic contamination by toxic waste. The toxicological literature documents the effects of controlled laboratory stress on animals exposed to toxic substances, i.e., that stress can cause shifts in dose-response curves for some substances for some stressors.

From a neurobiological viewpoint, the most important points are: (a) There is a response network for stress—the network of allostasis—that responds to psychological stressors, generated through the brain, the central organ of stress and adaptation; (b) this network—or at least parts of it—respond to toxic agents, e.g., air pollution leads to inflammation which, in turn, activates cortisol responses; (c) the imbalances in the network due to chronic psychological stress and lifestyle (e.g., poor sleep, excess calories and obesity/diabetes, alcohol) cause the network to respond differently to those toxic agents, and evidence so far indicates that there is synergy and enhancement of, for example, the inflammatory response and further imbalance in the network; and (d) imbalance in the network leads, over time, to allostatic load/overload, which accelerates disease processes. The above points lead to the general conclusion that one cannot study toxic agents in a vacuum without considering the psychological stressors and their impact on the body physiology through families and neighborhoods and interpersonal conflicts.

Other conclusions include:

Current risk assessment does not take into account the effects of psychosocial stress in addition to the toxic exposures in the Superfund or any other communities that the U.S. Environmental Protection Agency serves. Too often, there has been an "either-or" mentality regarding the causation of disease related to low-level environmental contamination. Many community members and scientists even felt that stress was a red herring designed to denigrate their very real health complaints thought to be due solely to toxic exposure.

Psychosocial stress itself has not been widely recognized as a risk factor for adverse health outcomes until research on the underlying causes of the current epidemic of heart disease in our society showed stress to be a potent and under-recognized risk factor.

The role of psychosocial stress in disease causation needs to be more fully elucidated because it is a potentially modifiable factor in the toxin-disease chain. Most of the prevention strategies at contaminated sites concentrate on practical engineering solutions designed to reduce or eliminate exposures. Obviously, where possible, this always should remain the primary strategy. But, in communities with known past exposures or hard-to-prevent ongoing exposures, other preventative measures such as community health

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education and measures designed to reduce community discord and shore up resilience also may prove useful and ameliorative to health.

For Agency personnel charged with ameliorating toxic contamination, it is critically important to be aware that the problems confronting contaminated communities are related not only to technical clean-up and physical health, but also to social aspects of the community. In many contaminated communities, a destructive social process develops that exacerbates the psychological and physical health impacts on community residents. If this goes unrecognized, outside agency intervention may make the social process even more destructive. On the other hand, if an agency works in partnership with a community, it is possible to decrease the development of social stresses and increase the social capital and collective efficacy available to a community to respond to contamination.

Positive involvement of local leadership and community groups with the process of environmental clean-up and/or containment is crucial. Open, honest communication that accurately and realistically conveys the risks of the situation and the processes involved in response is essential to building trust, and trust is the most essential element needed in helping to build a positive response from community residents.

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Synergistic Effects of Combined Lead and Stress: Implications for Disproportionate Environmental Health Impacts

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Lead (Pb) and stress are co-occurring risk factors, particularly for low-socioeconomic (SES) communities. Moreover, Pb and stress act on common biological substrates (the hypothalamic-pituitary adrenal [HPA] axis, brain mesocorticolimbic and hippocampal dopamine and glutamate systems) and produce common adverse outcomes (e.g., cognitive impairments). Collectively, these findings suggest the potential for these risk factors to act synergistically. Animal studies in rats of combined lead and stress strongly support this contention. For example, combined exposures of rat dams to Pb in drinking water and to prenatal stress synergistically altered, in female offspring, brain neurotransmitter levels, performance on a behavioral paradigm considered a surrogate for impulsivity, and the behavioral response to stress challenges. The latter effects correlated highly with stress challenge-induced corticosterone changes. Lifetime Pb exposure combined with prenatal stress produced synergistic and selective impairments in a repeated learning paradigm in female offspring, as well as corresponding synergistic increases in dopamine turnover in nucleus accumbens, a region important to mediation of cognitive function. The learning impairments were mitigated by administration of an antagonist of glucocorticoid receptors that mediate stress responses. Evidence now is emerging to indicate that Pb exposure and stress likewise act in a cumulative fashion in humans. From a regulatory perspective, these findings underscore the critical need to determine effect levels of toxicants in the context of other extant risk factors with which they share biological substrates and common adverse outcomes, i.e., to move toward cumulative risk assessment. From the policy and economics perspectives, the findings suggest that residual Pb exposure may contribute to the increased incidence of diseases and disorders in low-SES communities through its permanent modulation of HPA axis function and also that programs for screening elevated Pb body burden need to be expanded to include pregnant women, particularly those living in high-stress environments.

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The Contributions of Physical Infrastructure to Environmental Health Disparities: Housing, Transportation, and Water

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The physical infrastructure is the most basic and at the same time most varied foundation that makes living and modern social structures possible. Without a functioning, protective, and equitable infrastructure, our very survival as individuals and as a community would not be possible. Much of our existing environmental health apparatus is aimed at protecting aspects of the physical infrastructure (sometimes called the "shared commons"), with only secondary attention to solving environmental health disparities. Historically, the legal structure for the environmental movement in the United States stands on two fundamental principles of English Common Law: "Shared Commons" and "The Polluter Pays." "Shared Commons" is derived from medieval practice governing community use of a public resource. In short, while everyone's cattle may graze on the common green (a key component of the physical infrastructure of its day), nobody's cattle may overgraze the resource and deprive others of its use. In its current legal application, this principle means that the community may act to protect its interest if private activity deprives the public of its right and reliance on a shared resource—e.g., breathable air—or, as explored in this paper, housing, transportation, and water. The "Polluter Pays" principle holds that it is the originator of the pollution, not the injured public, who bears responsibility for the cost of its control.

Contrast this scenario with the aspects of the physical infrastructure we consider in this paper: housing, transportation, and water. For these three, there is not a consistent perceived "shared commons" for which the public feels a communal benefit and responsibility. Even the language is myopic—we refer to a housing *unit*, with the connotation that it is small and insignificant. Small communities and individual drinking water wells are almost entirely unregulated, creating environmental health disparities. And, transportation historically has meant building more freeways without interconnecting neighborhoods, thus creating neighborhoods that are cut off, ill served, or both. For these systems, there may not be a "polluter" that can be identified easily and tasked with payment for remediation.

We have selected three forms of physical infrastructure, one to represent the individual level (housing), another to represent the community level (transportation), and a third that includes both (water), while at the same time recognizing the significant overlap among them all. We have reviewed the literature on the individual and community factors that influence environmental health disparities, either through direct causal pathways or through more indirect distal and proximate pathways. We also have examined the evidence that interventions, particularly in the cases of childhood lead poisoning prevention, traffic calming and rerouting, and establishment of community water systems, can promote the environmental health of the general population *and* at the same time reduce disparities. We also have identified a number of research activities and methodological improvements that are needed, and we close with some conclusions on how scientific evidence on disparities in physical infrastructure can be used to bring environmental justice (EJ) considerations into policy deliberations.

For housing infrastructure, this review shows that racial and ethnic disparities in housing with both severe and moderate physical problems are large and have existed for decades. In contrast, other data demonstrate that when resources are properly targeted and when interventions have been proven effective (as has been the case in childhood lead poisoning prevention from lead-based paint hazards in housing), it is possible to greatly reduce disparities in housing-related health hazards. These two contrasting outcomes are examples of the evidence that housing disparities are pronounced, but effective interventions exist that

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can reduce them. This has enormous implications for how the EJ movement chooses to characterize social determinants of health, particularly in resolving long-standing housing-related health disparities.

For transportation infrastructure, this paper presents available evidence for five pathways through which transportation system infrastructure may cause disproportionate environmental or health impacts on vulnerable populations. Most directly, infrastructure can displace residents and permanently damage community structure and integrity. Second, both the construction and operation of infrastructure can impair (or benefit) walkability and livability. Third, use of motor vehicles on roadways and rail facilities generates air pollution, noise, and pedestrian hazards, disproportionately affecting residents living adjacent to these facilities. Fourth, preferential investments in auto-centered transport have generated a transit-dependent subclass that has substantial barriers to access. Finally, transportation systems facilitate ethnic- and class-based segregation, contributing to the reproduction of environmental injustice.

For water infrastructure, there is clear evidence that there are many cases where low-income, minority communities that rely on individual or shared water systems face risks from contaminants in their drinking water. These include Tribal communities, residents of border *colonias*, migrant farm workers, and communities in other rural areas. In each of these cases, there are efforts at the local, state, and/or federal level to address the problems, even though these agencies have no legislatively mandated regulatory role, and these efforts have involved the affected communities. Examining disparities involves by its nature a comparison of individuals or communities. The majority of evidence comes from the case studies of communities with unregulated water systems. The comparison is an implicit one, comparing these unregulated systems to fully compliant community water systems. Very few studies compare infrastructure between individuals or communities of different socioeconomic status, and these studies have focused on water quality as the outcome. Improving our understanding of disparities associated with water infrastructure will depend on better data, especially geo-referenced data on service area boundaries to link each water system to the individuals served.

Overall, there is no unified research agenda for physical infrastructure disparity research in the United States, although there have been recent advances in this area. The absence of a "home" for housing, transportation, and water quality health research, and research on health and the physical infrastructure generally within the National Institutes of Health, the U.S. Environmental Protection Agency, and other research agencies is noteworthy.

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Community Participation in the Environmental Decision-Making Process: Can It Reduce Disproportionate Impact?

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Environmental health exposures impose a disproportionate burden on low-income populations and communities of color. Although many factors contribute to this inequitable impact, one important influence is the ability of such communities to participate in making public policy decisions about environmental health. In this report, we seek to describe and analyze the characteristics of communities that contribute to their capacity to participate in making environmental decisions and of environmental policy decision making processes that invite or discourage such. The goal is to identify steps that the U.S. Environmental Protection Agency (EPA) can take to design programs and policies that achieve more meaningful participation.

Previous analyses have identified 10 important domains of action to strengthen community capacity: leadership, participation, skills, resources, social and organizational networks, sense of community, understanding of community history, community power, critical reflection, and community values. Our review of the specific literature on environmental justice and disparate exposures suggested three additional domains that are particularly promising for interventions: community cohesion, language capacity, and community information. In addressing all of these domains, we proposed five basic strategies for enhancing community capacity: training and technology transfer, technical assistance, community-based participatory research, empowerment approaches, and community organizing/social action.

Each of these capacity-building strategies offers some promise for helping environmental justice communities address their concerns. Our review suggests that many choices from bottom-up and Agency-down intervention are available to increase capacity. Careful documentation and evaluation of such efforts will help to establish a systematic body of knowledge that can help communities to make informed choices and match interventions to community contexts.

To more effectively reduce disparate environmental exposure and engage the public in making environmental policy decisions, we recommend that EPA engage relevant constituencies in participation processes early, provide these constituencies with the resources and information that can contribute to effective participation, and ensure that the outcomes reflect participation.

By strengthening community capacity, advancing authentic participation, and building democratic power, it may be possible to alter the demonstrated pattern of disparities that underlies the environmental "riskscape" of America—not by redistributing risk but by minimizing it in each of our communities. Thus, strengthening participation—by helping communities develop the capacities needed to be effective in such processes and by changing Agency practices to better incorporate such voices—will be a key and proper task for EPA in the years ahead.

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Measuring Specific Features of Neighborhood Environments and Estimating Their Contribution to Health Disparities

Mahasin Mujahid
University of California, Berkeley, CA

Studies examining neighborhood environments in relation to health often use census-derived indicators of neighborhood socioeconomic position as the key neighborhood measure of interest. Although these indicators have revealed important neighborhood health effects, there is a need for research that considers specific features of neighborhood environments to elucidate the potential pathways by which neighborhoods impact health. In this presentation, we discuss general approaches to measuring the physical and social environments of neighborhoods, with a focus on a survey of area residents. Using this approach, we illustrate a few challenges in developing neighborhood scales and testing their measurement properties. We conclude by highlighting the utility of these measures using examples from the Multi-Ethnic Study of Atherosclerosis.

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Modeling Effects of the Social and Physical Environment on Health—A Spatial Perspective

Basile Chaix
Inserm and University of Pierre and Marie Curie, Paris, France

In the analysis of associations between neighborhood exposures and individual health outcomes, socio-epidemiologic studies often have described the geographic distribution of health phenomena in terms of within-neighborhood correlation (using multilevel models) and have defined contextual exposures within administrative neighborhoods. In contrast to this approach considering a territory fragmented into disconnected administrative areas, the aim of a spatial perspective is to reintroduce spatial continuity in the measurement of environmental exposures (by considering personal exposure areas centered on residences) and in the modeling of their effects on health (to account for the spatial patterns of social and health phenomena).

First, focusing on the measurement of environmental exposures, we use the RECORD Cohort Study to illustrate that performing sensitivity analyses on the scale of measurement of contextual factors provides relevant information on the spatial scale on which environmental influences may operate.

Second, we report epidemiologic examples of the use of spatial regression models based on individual data. These models account for the fact that health outcomes may be more similar between neighborhoods that are close to each other than between neighborhoods that are farther apart. Models taking into account both spatially structured and unstructured components of variability, when estimable, are shown to provide information facilitating the interpretation of individual/environmental fixed effects. However, we also discuss recently described biases associated with the use of spatial random effects that affect the fixed effects of interest.

We conclude the presentation with a balanced discussion of the potential gains and added complexities associated with the consideration of spatial continuity in the measurement of exposures and modeling of their effects.

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Measuring Racial/Ethnic Inequality of Context

Theresa Osypuk
Bouve College of Health Sciences, Northeastern University, Boston, MA

In this presentation, I will discuss measurement and analytic approaches for measuring and modeling social and physical environments. I will discuss racial inequality measures of spatial separation of neighborhood exposure, and modeling approaches for understanding how such inequality in context may be associated with health. The talk will address such issues as inequality measurement, spatial scale, hierarchical modeling, racial/ethnic disparities in housing and neighborhood environments, and effects of place on health.

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Use of California Environmental Health Tracking Data To Investigate Environmental Health Disparities

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Communities long have expressed the need for accurate, timely, and neighborhood-scale data to address concerns regarding impacts of environmental hazards. In California, there are documented disparities by racial/ethnic group and/or income for specific hazards, such as agricultural pesticides. There remain two unaddressed concerns: (1) that hazard data (e.g., emission data from secondary data sources) do not accurately characterize the level of true exposure in individuals; and (2) although disparities in hazard proximity can be documented, information on disparities in local health impacts is lacking. This latter point is due to small numbers of health events, confidentiality restrictions, and unstable rates, among other issues. The California Environmental Health Tracking Program (CEHTP), established in 2003, has established a Web portal where users can assess timely localized data on many environmentally related diseases and hazards. We will present three case studies in which CEHTP data were used to examine disparities in environmental health outcomes: (1) prevalence of asthma in Alameda County, California; (2) use of hazard data to identify potential populations disproportionately exposed to pesticides in California's Central Valley; and (3) use of adverse reproductive outcome data as possible input into a health impact assessment of California's cap-and-trade regulations to reduce greenhouse gas emissions. Issues of data usability, access, and interpretation will be discussed, as well as the potential to expand these approaches into related areas of environmental health.

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Preliminary Screening Method To Estimate Cumulative Environmental Impacts

Steve Anderson and Maria Franco-Spera
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In response to recommendations made by the New Jersey Environmental Justice Advisory Council (NJEJAC), the New Jersey Department of Environmental Protection (NJDEP) has developed a preliminary screening method to estimate cumulative environmental impacts. This method, which is being evaluated continuously for enhancement, could be characterized as a state-level screening approach using data available for the entire state to develop indicators of environmental impact. Currently, nine indicators have been developed, including cancer risk (as estimated by the U.S. Environmental Protection Agency's National-Scale Air Toxics Assessment), vehicle counts using 1,000-foot buffers on roadways, densities of major regulated sites, and others. Indicators are quantified separately at a fine geographic scale (100 km) to estimate potential local impacts. Methods to normalize and combine indicators to see how multiple indicators impact the same location currently include calculating statistical z-scores (or standard scores). Estimates at the local level then are aggregated to the block-group level. This aggregation allows the estimates of environmental cumulative impact to be compared to social and economic factors with data available in the 2000 US Census. Initial comparisons with total minority and percent poverty show a positive correlation, with estimates of environmental cumulative impact increasing with increases in minority and poverty. The NJDEP is evaluating ways to update and enhance the current methods with new data and additional indicators.

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Environmental Justice Screening Method

James L. Sadd[1], Manuel Pastor, Jr.[2], Rachel Morello-Frosch[3]
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We have developed an Environmental Justice Screening Method (EJSM) designed to identify and map cumulative impacts and vulnerability at the neighborhood-level using a comprehensive set of 24 indicator metrics. Selection of indicators is based in the scientific literature of environmental health risk and social vulnerability to air pollution, organized into three categories – hazard proximity and land use; health risk and exposure, social and health vulnerability. The EJSM combines GIS spatial analysis and statistical programming define specific locations using land use and census polygons, evaluate proximity to air pollution hazards, analyze the distribution of indicator metrics. The results are expressed as a cumulative impacts (CI) "score" applied to specific locations, either census tracts or a finer unit of geography that combines census blocks and land use polygons, using relative ranking procedures. The EJSM was designed to be scientifically valid, flexible and transparent, and is optimized for application in California. As an integral part of the design process a variety of stakeholders – State regulators, policy makers, community leaders – were consulted for input during development. It offers a way to objective examine and screen large regions for areas most negatively affected by cumulative exposure and social vulnerability, to guide further research, community outreach, and to targeted regulatory strategies to better address environmental justice concerns related to air pollution impacts across diverse communities in California.

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EPA's Community-Focused Exposure and Risk Screening Tool: C-FERST and its Potential Use for Environmental Justice Efforts

Valerie Zartarian[1], Brad Schultz[2], Marybeth Smuts[1], Timothy Barzyk[2], Davyda Hammond[2], Myriam Medina-Vera[2], Andrew Geller[2]
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EPA's Office of Research and Development, in collaboration with the CARE Program, is developing the Community-Focused Exposure and Risk Screening Tool (C-FERST; www.epa.gov/heasd/c-ferst). C-FERST is a "one-stop shop" Web-based tool for conducting multimedia community assessments, and will support EPA's priorities for cleaning up communities and working for environmental justice.

C-FERST incorporates innovative, high quality science into a user-friendly interface to assist with characterizing the confluence of multiple stressors for: prioritizing environmental issues within communities; identifying communities at risk; and, ultimately, assessing impact of actions. It is anticipated that this tool will empower environmental managers and community residents to make better-informed and more cost-effective decisions to improve public health.

C-FERST links to and builds upon other EPA and Federal Agency tools for informing community assessments. Users will be able to:

- Follow available community guidance roadmaps
- Link to fact sheets about community environmental issues
- Access guidance on collecting and uploading local data
- Generate maps of sources, concentrations, human exposures, and cumulative risks, with overlays about EJ factors or health outcomes
- Generate C-FERST "issue profile" reports containing available fact sheets, weblinks, and maps for over 30 community environmental issues
- Explore risk reduction actions
- Learn about communities with similar issues and solutions implemented

This presentation will demonstrate C-FERST in the context of potential environmental justice applications, and describe ORD research efforts to develop census tract level data for community-identified priority environmental issues. It will also provide opportunities to explore collaborations between EPA, other Federal Agencies, and academia.

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EJSEAT: A Screening Tool for EJ Concerns

Reggie Harris[1] and Andrew Schulman[2]
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EJSEAT is a draft screening measure that can help to identify communities of highest environmental justice (EJ) concern, to better focus enforcement and compliance activities in those areas. It combines 18 data elements in categories of health, environment, demographics, and environmental enforcement. Case studies will illustrate how EJSEAT is used in combination with other information to identify minority and/or low-income communities that may be exposed to environmental harms and risks, and what actions were taken to address those circumstances through programmatic activities.

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Health Impact Assessment and the Management of Environmental Justice and Cumulative Effects

Rajiv Bhatia
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Health Impact Assessment (HIA) describes a systematic practice to judge the human health impacts of public decisions and to consider related health-responsive management strategies for policy design, adoption, and implementation. Defining characteristics of HIA include the use of all available theory and evidence, a broad definition of health and health determinants, potential application to policy-making in diverse public sectors, an explicit concern with vulnerable populations and health equity, engagement with decision-makers and stakeholders, and a commitment to transparency and democracy. HIA thus is instrumental to the fundamental objective of environmental justice (EJ)—identifying and preventing disproportionate, adverse health or environmental burdens on socially vulnerable populations. HIA similarly provides an integrated methodology for the assessment of cumulative health impacts, specifically one that can manage the joint effects of dissimilar exposures and dissimilar mechanisms of action. This presentation will provide an overview of the HIA method and use case studies to explore how this method can attend to gaps in conventional cumulative impact and EJ impacts analyses.

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Case Studies in Applying Health Impact Assessment To Address Health and Equity Holistically

Jonathan Heller
Human Impact Partners, Oakland, CA

Health Impact Assessment (HIA) is becoming more widely used in the United States as a framework to evaluate the potential effects of a proposed project, plan, or policy and the distribution of those effects within the population. With a primary goal of informing a decisjon-making process with an objective, holistic health analysis, HIA also is used to highlight disparities in impacts, identify feasible mitigations for negative impacts, build collaboration and consensus, and engage and empower the community. Three case studies demonstrating the use of HIA to achieve these aims will be discussed:

- The Jack London Gateway Senior Housing Development in Oakland, California
- The decision to include HIA in the Environmental Impact Assessment for the proposed I-710 freeway expansion in Los Angeles
- HIA-scoping for the Ports of Los Angeles and Long Beach

Other applications of HIA also will be described briefly.

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King County Equity and Social Justice Initiative

Ngozi Oleru
Public Health – Seattle and King County, Seattle, WA

In February 2008, King County launched the Equity & Social Justice Initiative (ESJI) to eliminate longstanding and persistent inequities and social injustices. The goal of ESJI is for all King County residents to live in communities of opportunity where all people thrive. The Initiative aims to improve conditions for people of color, low-income residents, and ethnic groups who have limited English proficiency and focuses on 13 social, economic, and physical environment factors that also are termed the determinants of equity. King County is applying the principles of equity and social justice in its service delivery, decisions, and policies and in how it engages communities. The County takes a comprehensive and systems-level approach to how it measures and monitors the impact of these actions on equity. (1) Policy development and decision-making: Monitor and examine the impacts of current policies and practices that promote equity or contribute to inequity. (2) Delivery of county services and organizational practices to address inequities: All executive departments commit to specific actions that promote equity and social justice. (3) Community partnerships: Engage community groups that are most impacted by inequities, as well as groups that hold power, to increase awareness, build partnerships, and address structural changes that improve the social, economic, and physical conditions where people live, work, and play. This session will focus on the tools (Equity Impact Review [EIR] tools and the Community Engagement Guide) that King County has developed to hold itself accountable to the Initiative's goal.

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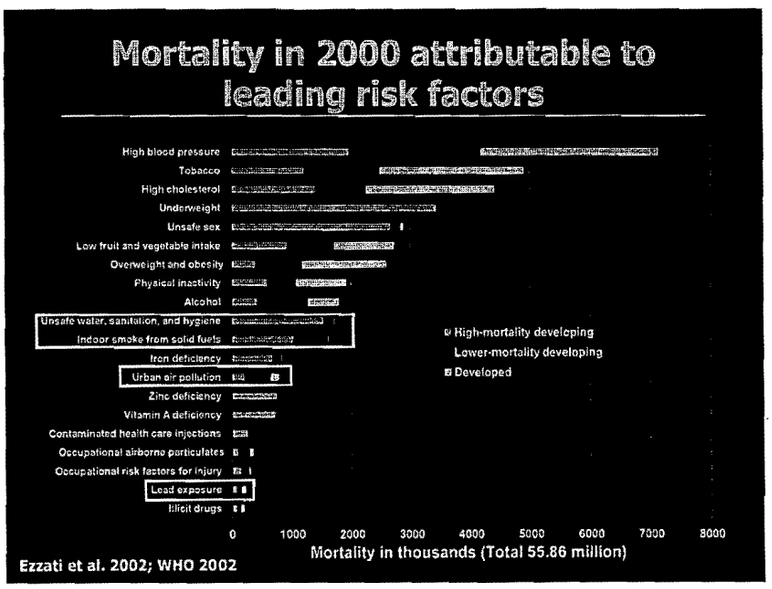
Quantifying Inequalities in the Global Burden of Disease Due to Environmental Factors: Perspectives from the Global Burden of Disease Comparative Risk Assessment

Aaron J. Cohen
Health Effects Institute, Boston, MA

The Global Burden of Disease Comparative Risk Assessment (GBD/CRA) is a collaborative effort of the Gates-funded Institute for Health Metrics and Evaluation, WHO, and leading academic centers, designed to measure loss of health due to comprehensive set of disease, injury, and risk factor causes using comparable and consistent methods*. It has periodically quantified the role of selected, potentially-modifiable risk factors in global and regional burden of disease, including major environmental risk factors such as poor water quality and sanitation, air pollution from indoor burning of solid fuels, outdoor air pollution and lead** (see Figure). Estimates will soon be updated to allow comparison of burden estimates for 1990 and 2005.

Because the burden of disease attributable to each risk factor is estimated in a comparable way using consistent methods the GBD/CRA framework provides a basis for comparing environmental risks, and for exploring the role played by economic and social inequalities in the burden of disease due to environmental factors among and with-in regions and countries. Recent estimates of the burden of disease attributable to selected environmental factors, and their global distributions, will be presented, along with an example of how this framework has been used for more detailed within-country assessment of the environmental burden of disease and its economic and social determinants.



**http://www.globalburden.org/* ***http://www.who.int/healthinfo/global_burden_disease/cra/en/index.html*

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Using Advanced Geospatial Methods To Address Childhood Lead Poisoning

Marie Lynn Miranda
Children's Environmental Health Initiative, Nicholas School of the Environment, Duke University, Durham, NC

Lead has long been recognized as an environmental neurotoxicant, with clear disproportionate impacts on low-income and minority children. To truly protect children from lead exposure, we must replace traditional mitigative approaches with preventive intervention programs. We have addressed this issue successfully by using advanced spatial and statistical analysis to develop the Childhood Lead Exposure Risk Model. The Lead Model uses spatial analysis of county tax assessor, U.S. Census, and North Carolina blood lead screening data to predict lead exposure risk levels mapped at the individual tax parcel unit. State and local public health officials and local community advocates use the Lead Model in designing and implementing programs to prevent lead exposure. The Lead Model, now available for 43 North Carolina counties and multiple national sites, allows the translation of complex data into clear and accessible maps and reports that are used for community outreach, strategic planning of outreach activities and resource expenditures, targeted blood lead screening, and housing rehabilitation programs.

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Does Community Vulnerability Amplify the Relationship Between Traffic Exposure and Adverse Birth Outcomes? A University-State-USEPA Research Collaborative on Environmental Health Inequalities

Debbie Lowe Liang[1], Rachel Morello-Frosch[2], Bill Jesdale[2], Paul English[3], Manuel Pastor[4], James Sadd, Thomas Plenys[1], Eric Hall[5], and Matthew Lakin[1]

[1]U.S. Environmental Protection Agency (EPA), San Francisco, CA; [2]University of California, Berkeley, CA; [3]California Department of Public Health, Department of Environmental Health, Richmond, CA; [4]Department of Geography and American Studies and Ethnicity, University of Southern CA, Los Angeles, CA; Environmental Science, Department of Geology, Occidental College, Los Angeles, CA ; [5]U.S. Environmental Protection Agency, Research Triangle Park, NC

This research project assesses the relationship between traffic exposure and risk of low birth weight and preterm birth, both strong predictors of health status throughout the life course, among 1.5 million births in California during 2001-2006. The analysis also examines whether measures of community and individual vulnerability confound or amplify the adverse effects of these exposures. While previous studies have examined relationships between ambient air pollution and adverse birth outcomes, most of these studies have not assessed whether and how individual- and area-level measures of community vulnerability affect observed pollutant-perinatal outcome relationships. Preliminary results indicate an increased risk of low birth weight and preterm birth with higher estimated traffic exposures. Effect estimates remain robust after conducting sensitivity analysis using different exposure assessment techniques. This unique collaborative between academic, EPA, and California Department of Public Health scientists produced a novel application of GIS spatial analysis to estimate traffic exposure metrics for every census block in the state. Results of this collaborative study will enhance understanding about how source-specific measures, such as traffic burden, can elucidate policy-relevant opportunities for environmental agencies to reduce community exposure to multiple pollutants by taking actions such as targeting enforcement actions, encouraging voluntary reductions, and requiring mitigations.

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Evaluating Environmental Justice/Disproportionate Impacts Over Time at a Typical Industrial Facility Within a Cumulative Risk Framework

Matthew C. Small
Region 9, U.S. Environmental Protection Agency, San Francisco, CA

This presentation will discuss how cumulative risks can change over the lifetime of a facility. This session also will identify ways in which temporal considerations of cumulative risk might inform decision-making for environmental justice/disproportionate impacts at local levels. Cumulative risk in the context of local decisions will be examined through case studies focused on the four lifecycle stages of a typical industrial facility: (1) planning and installation; (2) operation; (3) cleanup and closure; and (4) land re-use. We will discuss how the sources of risk, risk management goals, risk assessors, risk managers, and cumulative risk assessment tools can change dramatically during each of the four stages. For example, the sources of risk during construction of a hazardous waste incineration facility are quite different from the hazards associated with the combustion emissions during operation of the facility. In addition, the city council, financial institutions, and developers often drive risk assessment and management decisions when selecting a location for a facility, whereas regulatory agencies are more likely to be responsible for monitoring facility emissions during operation. A cumulative risk approach allows for inclusion of environmental justice/disproportionate impact analysis throughout the lifecycle of the facility.

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Challenges in Assessing Risk for Disproportionately Impacted Populations in the Regulatory Context (the Examples of Lead and Mercury)

Zachary Pekar
Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC

The review and development of air quality regulations by the U.S. Environmental Protection Agency can involve consideration of risks experienced by disproportionately impacted populations. This in turn requires application of population-level risk assessment to assess both the magnitude and severity of public health impacts on these special at-risk populations. The use of risk assessment in this context can be challenging given limitations in available data, including the absence of data characterizing high-end exposure-related behavior in the multipathway context. Challenges in modeling exposure and risk for disproportionately impacted populations are well illustrated by the examples of ambient-air-sourced lead and mercury. In the case of lead, we must consider both direct and indirect exposures to lead released into ambient air as well as non-air sources of exposure (e.g., indoor paint). With lead, we have the added challenge of a concentration-response function for IQ loss that is non-linear, increasing demands on the precision of our exposure modeling and requiring that we consider total exposure and not just air-sourced. In the context of mercury exposure (primarily through fish ingestion), we have the challenge of accounting for self-caught fish consumption, as well as commercial (bought) consumption. How these two sources of fish consumption combine to determine overall exposure for disproportionately impacted populations (and particularly subsistence fishers) can be challenging. This talk will cover some of the uncertainties (data needs) associated with modeling risk related to lead and mercury exposure for disproportionately impacted populations.

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Including Environmental Justice in the Economic Analyses at the EPA

Charles Griffiths
National Center for Environmental Economics, U.S. Environmental Protection Agency, Washington, DC

The U.S. Environmental Protection Agency (EPA) is required by Executive Order and statute to conduct an economic analysis for some of its regulations. This analysis generally includes a benefit-cost analysis, which primarily is concerned with economic efficiency and maintains an implicit assumption that dollar impacts affecting different groups have equal weighting. Since 1994, the Agency also has been required to address environmental justice (EJ) concerns, and this consideration has sometimes made its way into the economic analysis. This presentation will begin with a review of the mandates for both economic analysis and EJ and discuss Agency guidelines for how equity considerations are supposed to be included in regulatory impact analyses. It then will describe what the Agency typically includes in its economic analyses and review the degree to which EJ and equity concerns actually have been included. The presentation will close with a brief discussion of how the Agency currently is moving forward in including these concerns.

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Incorporating Equity Concerns Into Benefit-Cost Analysis

Maureen L. Cropper
University of Maryland, College Park, MD, and Resources for the Future, Washington, DC

This presentation will focus on several questions that must be answered before equity concerns can be incorporated in benefit-cost analyses of environmental regulations. The talk will begin by discussing the relationship between equity and altruism, and will discuss the theoretical basis for monetizing either altruistic or equity concerns in a benefit-cost analysis. When it is appropriate to include equity concerns, how should equity be characterized: by the distribution of risks in a population, or using a measure that summarizes this distribution, such as the Gini coefficient or Atkinson index? The answer to this question depends in part on how people perceive the distribution of outcomes (such as health risks) in a population. The talk will conclude by discussing the types of distributional changes that are likely to be associated with environmental policies, and how we might measure the preferences of laypersons for changes in the distribution of risks delivered by environmental programs.

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Addressing Distributional Issues in Environmental Health Benefits Analysis

Jonathan Levy
Department of Environmental Health, School of Public Health, Harvard University, Boston, MA

When developing regulations to address environmental health risks, decision makers often attempt to take into account both benefit-cost considerations and environmental justice or equity issues. Although methods to quantify population health benefits and other measures of efficiency have been well defined and extensively applied, there have been fewer attempts to develop meaningful and interpretable methods to address the distribution of health benefits. In this presentation, I provide an overview of an axiomatic approach for deriving meaningful measures of health inequality, leveraging insight from previously developed measures of income inequality but considering issues specific to environmental health. These include the necessity of explicitly incorporating background conditions and avoiding implicit value judgments. Given the quantitative inequality indicators that best meet the various axiomatic criteria, I present two case studies illustrating the strengths and limitations of this approach, focusing on optimal strategies to control power plant emissions across the United States given a national cap and to control diesel bus emissions in Boston given budgetary constraints. In each case, both the magnitude and distribution of public health benefits are characterized formally across numerous control strategies. These analyses suggest that, in settings with multiple risk management options, more efficient strategies may correspond with more equitable strategies, as targeting high-risk populations can both provide greater risk reductions per unit of concentration change and best reduce health risk disparities. These studies provide evidence that environmental equity issues can be incorporated formally in regulatory analyses at the U.S. Environmental Protection Agency and elsewhere, helping to determine policies that are both efficient and equitable.

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Evaluating Distributional Impacts in a Regulatory Context: Lead NAAQS Case Study

Erika Sasser
Office of Air and Radiation, U.S. Environmental Protection Agency, Research Triangle Park, NC

In 2008, the U.S. Environmental Protection Agency conducted a limited distributional analysis in connection with a proposed rule to revise the national ambient air quality standards (NAAQS) for lead. This analysis serves as a useful case study to illustrate how a proximity-based analytical approach can provide information about potential exposures to environmental hazards, and also the limitations of such an approach. The presentation outlines the methodology used to assess the sociodemographic characteristics of populations living near ambient air lead monitors and stationary sources of lead emissions. The presentation describes the technical approach used in the analysis, demonstrates the type of results that can (and cannot) be generated using these methods, and discusses uncertainties and limitations associated with this type of analysis. Finally, the presentation briefly considers how other analytical approaches may compare in terms of providing information useful to regulatory decision makers.

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Analysis of the Effects of Air Pollution Control Programs on Inequality in Risks in Two Urban Areas

Henry Roman[1], Jeneva Craig[2], Mikael Gentile[1], and Jonathan Levy[3]
[1]Industrial Economics, Incorporated, Cambridge, MA; [2]Office of Air and Radiation, U.S. Environmental Protection Agency, Washington, DC; [3]Harvard School of Public Health, Boston, MA

The U.S. Environmental Protection Agency does not currently have a peer-reviewed framework for addressing inequality in risk in the context of air pollution benefit assessments or for assessing disproportionate risk changes across populations. Recent papers by Levy et al. (2006, 2007, and 2009) have proposed using the Atkinson index as a meaningful indicator of inequality in human health risks across populations. Among the favorable properties of the Atkinson index are scale invariance and decomposability. The former allows for comparisons of inequality among air pollutants with widely ranging concentrations and potencies, while the latter facilitates assessments of inequalities at different geographic resolutions and assessments for sensitive subpopulations or economically disadvantaged groups. The authors currently are applying the Atkinson index approach to evaluate the effects of actual or potential pollution control programs on inequalities in risks due to air pollutant exposures in two major U.S. cities—Detroit and Houston. The Detroit analysis uses urban scale air quality modeling data for fine particulate matter ($PM_{2.5}$), ozone, and a number of carcinogenic hazardous air pollutants (HAPs, e.g., vinyl chloride) to assess the baseline degree of risk inequality associated with exposures to these pollutants and estimate the effect of alternative multi-pollutant control strategies on reducing inequality. The Houston analysis involves characterizing the degree of inequality in leukemia risks associated with benzene exposure in the Houston metropolitan area and evaluating the effect of Clean Air Act provisions for regulating benzene on leukemia risk inequality.

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The Impact of the Environmental Justice Movement on Public Policy in the United States

Richard D. Schulterbrandt Gragg
Center for Environmental Equity and Justice, Environmental Sciences Institute, Florida A&M University, Tallahassee, FL

By way of effective advocacy, the Environmental Justice Movement has successfully made the issue of environmental quality and its impact on human health and well being a critical public policy issue in the United States. Some examples of this impact are: the1991 First National People of Color Environmental Leadership Summit in Washington, DC; the establishment of the U.S. Environmental Protection Agency's Office of Environmental Justice in 1992; the National Environmental Justice Advisory Council in 1993, followed by the 1994 Presidential Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations; the National Institutes of Health–National Institute of Environmental Health Sciences Environmental Justice: Partnerships for Communication Extramural Research Program in 1994, followed by the Community-based Participatory Research Program in 1995; the National Center on Minority Health and Health Disparities, established by the passage of the Minority Health and Health Disparities Research and Education Act of 2000, Public Law 106-525; the National Academies Institute of Medicine 1999 Report: *Toward Environmental Justice: Research, Education, and Health Policy Needs*; the University of Michigan undergraduate and graduate programs in environmental justice; *Toxic Waste and Race at Twenty 1987–2007, A Report Prepared for the United Church of Christ Justice & Witness Ministries*; and the 2009 Advancing Climate Justice–A 20th Anniversary National Conference Hosted by WE ACT for Environmental Justice at Fordham University Lincoln Center Campus, New York City. The purpose of this study is to examine and articulate the change and impact of the coalition of environmental justice grass roots community organizations and other stakeholders on the environmental and public health enterprise at the local, state, and federal levels, in response to disparate environmental exposures and health outcomes in people of color and low-income communities and populations.

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Assessment of a Novel Environmental Justice Community-University Partnership

Leah Williams[1], Sacoby Wilson[2], Omega Wilson[3], and Roy Charles[4]
[1]Arnold School of Public Health, University of South Carolina, Columbia, SC; [2]Institute for Families in Society, University of South Carolina, Columbia, SC; [3]West End Revitalization Association, Mebane, NC; [4]School of Education, University of North Carolina, Chapel Hill, NC

Background and Objectives: This study seeks to address critical gaps in the scientific knowledge on the effectiveness of community-university partnerships in empowering vulnerable communities to address environmental justice (EJ) issues. The West End Revitalization Association (WERA), a community-based environmental protection organization based in Mebane, North Carolina, established a community-university partnership to address the lack of basic amenities, environmental injustice, and public health issues in local black communities. WERA developed the community-owned and -managed research (COMR) framework as the foundation for its community-university partnership.

Methods: We are using semi-structured interviews, focus groups, and surveys to evaluate the effectiveness of WERA's community-university partnership, particularly its COMR approach and use of the EPA collaborative problem solving model (CPSM) to address EJ and health issues.

Results: Preliminary analysis of interview and survey data has shown that the COMR approach has been effective in addressing EJ and health issues in WERA neighborhoods and can be effective at helping other communities address their issues. There are mixed results on the impact and utility of the CPS approach.

Conclusions: Preliminary analyses of interview and survey data reveal that WERA's community-university partnership has been effective at addressing local EJ and health issues. Study participants generally agreed that the COMR approach can be adopted by other communities to address local EJ and health issues. More focus groups need to be performed to obtain information from study participants on the overall impact and utility of WERA's COMR and CPSM to address EJ and health issues in various community contexts.

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The Breakdown of Federal Protections: How Environmental Health Policy Set at the National Level Can Be Derailed at the State Level

Heather J. Tanana[1,2], Robert Adler[1], and William McDonnell[3]
[1]S.J. Quinney College of Law, University of Utah, Salt Lake City, UT; [2]Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD; [3]University of Utah School of Medicine, Center for Children's Environmental Health Law and Policy, University of Utah, Salt Lake City, UT

Background and Objectives: The effectiveness of federal statutes and regulations designed to prevent adverse environmental exposures relies on adequate federal, state, and local implementation. This study addresses the legislative gaps under environmental laws, specifically the exemption of mining waste from hazardous and solid waste regulation. Contrary to legislative intent, some states have failed to regulate mining waste, creating a void in solid waste regulation and contributing to disproportionate environmental health impacts.

Methods: Current policy and regulatory structures were analyzed through a case study of Utah's experiences with the regulation of by-product mining wastes. Utah's waste management scheme was examined in light of the intent and purpose of the Resource Conservation and Recovery Act (RCRA). Actual and potential disparate adverse impacts on certain subpopulations associated with Utah's regulatory approach were explored.

Results: Utah has exempted mining waste from both hazardous and solid waste management, despite the associated environmental risks. Such a comprehensive mining exemption exemplifies how state environmental regulation can contravene federal principles. With more than 23,000 active mining claims in Utah, mining wastes increase exposures to low-income communities, including San Juan County, without appropriate RCRA regulation. Consequently, the public is denied crucial protection from environmental hazards as well as the capacity to participate in the decision-making process.

Conclusion: State loopholes can circumvent the purpose and effectiveness of even well-designed federal requirements governing environmental health. As a result, low-income communities are disproportionately impacted, without the appropriate protections intended by federal standards or opportunities to participate effectively in decisions regarding adverse exposures.

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Whose Backyard Is It? Proximity Analysis Using GIS as a Tool for Environmental Justice

Martha Keating, Marie Lynn Miranda, and Sharon Edwards
Children's Environmental Health Initiative, Duke University, Durham, NC

Background and Objectives: A geographic information systems (GIS) methodology is used in two different studies to evaluate the environmental justice (EJ) implications of proximity to industrial sources and pollution exposure. The first study assessed the demographics of communities affected by the Toxics Release Inventory (TRI) Burden Reduction Rule (issued by the U.S. Environmental Protection Agency in December 2006 and rescinded in March 2009). This rule exempted facilities meeting certain higher reporting thresholds from filing detailed reports about chemical releases. The second study assessed the demographics of populations residing in counties with poor ambient air quality. The objective of these studies was to illustrate the utility of spatial analysis for assessing policy change and to describe the potential disproportionate exposure to environmental hazards borne by certain segments of the population.

Methods: The analytical approach examines demographic characteristics of populations within defined buffers around a georeferenced facility or air pollution monitor. We used a 50 percent areal containment method to identify Census 2000 block groups within different buffers. Demographics of these populations were compared to populations in unaffected locations.

Results: TRI facilities that were eligible for reduced reporting are more likely to be proximate to communities with a higher percentage of minority and low-income residents. Demographic differences are more apparent at increasingly resolved geographic scales. Similarly, populations residing in counties with poor air quality are more likely to be minority and have low socioeconomic status.

Conclusion: Proximity analysis using GIS is a valuable tool for describing, quantifying, and visualizing the EJ implications of environmental policies.

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Shifting Exposures: Diesel Emission Reductions and Environmental Justice

Kathryn R. Lundquist and Julian D. Marshall
Department of Civil Engineering, University of Minnesota, Minneapolis, MN

Background and Objective: Particulate matter from diesel engines (DPM) is estimated to be responsible for a majority of the outdoor air pollution lung cancer risk in California's South Coast. Previous research documents exposure inequalities for DPM in this location. Current policies will reduce DPM emissions. Our research aims to quantify how changes in exposure distributions would depend on which sources are targeted for emission reductions.

Methods: To estimate air pollution exposures, we combined the CAMx air dispersion model with census data and a mobility-based exposure model. The mobility model simulates minute-by-minute micro-environmental exposures for approximately 25,000 people. We explore emission reductions from the five main DPM sources: on-road mobile, off-road mobile, ships, trains, and stationary sources. We compare several exposure metrics, including intake per person, environmental equality (variations among individuals), and environmental justice (EJ, variations among socioeconomic groups).

Results: Exposures vary among individuals and groups; on average, exposure is inversely related to socioeconomic status. Changes in these exposure distributions depend on which source is targeted for emission reductions. For example, reducing ship emissions would provide comparatively large benefits to equality, yet only modest changes to EJ. Total exposure impacts are greater for off-road than for on-road emissions, but EJ impacts are greater for on-road than for off-road emissions.

Conclusion: Air quality management involves evaluating which sources should reduce their emissions and by how much. Our results quantify the exposure, EJ, and environmental equality impacts of potential emission reductions.

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Plenary 3: Research and Data Needs for Assessing and Addressing Disproportionate Environmental Health Impacts Among Minority and Disadvantaged Populations

Session Panel Moderator: Sherry Baron, Coordinator for Priority Populations and Health Disparities, National Institute for Occupational Safety and Health

Speakers: *Gwen W. Collman, Interim Director, Division of Extramural Research and Training, National Institute of Environmental Health Sciences, NIH*
Jennifer D. Parker, Office of Analysis and Epidemiology, National Center for Health Statistics, CDC
Steve Wing, Associate Professor, Epidemiology, Gillings School of Global Public Health, University of North Carolina School of Public Health
Ana V. Diez-Roux, Professor, Epidemiology, School of Public Health, University of Michigan, and Director, Center for Integrative Approaches to Health Disparities
Gail C. Christopher, Vice President, W.K. Kellogg Foundation

This session will feature reflections on the first two days of conference discussions, with a focus on how research efforts can best advance and improve the development and implementation of environmental policy that reduces disproportionate exposures. Perspectives will be shared from academic researchers, federal officials, and private foundation personnel reflecting views from those who fund, conduct, and promote research aimed at eliminating health disparities and environmental injustice. Issues to be addressed include: Are there more appropriate approaches to research that have proven successful in leading to effective policy changes? Are the right research questions and approaches being used and are the appropriate research disciplines being included and supported to address these questions? Are researchers appropriately considering and measuring the social context of the physical environment that EPA regulates? How can research on psychosocial factors be structured to support environmental action and not just clinical interventions? Are there major data gaps that should be addressed through changes in policy? How might policy makers, researchers, and affected communities collaborate to promote more appropriate and effective collection of data? What research is needed to detect and intervene when policy changes have the unintended consequence of creating disproportionate exposures? When evidence is sufficient, how can researchers and public officials avoid delaying action by calls for more research? Using these questions, the panel will engage in a dialogue on practices that can advance our knowledge of environmental justice issues and promote protection of all citizens and communities from harm from environmental exposures.

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Plenary 4: Incorporating the Concept of Disproportionate Environmental Health Impacts in "Regulatory Development" at EPA: Analytical Challenges and Opportunities

Session Description

The U.S. Environmental Protection Agency (EPA) protects public health and the environment primarily through creating and enforcing regulations. EPA regulations include but are not limited to setting standards to: (1) regulate the levels of pollutants in environmental media; (2) control emissions from industry and other sources; and also (3) guide the cleanup of toxic waste sites. The process of developing regulations, also known as "regulatory development," may include an analytical phase in which EPA analyzes the problem to inform its options and the decision making process. Depending on statutory requirements, this analytical phase generally uses one or more of three types of analytical frameworks: risk analysis, economic analysis, and technological feasibility analysis. Results from these analyses feed into decision frameworks and, where appropriate, are used to inform the outcomes of the regulatory process. A core function of these analytical frameworks is that of **anticipating/predicting** human health risks (and in some cases ecological system impacts), which are often translated into valuation estimates of human health and societal benefits of regulations that help to inform EPA decisions. To incorporate environmental justice concerns in the regulatory process, the analytical step in the regulatory development process is a critical point for identifying "disproportionality" in exposure, vulnerability, and therefore health risks and impacts.

This session will provide examples of methods for assessing disproportionality and inequalities, drawing from the health policy and economics fields. In addition, this session will highlight principles for incorporating equity in decision making, and explore the application of these principles in health impacts and benefits analysis. Finally, this session will review an example of a specific regulatory decision context to generate discussion on opportunities to enhance existing EPA analytical and decision frameworks to assess disproportionate environmental health impacts and incorporate environmental justice concerns.

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SPEAKER BIOSKETCHES

Paul Anastas

Paul Anastas, Ph.D., is the Assistant Administrator for the U.S. Environmental Protection Agency (EPA) Office of Research and Development (ORD) and the Science Advisor to the Agency. Known widely as the "Father of Green Chemistry" for his groundbreaking research on the design, manufacture, and use of minimally toxic, environmentally friendly chemicals, Dr. Anastas has an extensive record of leadership in government, academia, and the private sector. At the time he was nominated by President Obama to lead ORD, Dr. Anastas was the Director of the Center for Green Chemistry and Green Engineering, and the inaugural Teresa and H. John Heinz III Professor in the Practice of Chemistry for the Environment at Yale University's School of Forestry and Environmental Studies. Prior to joining the Yale faculty, Dr. Anastas was the founding Director of the Green Chemistry Institute, headquartered at the American Chemical Society in Washington, DC. From 1999 to 2004, he worked at the White House Office of Science and Technology Policy, concluding his service there as the Assistant Director for the Environment. Dr. Anastas began his career as a staff chemist at EPA, where he rose to the positions of Chief of the Industrial Chemistry Branch, and Director of the U.S. Green Chemistry Program. It was during his work at EPA that Dr. Anastas coined the term "green chemistry." Trained as a synthetic organic chemist, Dr. Anastas's research interests have focused on the design of safer chemicals, bio-based polymers, and new methodologies of chemical synthesis that are more efficient and less hazardous to the environment. A leading writer on the subjects of sustainability, green chemistry, and green engineering, he has published 10 books, including *Benign by Design*, *Designing Safer Polymers*, *Green Engineering*, and his seminal work with co-author John Warner, *Green Chemistry: Theory and Practice*. Dr. Anastas has been recognized for his pioneering work with a host of awards and accolades, including the Vice President's Hammer Award, the Joseph Seifter Award for Scientific Excellence, the Nolan Sommer Award for Distinguished Contributions to Chemistry, the Greek Chemical Society Award for Contributions to Chemistry, the Inaugural Canadian Green Chemistry Award, a Scientific American 50 Award for Policy Innovation, the John Jeyes Award from the Royal Society of Chemistry, and an Annual Leadership in Science Award from the Council of Scientific Society Presidents. He was a Special Professor at the University of Nottingham and an Honorary Professor at Queens University in Belfast, where he also was awarded an Honorary Doctorate. Dr. Anastas earned his B.S. from the University of Massachusetts at Boston and his M.A. and Ph.D. in chemistry from Brandeis University.

Steve Anderson

Biosketch not available at time of printing.

Sherry Baron

Sherry Baron, M.D., M.P.H., is Coordinator for Occupational Health Disparities at the National Institute for Occupational Safety and Health (NIOSH) at the Centers for Disease Control and Prevention. She coordinates NIOSH's portfolio of research and dissemination activities related to the disproportionate rates of work-related injuries and illnesses among younger, older, immigrant, minority, and lower wage workers. Her own research includes a community-based participatory intervention project for English-, Spanish-, and Chinese-speaking home-care workers. She also is examining the work-related contributors to disparities in cardiovascular diseases. Along with collaborators at the National Institute of Environmental Health Sciences (NIEHS) and the U.S. Environmental Protection Agency (EPA), she recently co-edited a special issue of the *American Journal of Public Health* devoted to Environmental and Occupational Justice, with a focus on community-based participatory research. Included in that special issue was an article she authored along with EPA and NIEHS that evaluated a 13-year funding initiative by the three federal agencies called Partnerships for Communication, which supported 54 environmental

justice projects. She also co-edited a special issue of the *American Journal of Industrial Medicine* in February 2010 on Occupational Health Disparities.

Stanley Barone Jr.

Stanley Barone Jr., Ph.D., was trained as a neuroscientist and came to the U.S. Environmental Protection Agency (EPA) in 1990 as a developmental neurotoxicologist in the neurotoxicology division of what was to become the National Health and Environmental Effects Research Laboratory (NHEERL) in the Office of Research and Development (ORD) in Research Triangle Park, North Carolina. Subsequently, Dr. Barone moved to Washington, DC, and joined the National Center for Environmental Assessment (NCEA) in 2004, after 14 years in NHEERL. Since 2006, Dr. Barone has been a Senior Scientist and Assistant Center Director for Human Health Risk Assessment at NCEA in ORD. Dr. Barone led an effort to develop and implement a framework for Assessing Health Risks of Environmental Exposures to Children, which was published by EPA in 2006. Currently, he is working on cross-cutting human health risk assessment issues, including ongoing Integrated Risk Information System assessments of tetrachloroethylene, trichloroethylene, methanol, formaldehyde, and ethylene dichloride. He currently serves on the EPA Human Health Oversight Committee of the Risk Assessment Forum and is the EPA Project Officer on the World Health Organization cooperative agreements dealing with the International Programme on Chemical Safety and Protection of Human Health. He has published more than 60 peer-reviewed papers and six book chapters. Dr. Barone has served on peer-review panels for numerous government and nongovernmental funding organizations (e.g., the Veterans Administration, National Institutes of Health, U.S. Food and Drug Administration, Department of Defense, and Texas A&M University pilot grants program, Cure Autism Now Investigator-Initiated Research proposals for Jeffress Research Grant Memorial Trust). He has served on numerous government advisory panels (e.g., National Toxicology Program's Center for the Evaluation of Risks to Human Reproduction and Member of Interagency Workgroup on Development and Behavior to National Children's Study).

David Bellinger

David Bellinger, Ph.D., M.Sc., is a Professor of Neurology at Harvard Medical School and a Professor of Environmental Health at the Harvard School of Public Health, where he directs the Interdisciplinary Postdoctoral Training Program in Neurodevelopmental Toxicology. A licensed psychologist, he received a Ph.D. in Developmental Psychology at Cornell University and an M.Sc. in Epidemiology at Harvard School of Public Health. His major areas of research interest are the developmental impact of metabolic and chemical insults to the nervous system, neuropsychological toxicology, and the neurobehavioral sequelae of pediatric cardiac surgery. He frequently serves on national and international committees involving the evaluation of scientific evidence and its use in setting regulatory policies. He also has served on the Federal Advisory Committee of the National Children's Study, the Human Studies Review Board of the U.S. Environmental Protection Agency, and the Foodborne Disease Epidemiology Reference Group of the World Health Organization.

Rajiv Bhatia

Rajiv Bhatia, M.D., M.P.H., is the Director of Occupational and Environmental Health for the San Francisco Department of Public Health and an Assistant Clinical Professor of Medicine at the University of California at San Francisco. He has developed and implemented environmental health policy in San Francisco since 1998, broadening local environmental health practice to extend to labor rights, working conditions, housing policy, land use and transportation planning, food security, and pioneering the development of health impact assessment practice in the United States. He teaches a graduate course on the health impacts of public policy at the University of California at Berkeley. He is a

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co-founder of and a scientific advisor to Human Impact Partners, which is working nationally to bring health impact assessment into public policy making. He is a founding member of the Health and Social Justice Team for the National Association of County and City Health Officials. Dr. Bhatia earned an M.D. from Stanford University in 1989.

Paula Braveman

Paula Braveman, M.D., M.P.H., is Professor of Family and Community Medicine and Director of the Center on Social Disparities in Health at the University of California at San Francisco (UCSF). She received her degree in Medicine from UCSF and in Epidemiology from UC Berkeley, and practiced medicine in a range of settings serving diverse, disadvantaged populations. For more than two decades, Dr. Braveman has studied and published extensively on social disparities in health and health care and been actively engaged in bringing attention to this field in the United States and internationally. Her research has focused on measuring, documenting, and understanding socioeconomic and racial/ethnic disparities, particularly in maternal and infant health and health care. During the 1990s, she worked with World Health Organization staff in Geneva to develop and implement a global initiative on equity in health and health care. Throughout her career, she has collaborated with local, state, federal, and international health agencies to see research translated into practice with the goal of achieving greater equity in health. She has been a member of the Institute of Medicine of the National Academy of Sciences since her election in 2002.

Jean Brender

Jean Brender, Ph.D., is the Associate Dean for Research at the Texas A&M Health Science Center (TAMHSC), School of Rural Public Health, and Professor of Epidemiology in the Department of Epidemiology and Biostatistics. She graduated from Whitworth College (*summa cum laude*) with a B.S. in Nursing, and from the University of Washington with a Master of Nursing and a Ph.D. in Epidemiology. Prior to joining academia full time, she worked as an epidemiologist, program director, and division director at the Texas Department of Health (now Texas Department of State Health Services) for 13 years. While there, she served as the State Environmental Epidemiologist and Chair of the State of Texas Toxic Substances Control Committee. For the past 11 years, she has taught graduate courses in epidemiology, first at Texas State University and then at TAMHSC School of Rural Public Health. She has co-authored numerous peer-reviewed journal articles on birth defects with an emphasis on Mexican-American populations and on environmental and occupational epidemiology, including eight articles within the past 4 years that examine methods of linkage and the relation between residential proximity to hazardous waste sites and industrial facilities and birth defects in offspring. She currently serves as Principal Investigator for a National Institutes of Health R01 grant through the National Institute for Environmental Health Sciences on “Nitrates, Nitrites, Nitrosatable Drugs, and Selected Congenital Malformations.” She also is a member of the TAMU Institutional Review Board and a research collaborator with the Texas Center for Birth Defects Research and Prevention.

Joanna Burger

Joanna Burger, Ph.D., is an ecologist specializing in ecotoxicology. She is a Distinguished Professor at Rutgers University in the Division of Life Sciences and in the Environmental and Occupational Health Sciences Institute, and a professor at the University of Medicine and Dentistry of New Jersey School of Public Health. During her 30+ years at Rutgers, she has taught undergraduate and graduate students ecology, ecological risk, and animal behavior. She is one of the founding members of the Consortium for Risk Evaluation with Stakeholder Participation and has conducted research on stakeholder involvement, environmental justice, risk perception, ecotoxicology, human exposure, risk, and long-term biomonitoring

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around several Department of Energy sites. A major emphasis of this research has been on fishing behavior, perceptions, fish consumption, and risk. Her main research has focused on metals and developmental neurotoxicology, ecological risk, environmental assessment, and biomonitoring at contaminated sites, as well as the effects of humans on animal behavior. She has authored more than 300 peer-reviewed papers in the biomedical literature as well as several books and book chapters. She has served on several national and international committees, including the National Academy of Sciences' Board on Biology and Board of Environmental Studies and Toxicology, and the Scientific Committee on Problems of the Environment, as well as on advisory committees for the U.S. Environmental Protection Agency, the National Oceanic and Atmospheric Administration, and the U.S. Department of the Interior. She has received the Brewster Medal of the American Ornithologists' Union, the Lifetime Achievement Award of the Society of Risk Analysis, and an honorary doctorate from the University of Alaska for her research on radionuclide contamination at Amchitka Island.

Basile Chaix

Basile Chaix received advanced training in epidemiology and public health as a doctoral student at the University Pierre and Marie Curie (Paris, France) and as a post-doctoral student at the University of Lund (Sweden). Since 2007, he has held a permanent position of researcher at Inserm, the French National Institute of Health and Medical Research. Dr. Chaix has worked for 9 years in the field of neighborhood influences on health. He is the Principal Investigator of the RECORD (Residential Environment and CORonary heart Disease) Cohort Study, in which 7,300 participants were recruited in 2007-2008 in the Paris metropolitan area and will be followed over time. His particular interest is to develop and apply innovative strategies for the measurement of neighborhood variables and the modeling of their effects on health. Dr. Chaix is an Advisory Editor at *Social Science and Medicine*, the first world journal in social sciences.

Jayajit Chakraborty

Jayajit Chakraborty, Ph.D., is an Associate Professor and Associate Chair of the Department of Geography at the University of South Florida, Tampa. He has a Ph.D. in Geography and an M.S. in Urban and Regional Planning from the University of Iowa, Iowa City. His research focuses on environmental justice (EJ), environmental health, air pollution, racial/ethnic disparities, vulnerability to environmental hazards, and urban geography. He is particularly interested in applications of geographic information science and spatial statistical techniques. He is the author of numerous articles in prominent academic journals such as *The Annals of the Association of American Geographers*, *Environment and Planning A*, *Journal of Epidemiology and Community Health*, *Risk Analysis*, and *The Professional Geographer*; and a chapter in the Association of American Geographers' centennial publication, *WorldMinds: Geographical Perspectives on 100 Problems* (Kluwer Academic Publishers, 2004), which showcases 100 significant contributions made by geographers since 1904. Dr. Chakraborty is the editor of a new book titled *Spatial and Environmental Injustice in an American Metropolis: A Study of Tampa Bay, Florida* (Cambria Press, 2010) and also has received several research grants to investigate the EJ implications of transportation improvement projects in Florida. Additionally, he has served as a Chair of the Association of American Geographers Hazards Specialty Group (2005-2007), which seeks to promote education, research, and the application of knowledge on natural, technological, and social hazards.

The Honorable Donna M. Christensen continues to distinguish herself as a leader in the United States Congress. As a Member serving her seventh term, she is the first female physician in the history of the U.S. Congress, the first woman to represent an offshore Territory, and the first woman Delegate from the United States Virgin Islands. She serves as an Assistant Majority Whip.

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Donna Christensen

Delegate Christensen is the Second Vice-chair of the Congressional Black Caucus and chairs the Congressional Black Caucus' Health Braintrust, which oversees and advocates minority health issues nationally and internationally. She is a Member of the Congressional Caucus for Women's Issues; Member of the Friends of the Caribbean Caucus; Member of the Coastal Caucus; Member of the Congressional Fire Caucus, the National Guard and Reserve Caucus and the Coast Guard Caucus.

She was born in 1945 to the late Judge Almeric Christian and Virginia Sterling Christian. She earned a Bachelor of Science in 1966 at St. Mary's College in Notre Dame, Indiana. She earned an M.D. (Doctor of Medicine) in 1970 from George
Washington University School of Medicine in Washington, D.C. She interned at Pacific Medical Center in San Francisco, California from 1970 to 1971 and did her residency in
family medicine at Howard University Medical Center from 1973 to 1974. She became a board certified physician in 1977.

She is the mother of two daughters, Rabiah Green George and Karida Green and the grandmother of Nia Elena Hamilton, Kobe George and Nealia Williams. She is the granddaughter of the late renowned Virgin Islands educator Elena Christian. Congresswoman Christensen also gained two new daughters, Lisa and Esther, and two sons, Bryan and David, through her 1998 marriage to Chris Christensen.

Gail C. Christopher

Dr. Gail Christopher is vice president for programs at the W.K. Kellogg Foundation in Battle Creek, Michigan. In this role, she serves on the executive team that provides overall direction and leadership for the Kellogg Foundation and provides leadership for Food, Health & Well-Being, and Racial Equity programming. She is a nationally recognized leader in health policy with particular expertise and experience in the issues related to social determinants of health and health disparities and public policy issues of concern to African Americans and other minority populations. A prolific writer and presenter, she is the author or co-author of three books, a monthly column in the *Federal Times*, and more than 250 articles, presentations, and publications. Prior to joining the Kellogg Foundation, Dr. Christopher was vice president of the Joint Center for Political and Economic Studies' Office of Health, Women, and Families in Washington, DC. She holds a doctor of naprapathy degree from the Chicago National College of Naprapathy in Illinois and completed advanced study in the interdisciplinary Ph.D. program in holistic health and clinical nutrition at the Union for Experimenting Colleges and Universities at Union Graduate School of Cincinnati, Ohio.

Jane E. Clougherty

Jane Clougherty, Sc.D., M.Sc., is the Senior Air Quality Scientist at the New York City Department of Health and Mental Hygiene, where she manages the New York City Community Air Survey, a large study of year-round intra-urban variability in multiple air pollutants. She is a Research Associate at the Harvard School of Public Health Department of Environmental Health, where she completed her Sc.D. and post-doctoral research. Dr. Clougherty's research focuses on chronic social stress and susceptibility to urban air pollution. To this end, she has developed epidemiological studies of chronic urban stressors and susceptibility to air pollution in the etiology and exacerbation of urban asthma in Boston and New York City (the latter recently funded by a U.S. Environmental Protection Agency Science To Achieve Results grant), as well as occupational epidemiological studies of chronic workplace noise exposures and response to industrial air pollution exposures (currently funded by the National Institute for Occupational Safety and Health), and toxicological studies combining chronic social stress exposures among rats and respiratory response to concentrated ambient fine particulate air pollution.

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Aaron J. Cohen

Aaron Cohen, D.Sc., M.P.H., is Principal Scientist at the Health Effects Institute (HEI) in Boston, Massachusetts, where he has worked since 1990. At HEI, Dr. Cohen manages an international program of epidemiologic research on the health effects of air pollution and is involved in scientific program development. Since 1999, he has served as a Temporary Advisor to the World Health Organization (WHO) on the evaluation of epidemiologic evidence, air pollution health impact assessment, and air quality guideline development. He co-chairs the Expert Group on Outdoor Air Pollution that produced estimates of the global burden of disease due to outdoor air pollution for the WHO's Global Burden of Disease Comparative Risk Assessment in 2002, to be updated in 2010. Dr. Cohen holds a D.Sc. in Epidemiology (1991) and a Masters in Public Health (1985) from the Boston University School of Public Health, where he is Adjunct Assistant Professor of Environmental Health. He also is a Registered Respiratory Therapist, and worked for 15 years in newborn intensive care and subsequently as Research Associate in Perinatal Epidemiology at Brigham and Women's Hospital in Boston.

Charlton Coles

Charlton Coles, Ph.D., received his B.S. (1989) in Psychology from Georgia State University and his M.S. (1993) and Ph.D. (1996) in Clinical Psychology from the University of Florida. He currently is employed at the Agency for Toxic Substances and Disease Registry as a behavioral scientist. Recent research work has included asset mapping to identify the strengths of communities in addressing public health concerns and helping evaluate continuing medical education curricula for environmental medicine. Dr. Coles has publications in the *Journal of Clinical Psychology, Aggression and Violent Behavior,* and *Adolescence,* and he has presented at the International Qualitative Health Research Conference, Eastern Psychological Association Conference, and Urban Educational Expo. Current research projects involve the development of a working framework for clinicians and responders to more effectively manage community and family stress from a technological disaster, and the continued development of an obesity intervention for rural African-American women. Dr. Coles also is assisting colleagues in the development of an online environmental literacy course geared toward middle school students. Other research interests include comprehensive anger and anxiety assessments in communities impacted by technological disasters, family psychology, health psychology, and the elimination of health disparities.

Gwen W. Collman

Gwen Collman, Ph.D., is the Acting Director of the Division of Extramural Research and Training at the National Institute of Environmental Health Sciences (NIEHS). Dr. Collman has served in program development and management, first as a member and then as Chief of the Susceptibility and Population Health Branch since 1992. During this time, she directed and managed research on the role of genetic and environmental factors on the development of human disease, from animal models of genetic susceptibility to population studies focusing on etiology and intervention. Dr. Collman was responsible for building the NIEHS grant portfolio in Environmental and Molecular Epidemiology. She developed and managed several complex multidisciplinary research programs that include involvement of communities in partnerships with researchers. These include the NIEHS Breast Cancer and the Environment Research Centers Program; the NIEHS/U.S. Environmental Protection Agency Centers for Children's Environmental Health and Disease Prevention; and the Genes, Environment, and Health Initiative. During the last year, she led a team to create a vision for the Partnerships for Environmental Public Health programs for the next decade. Dr. Collman received a Ph.D. in Environmental Epidemiology from the University of North Carolina, School of Public Health. She has worked at the NIEHS since 1984, first as a member of the Epidemiology Branch in the Division of Intramural Research, and since 1992 as a member of the Division of Extramural Research and Training.

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Deborah A. Cory-Slechta

Deborah Cory-Slechta, Ph.D., became a faculty member at the University of Rochester Medical School (URMC) in 1982. She became Chair of its Department of Environmental Medicine and Director of the National Institutes of Environmental Health Sciences (NIEHS) Environmental Health Sciences Center in 1998, and served as Dean for Research from 2000-2002. She then became Director of the Environmental and Occupational Health Sciences Institute and Chair of the Department of Environmental and Community Medicine at the University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School from 2003-2007, before returning to URMC as Professor in Environmental Medicine and Pediatrics. Dr. Cory-Slechta has served on national review and advisory panels of the National Institutes of Health, the National Institute of Environmental Health Sciences, the U.S. Food and Drug Administration, the National Center for Toxicological Research, the U.S. Environmental Protection Agency (EPA), the National Academy of Sciences, the Institute of Medicine, and the Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention (CDC). She currently serves on the Science Advisory Board of the EPA and on the Advisory Committee for Childhood Lead Poisoning Prevention of the CDC. In addition, Dr. Cory-Slechta has served on the editorial boards of the journals *Neurotoxicology, Toxicology, Toxicological Sciences, Fundamental and Applied Toxicology, Neurotoxicology and Teratology,* and *American Journal of Mental Retardation*. She has held the elected positions of President of the Neurotoxicology Specialty Section of the Society of Toxicology and President of the Behavioral Toxicology Society, and has been named a Fellow of the American Psychological Association. Her research has focused largely on the relationships between brain neurotransmitter systems and behavior, and how such relationships are altered by exposures to environmental toxicants, particularly the role played by environmental neurotoxicant exposures in developmental disabilities and neurodegenerative diseases. These research efforts have resulted in more than 120 papers and book chapters to date.

Stephen R. Couch

Stephen Couch, Ph.D. (Professor of Sociology and Professor of Science, Technology, and Society), is Director of Academic Affairs at the Schuylkill Campus of the Pennsylvania State University. After receiving an undergraduate degree in music from the Oberlin College Conservatory of Music, he remained at Oberlin College for an M.A. in sociology. His doctorate in sociology is from Binghamton University. An award-winning teacher and researcher, Dr. Couch is co-author or co-editor of four books and has written more than 30 published research articles, most of them dealing with environmental sociology and technological hazards. He has presented the results of his research at conferences throughout the United States, as well as in Europe, Mexico, and Japan. His current research interests are in community breakdown and recovery from environmental contamination, the relationship of lay and scientific knowledge concerning environmental risks, popular culture and disasters, and the collective construction of meaning by groups victimized by modern technology. Dr. Couch has served as an expert witness in several cases involving environmental contamination. He has consulted in his areas of expertise for numerous governmental and business organizations, including the U.S. Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry, and Borden Chemicals. He is past Chair of the Environment and Technology Division of the Society for the Study of Social Problems, is former Editor of Social Problems Forum, has been a member of the Board of Directors of the Sociological Practice Association, and sat on the Council of the Environment and Technology Section of the American Sociological Association.

Maureen Cropper

Maureen Cropper, Ph.D., is a Professor of Economics at the University of Maryland, a Senior Fellow at Resources for the Future, and a former Lead Economist at the World Bank. Dr. Cropper has served as

chair of the U.S. Environmental Protection Agency Science Advisory Board Environmental Economics Advisory Committee and as president of the Association of Environmental and Resource Economists. She is a member of the National Academy of Sciences and a Research Associate of the National Bureau of Economic Research. Her research has focused on valuing environmental amenities (especially environmental health effects), on the discounting of future health benefits, and on the tradeoffs implicit in environmental regulations. Her current research focuses on energy efficiency in India, on the impact of climate change on migration, and on the benefits of collective action in pandemic flu control. Dr. Cropper received a B.A. in Economics from Bryn Mawr College (*summa cum laude*, 1969) and a Ph.D. in Economics from Cornell University (1973).

Sally Perreault Darney

Sally Perreault Darney, Ph.D., serves as the National Program Director for the U.S. Environmental Protection Agency's (EPA) Human Health Research Program in the Office of Research and Development (ORD). In partnership with ORD's Labs and Centers and EPA's Program Offices and Regions, she sets strategic directions for and coordinates a multidisciplinary health research program. The program's overarching objective is to inform linkages in the continuum from environmental exposures to human health outcomes. Major goals include understanding children's unique exposures and vulnerabilities, and translating chemical risk knowledge to real-world communities where exposures to chemicals and other stressors are complex. Program outputs include new Web-based mapping tools to help communities identify environmental problems and develop remediation strategies. She also represents EPA on the Interagency Coordinating Committee for the National Children's Study and is active in scientific societies and editorial boards related to reproductive health. After earning a Ph.D. in Anatomy and Reproductive Biology from the University of Hawaii, Dr. Darney completed postdoctoral research at the Bloomberg School of Public Health, Johns Hopkins University. She joined EPA's ORD in 1984 and established a research program in reproductive toxicology. The author of more than 100 peer-reviewed journal articles and reviews, Dr. Darney also has served as the Director of the Reproductive Toxicology Division in ORD's National Health and Environmental Effects Research Laboratory.

Felicia Eaves

Felicia Eaves, Special Projects Coordinator for the Joint Center for Political and Economic Studies, Health Policy Institute, has been a dedicated human rights advocate for nearly 20 years. Ms. Eaves began her journey into social-political advocacy and activism in San Diego, California, where she obtained a degree in Political Science at the University of California, San Diego. Since then, she worked in the area of environmental health justice, beginning in San Diego with the Environmental Health Coalition (EHC), one of the oldest grassroots organizations in the country. As a result of her work with EHC, she later moved to Washington, DC, and began work with the Alliance for Healthy Homes (formerly the Alliance to End Childhood Lead Poisoning) as a project manager to advocacy groups around the country to protect children at highest risk from environmental health hazards in their housing, schools, neighborhoods, and communities. As Special Projects Coordinator for the Joint Center for Political and Economic Studies, Health Policy Institute, Ms. Eaves continues her commitment to working on behalf of low-income communities and people of color in the area of health equity. Through the Place Matters initiative, Eaves serves as project manager to 16 teams responsible for designing and implementing strategies that address the social determinants of health impacting residents in 21 counties and 3 cities.

Paul English

Paul English, Ph.D., M.P.H., currently is State Environmental Epidemiologist and Branch Scientific Advisor for the Environmental Health Investigations Branch at the California Department of Public

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Health (CDPH). He has had more than 15 years' experience working in environmental public health for CDPH, focusing on spatial epidemiology, public health impacts of climate change, environmental health issues at the U.S./Mexico border, and environmental links to adverse reproductive outcomes and asthma, in particular exposures to traffic pollution. During the last 7 years, Dr. English has served as Principal Investigator of the California Environmental Health Tracking Program, which takes a community-based approach to developing surveillance and biomonitoring systems for environmental hazards, exposures, and environmentally related chronic disease. He has been dedicated to responding to community needs and concerns regarding environmentally related disease by integrating environmental epidemiology, health education, community participation, geographic information systems and spatial methodologies, and health policy. He received his masters and doctorate degrees from the University of California at Berkeley.

Laurel Firestone

Laurel Firestone, J.D., co-founded and co-directs the Community Water Center (CWC), a non-profit environmental justice organization located in Visalia, California. The CWC helps disadvantaged, primarily farmworker communities gain access to clean and affordable water. She previously served as the Director of the Rural Poverty Water Project at the Center for Race, Poverty, and the Environment in Delano, under a 2004-2006 Equal Justice Works Fellowship. In 2009, she authored the comprehensive *Guide to Community Drinking Water Advocacy*; and in 2010, she was awarded the Carla Bard Advocacy Award from the Public Officials for Water and Environmental Reform, awarded to one water advocate in California each year. She currently serves on the Tulare County Water Commission. Ms. Firestone graduated with honors from Harvard Law School, where she focused on environmental poverty law. She has been a member of the California Bar since 2004. A native of California, she spent her last year of law school at Boalt Hall through the Berkeley-Harvard Exchange Program. During law school she worked on a variety of projects combining human rights and environmental law, from working with trash pickers in the major cities of Brazil, to advising indigenous groups in the Amazon who sought to protect their traditional knowledge and genetic resources. She also holds a B.A. *magna cum laude* in Environmental Studies from Brown University.

Sheila Foster

Sheila Foster, J.D., is the Associate Dean for Academic Affairs and the Walsh Professor of Real Estate, Land Use, and Property Law at Fordham University. Professor Foster is the author of numerous publications in top law journals, including the *California Law Review*, *Notre Dame Law Review*, *Wisconsin Law Review*, *Harvard Environmental Law Review*, *Georgetown International Environmental Law Review*, and the *Ecology Law Quarterly*. Professor Foster is a coauthor (with Luke Cole) of *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement* (N.Y.U. Press, 2001; second edition forthcoming 2010) and coeditor of the 2nd edition of *The Law of Environmental Justice* (with Michael Gerrard 2008). Professor Foster also has provided legal expertise to a number of nonprofit environmental organizations in New York, New Jersey, and Pennsylvania.

Maria Franco-Spera

Maria Franco-Spera, M.S., presently serves as the Environmental Justice Coordinator and Policy Advisor for the New Jersey Department of Environmental Protection (DEP). She administers New Jersey's Environmental Justice Executive Order and the Environmental Justice Advisory Council to the DEP. In this role, she collaborates and interacts with programs throughout the DEP, sister state agencies, the U.S. Environmental Protection Agency, other states, public officials, non-profit organizations, community representatives, and the public to develop and implement New Jersey's environmental justice (EJ)

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policies. For the past 3 years, she has researched and advised on the development of a methodology that would assist DEP with identifying communities that are disproportionately impacted by environmental burdens. She joined the DEP in 1989, and her DEP career spans research and practice in EJ, policy development, brownfield remediation, public outreach, and climate and energy. Ms. Franco-Spera received her Bachelor of Science in Geology and Chemistry from Hunter College and earned a Master of Science in Geophysics from Pennsylvania State University. Prior to joining the DEP, she worked in the private sector as an oil exploration geophysicist in projects throughout the United States and overseas.

Nicholas Freudenberg

Nicholas Freudenberg, Dr.P.H., is Distinguished Professor of Public Health at the City University of New York (CUNY) School of Public Health at Hunter College and the Graduate Center, and Director of the CUNY Doctoral Program in Public Health. Dr. Freudenberg's research focuses on the social determinants of the health of urban populations. He has worked to develop, implement, and evaluate health programs in schools, communities, churches, and jails and advocated for municipal policies that promote health. He has participated in and evaluated several community-based participatory research projects. He is the author of *Not in Our Backyards! Community Action for Health and the Environment* (1983), and lead editor of *Cities and the Health of the Public* (Vanderbilt Press, 2006), a synthesis of recent scholarship on how city living affects health, and *Urban Health and Society*: *Interdisciplinary Approaches to Research and Practice* (Jossey-Bass, 2009). More recently, Dr. Freudenberg has investigated how the alcohol, automobile, tobacco, firearms, food, and pharmaceutical industries contribute to socioeconomic and racial/ethnic disparities in health and the role of public health advocacy in modifying health-damaging corporate practices.

Howard Frumkin

Howard Frumkin, M.D., Dr.P.H., is Special Assistant to the Director for Climate Change and Health at the Centers for Disease Control and Prevention (CDC). CDC's Climate Change program works to identify and understand the adverse health impacts of climate change, ranging from heat waves to infectious diseases, and to prevent or control these impacts. Dr. Frumkin is an internist, environmental and occupational medicine specialist, and epidemiologist. From 2005 to 2010, he directed the National Center for Environmental Health and Agency for Toxic Substances and Disease Registry (NCEH/ATSDR) at the CDC. During his tenure, NCEH/ATSDR created its Climate Change program; launched training programs for college students, doctoral students, and post-docs; expanded its Built Environment, Biomonitoring, and Environmental Health Tracking programs; and launched its National Conversation on Public Health and Chemical Exposures. Previously, he was Professor and Chair of the Department of Environmental and Occupational Health at Emory University's Rollins School of Public Health and Professor of Medicine at Emory Medical School. Dr. Frumkin previously served on the Board of Directors of Physicians for Social Responsibility, where he co-chaired the Environment Committee; as president of the Association of Occupational and Environmental Clinics; as chair of the Science Board of the American Public Health Association; and on the National Toxicology Program Board of Scientific Counselors. As a member of the Environmental Protection Agency's Children's Health Protection Advisory Committee, he chaired the Smart Growth and Climate Change work groups. He currently serves on the Institute of Medicine Roundtable on Environmental Health Sciences, Research, and Medicine. In Georgia, he was a member of the state's Hazardous Waste Management Authority, the Department of Agriculture Pesticide Advisory Committee, and the Pollution Prevention Assistance Division Partnership Program Advisory Committee, and is a graduate of the Institute for Georgia Environmental Leadership. In Georgia's Clean Air Campaign, he served on the Board and chaired the Health/Technical Committee. He was named Environmental Professional of the Year by the Georgia Environmental Council in 2004. His research interests include public health aspects of the built environment; air pollution; metal and PCB

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toxicity; climate change; health benefits of contact with nature; and environmental and occupational health policy, especially regarding minority communities and developing nations. He is the author or co-author of more than 180 scientific journal articles and chapters, and his books include *Urban Sprawl and Public Health* (Island Press, 2004, co-authored with Larry Frank and Dick Jackson; named a Top Ten Book of 2005 by Planetizen, the Planning and Development Network), *Emerging Illness and Society* (Johns Hopkins Press, 2004, co-edited with Randall Packard, Peter Brown, and Ruth Berkelman), *Environmental Health: From Global to Local* (Jossey-Bass, 2005 and 2010; winner of the Association of American Publishers 2005 Award for Excellence in Professional and Scholarly Publishing in Allied/Health Sciences), *Safe and Healthy School Environments* (Oxford University Press, 2006, co-edited with Leslie Rubin and Robert Geller), and *Green Healthcare Institutions: Health, Environment, Economics* (National Academies Press, 2007, co-edited with Christine Coussens). Dr. Frumkin received his A.B. from Brown University, his M.D. from the University of Pennsylvania, his M.P.H. and Dr.P.H. from Harvard, his Internal Medicine training at the Hospital of the University of Pennsylvania and Cambridge Hospital, and his Occupational Medicine training at Harvard. He is Board-certified in Internal Medicine and Occupational Medicine and is a Fellow of the American College of Physicians, the American College of Occupational and Environmental Medicine, Collegium Ramazzini, and the Royal College of Physicians of Ireland.

Lisa F. Garcia

Lisa Garcia joined the U.S. Environmental Protection Agency (EPA) in January, serving as the Administrator's Senior Advisor on Environmental Justice. Ms. Garcia will help elevate environmental justice (EJ) issues to the highest levels of the Agency and will work closely with all programs to integrate and strengthen all of EPA's EJ initiatives. Ms. Garcia's work will promote meaningful working relationships with EJ communities and build strong partnerships to address some of the country's most persistent environmental challenges. Ms. Garcia joins EPA after serving as the Chief Advocate for Environmental Justice and Equity at the New York State Department of Environmental Conservation. In that position, she developed statewide EJ initiatives to tackle critical environmental challenges and served as co-chair of the Governor's Environmental Justice Interagency Task Force. Ms. Garcia also served as Assistant Attorney General for the New York State Attorney General, where she represented various state agencies in environmental litigation matters and defended New York's Brownfields Cleanup Program. Ms. Garcia also served as Senior Attorney at the New York Public Interest Research Group. Ms. Garcia has a long and impressive history of using her legal, policy, and legislative experience to promote EJ.

Cynthia Giles

Prior to her confirmation as the Assistant Administrator for the U.S. Environmental Protection Agency's (EPA) Office of Enforcement and Compliance Assurance, Cynthia Giles, J.D., M.P.A., served as the Director of the Conservation Law Foundation's Advocacy Center in Rhode Island, where she drafted legislation to control greenhouse gases, influenced the state to adopt stringent emission standards for cars, and defended those standards in court. In her 30-year career, Ms. Giles has prosecuted environmental laws as an Assistant United States Attorney, led the Bureau of Resource Protection in Massachusetts, and served as Director of Enforcement Coordination for EPA Region 3 in Philadelphia. Ms. Giles has a B.A. from Cornell University, a J.D. from the University of California at Berkeley, and an M.P.A. from the Harvard University Kennedy School of Government.

Gary L. Ginsberg

Gary Ginsberg, Ph.D., is a toxicologist at the Connecticut Department of Public Health, within the Division of Environmental and Occupational Health Assessment. He has responsibility for human health

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risk assessments conducted in the state. Dr. Ginsberg serves as adjunct faculty at the Yale School of Public Health and is an Assistant Clinical Professor at the University of Connecticut School of Medicine. He recently finished serving on the National Academy of Sciences Panels on Biomonitoring and Improving U.S. Environmental Protection Agency (EPA) risk methods (Science and Decisions). He is a member of EPA's Science Advisory Panel and has served on the Children's Health Protection Advisory Committee. He received a Ph.D. in toxicology from the University of Connecticut and was a post-doctoral fellow in carcinogenesis/mutagenesis at the Coriell Institute for Medical Research. Dr. Ginsberg's toxicology experience has involved a variety of settings: basic research, teaching, working within the pesticide and consulting industries, and now working in public health. He has published in the areas of toxicology, carcinogenesis, physiologically based pharmacokinetic modeling, inter-individual variability, and children's risk assessment.

Thomas A. Glass

Thomas Glass, Ph.D., is Associate Professor of Epidemiology at the Bloomberg School of Public Health. He is broadly trained in social science and holds a Ph.D. in Medical Sociology from Duke University. He completed post-doctoral training in epidemiology at Yale School of Medicine. He has held teaching positions at Yale School of Medicine, Harvard School of Public Health, and the Johns Hopkins Bloomberg School of Public Health. Dr. Glass primarily is interested in understanding the impact of social and behavioral factors on health and functioning across the lifespan. His previous work has explored the role of social support, social networks, and social engagement on outcomes ranging from stroke recovery to alcohol consumption and cognitive decline. He teaches, directs graduate students, and conducts research in social epidemiology and gerontology. In addition to observational studies, he has done intervention studies to improve function in older persons. More recently, his work has centered on unraveling the impact of factors in the built and social environments on a range of health and behavioral outcomes. He directs the Baltimore Neighborhood Research Consortium at Johns Hopkins. He is Co-Principal Investigator of the Baltimore Memory Study, a large cohort study of the multilevel determinants of cognitive decline in older persons. Among his current projects, Dr. Glass is leading a team to develop and test an integrated sensor system to improve the measurement of social, physical, and cognitive function in population studies. He also has done work related to the role of theory in public health science.

Michael Gochfeld

Michael Gochfeld, M.D., Ph.D., is an environmental toxicologist and occupational physician who is a Professor in the Department of Environmental and Occupational Medicine at the University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School in the Environmental and Occupational Health Sciences Institute (Piscataway, New Jersey). He is one of the founding members of the Consortium for Risk Evaluation with Stakeholder Participation, which provides a variety of research endeavors supporting the Department of Energy's management of nuclear and chemical contamination from the manufacture and testing of nuclear weapons. His research has focused on ecological and human health consequences of occupational and environmental exposure to heavy metals, particularly mercury. From 1999 to 2001, he chaired New Jersey's Mercury Task Force. His work on mercury included investigating cultural practice resulting in exposure to elemental mercury. He has been active in exploring unique environmental exposure pathways and environmental justice. He also has chaired the international Cadmium Working Group for and the Scientific Group on Methodology for Safety Evaluation of Chemicals for the Scientific Committee on Problems of the Environment. He also is a clinician seeing patients exposed to heavy metals and other contaminants in their home, community, or workplace environments, one aspect of which is evaluation of high-end fish consumers exposed to methylmercury. He received the Health Achievement Award from the American College of Occupational and

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Environmental Medicine. He is author of more than 200 peer-reviewed papers on environmental and occupational health and has contributed book chapters on toxicology and risk assessment.

Richard D. Schulterbrandt Gragg III

Richard Schulterbrandt Gragg III, Ph.D., serves as Associate Director and Associate Professor of the Environmental Sciences Institute and Director of the Florida Center for Environmental Equity and Justice at Florida A&M University (FAMU). His research and professional interests include: the impact of environmental contaminants on human health and aquatic ecosystems; environmental health disparities; environmental equity and justice; community-based participatory research; and public health policy. Dr. Gragg has numerous refereed publications, professional presentations, and reports, including serving as guest editor for the *Environmental Justice* journal. He teaches undergraduate and graduate courses in environmental toxicology, environmental ethics, environmental toxicology and human health, and environmental justice, and directs undergraduate and graduate students in thesis and dissertation research. He is the Chair of the FAMU Environment and Sustainability Council and serves as a member of the Audubon of Florida Board of Directors, the Gadsden County Community Health Council, and the National Council of Science and the Environment, Council of Environmental Deans and Directors. He is a former member of the Florida Environmental Regulations Commission, and the U.S. Environmental Protection Agency, National Environmental Justice Advisory Council and Health and Research Subcommittee.

Gary R. Grant

Gary Grant is the Executive Director of the internationally acclaimed Concerned Citizens of Tillery and is the founding president of the national Black Farmers and Agriculturalists Association, the director of the National Land Loss Fund, and director of the North Carolina Environmental Justice Network. The son of the late Matthew and Florenza Moore Grant, Grant was reared on a family farm in the New Deal Community of Tillery Farms, Halifax County, North Carolina. Holder of a B.A. degree from North Carolina College (now NC Central University), Durham, he was a teacher in the Halifax County School System and worked with the New York City Department of Human Services. Mr. Grant has appeared on CBS's *60 Minutes* "Pork Power" 1996, on NC Public Television "Now," and numerous other media. He has authored and co-authored several papers on the destruction of the environment by corporate hog growing facilities and the decline of black farmers in America. He also gave the commencement address at the 2009 graduation of the Gillings School of Global Public Health at the University of North Carolina at Chapel Hill.

Peter Grevatt

Peter Grevatt, Ph.D., is the Director of the Office of Children's Health Protection and Environmental Education and the Senior Advisor to U.S. Environmental Protection Agency (EPA) Administrator Jackson for Children's Environmental Health. He is responsible for ensuring that all EPA decisions are protective of children's health and that EPA is an international leader on children's environmental health issues. Dr. Grevatt served as the Senior Science Advisor in EPA's Office of Solid Waste and Emergency Response and as the senior health scientist in EPA's Region 2 office. In these roles, he was responsible for ensuring that science, public health, risk assessment, environmental justice, and children's health were fully considered for a range of critical issues such as asbestos, PCBs, lead, and arsenic. Dr. Grevatt led the national water quality monitoring program in EPA's Office of Water, and more recently, as Director of the Economics, Methods and Risk Analysis Division in EPA's Office of Resource Conservation and Recovery. He provided leadership to the Regions and States on Resource Conservation and Recovery Act implementation, and provided health risk assessments and economic cost-benefit analyses on major

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rulemakings. He received his B.A. degree in Biology from Earlham College and his M.S. and Ph.D. degrees in Basic Medical Sciences from New York University Medical Center.

Charles Griffiths

Charles Griffiths, Ph.D., is an Economist in the U.S. Environmental Protection Agency's National Center for Environmental Economics. He earned his Ph.D. in Economics from the University of Maryland and a Masters in Economics from the University of Zimbabwe. His current areas of research include work on climate change and the social cost of carbon, environmental justice, valuation of water quality improvements, risk and benefits assessment, evaluation of voluntary programs, and air pollution and health impacts. He has worked on a number of regulatory actions, including the proposed and final rule for Concentrated Animal Feeding Operations and the Clean Air Mercury Rule. Prior to joining the EPA, Dr. Griffiths worked at a macroeconomic forecasting group at the University of Maryland and for the World Bank's Development Economic Research Group and taught at Gettysburg College. He recently worked as a Senior Economist at the Council of Economic Advisers and currently teaches evening and summer classes at Johns Hopkins University.

Monique C. Harden

Monique Harden, J.D., is the co-director and attorney of Advocates for Environmental Human Rights (AEHR), a nonprofit, public interest law firm in New Orleans, Louisiana, that she co-founded with attorney Nathalie Walker in 2002. AEHR is dedicated to upholding the human right to live in a healthy environment. The organization works to transform legal systems that make communities vulnerable to environmental disaster and displacement. AEHR provides human rights-based legal services, community organizing support, and public advocacy campaigns. On behalf of African Americans living in the historic community of Mossville, Louisiana, Ms. Harden and AEHR legal staff filed the first-ever human rights petition that seeks fundamental change of the United States environmental regulatory system. The Mossville human rights/environmental justice case currently is pending with the Inter-American Commission on Human Rights of the Organization of American States. In the aftermath of Hurricanes Katrina and Rita, AEHR is spearheading advocacy and organizing efforts aimed at establishing recovery as a legal right, not an empty promise, in accordance with the United Nations' *Guiding Principles on Internal Displacement*. Ms. Harden has coordinated international coalitions advocating for human rights.

Sam Harper

Sam Harper, Ph.D., is an Assistant Professor in the Department of Epidemiology, Biostatistics, and Occupational Health at McGill University in Montreal, Quebec. He received his training in epidemiology at the University of South Carolina and the University of Michigan, and was a research fellow at the National Center for Health Statistics. His research interests are in social epidemiology and population health, health demography, and public health ethics. He currently is working in three principal areas: methods for measuring and monitoring health inequalities, the analysis of global inequalities in health and risk factors, and the use of microsimulation models for evaluating population health interventions. He is currently working with the U.S. National Cancer Institute and the World Health Organization on the development of indicators for monitoring social inequalities in health.

Reginald F. Harris

Since coming to the U.S. Environmental Protection Agency's (EPA) Mid-Atlantic Regional Office located in Philadelphia in 1990, Reginald Harris, M.A., has served as a Toxicologist in the Superfund Program, as Special Assistant to the Deputy Regional Administrator, and as the Regional Environmental Justice (EJ) Coordinator. He currently is a Senior Toxicologist and the Regional EJ Coordinator. From

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1990 through 1995, he served as a Toxicologist in the Superfund Program. From 1995 to 1997, he also served as a Special Assistant to the Deputy Regional Administrator. Mr. Harris's duties and responsibilities have included serving as the co-chair of the Cleanup and Remediation EJ review Protocol Development Team for EPA, Chair of the All States EJ Work Group, and the Designated Federal Official to the South Africa Working Group for the National Environmental Justice Advisory Council's International Subcommittee. He also has held management responsibilities for various EJ initiatives; written and reviewed risk assessments; worked as the Lead Toxicologist for the Chester Risk Study and as Technical Advisor to the South/Southwest Philadelphia Environmental Risk Study, Regional Toxics Integration Coordinator, co-chair of the EPA Risk Assessors Teleconference Calls; participated in the Greater Leadership Opportunities Program; and served as facilitator for the EPA Environmental Assessment course in Hong Kong and Principles of Solid Waste Management Planning course in Poland, Hungary, and South Africa. Mr. Harris makes numerous presentations at colleges, universities, national forums, and other meetings and symposia. He serves as an adjunct lecturer at the University of Pennsylvania in the Masters of Environmental Studies Program. Additionally, Mr. Harris served as an instructor of Secondary Science Education in the Baltimore City Public Schools, conducted immunochemistry research at the Johns Hopkins University School of Medicine and for the Department of the Army, and served as an Industrial Hygienist and Program Manager in the Lead Poisoning Prevention Program with the Maryland Department of the Environment.

Earl L. Hatley

Earl Hatley, M.A., is a co-founder of LEAD Agency, Inc., a grassroots group in northeastern Oklahoma, and served as the Board President from 1997-2003. LEAD's original focus was the Tar Creek Superfund Site. The Site is a 40-square-mile area of abandoned lead and zinc mines impacting the subsistence and cultural resources of the 10 tribes located in the area. LEAD Agency is predominantly of Native American membership. LEAD Agency is a member of the Waterkeeper Alliance, founded by Robert F. Kennedy Jr., and Mr. Hatley serves as the Grand Riverkeeper, patrolling the Grand Lake O' the Cherokees and feeder streams of the upper Grand River watershed. Mr. Hatley was appointed by Oklahoma's Governor to serve on the Hazardous Waste Management Advisory Council for the Oklahoma Department of Environmental Quality in March 2007, representing the State's environmental community. Since October 2007, Mr. Hatley serves on the Board of Directors for the Oklahoma Sustainability Network and serves on the Steering Committee for the Western Mining Action Network, including the Indigenous Environment Network's tribal caucus. Mr. Hatley also works as an environmental consultant to Indian Tribes and Alaska Native Villages, as well as indigenous grassroots groups around the country. He works with tribal governments to develop environmental programs and water and air quality monitoring projects; write quality control instruments; write grants; conduct culturally based risk assessments; and conduct hazardous waste site investigations. Mr. Hatley also serves as an organizing consultant to national and statewide non-profit groups, including the Indigenous Environmental Network. He served as a consultant and co-leader on a $5 million grant as a partner with Harvard School of Public Health and LEAD Agency. In this capacity, he developed the Tribal Subcommittee of the grant's Community Advisory Board. Mr. Hatley served as a Special Consultant to the Community-Tribal Subcommittee for the Board of Scientific Counselors of the Agency for Toxic Substances and Disease Registry (ATSDR), and served as a member of the *Ad Hoc* Tribal Working Group of the Office of Tribal Affairs at ATSDR. In addition, Mr. Hatley served as an advisor to the Tribal Environmental Coalition in Oklahoma (TECO), a coalition of all 39 federally recognized tribes in the state, and served as a TECO representative on the Oklahoma Water Monitoring Council, organized under the office of the Oklahoma Secretary of the Environment. From August 2000 to January 2003, Mr. Hatley served as the Director for the office of Tribal Environmental Management Services (TEMS) at the University of Tulsa College of Law-National Environmental Law and Policy Institute (NELPI). TEMS provides technical, legal, and organizing assistance to tribes, tribal consortia, and inter-tribal environmental organizations that represent

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tribal government. Activities included: (1) conducting a 2-year research project, as a contractor, for the Tribal Association on Solid Waste and Emergency Response, funded by the U.S. Environmental Protection Agency (EPA). The purpose of the project was to identify abandoned and active industrial sites located on or near tribal lands that may impact human health and the environment, and develop a model for conducting risk assessments that are sensitive to tribal, cultural, and subsistence practices; (2) assisting tribes with development of air, water, Superfund, and solid waste programs or projects; (3) representing tribes on Superfund activities, including Natural Resource Damage Assessment Actions; (4) environmental program development, including grant writing, project development, and development of Quality Control/Quality Assurance instruments; and (5) writing water quality standards specific for tribal clients. Prior to coming to Tulsa University, Mr. Hatley served as the Environmental Program Director for the Quapaw Tribe of Oklahoma. As founding director for that department, he built the program to a staff of five. The Tar Creek Superfund Site is the key environmental issue for the tribe. During Mr. Hatley's tenure, the Tribe received the first Remedial Investigation and Feasibility Study ever provided to a Tribe by the EPA. In, addition, the tribe was approved for Program Authority under the Clean Water Act and began an aggressive water monitoring program of the three streams in the Tribe's jurisdiction (including Tar Creek). The Tribe developed an air program that includes regional stations for PM 10, PM 2.5, and mezonet. The Tribe also began an emergency response program. He also has served as Regional Organizer for the national non-profit organization National Toxics Campaign (1990-1993), and as Director of the statewide group Oklahoma Toxics Campaign (1993-1997). His degrees include: ABD, Environmental Science Ph.D. Program, Oklahoma State University, Stillwater; M.A., Political Science, Oklahoma State University, Stillwater; and B.A., Human Development, Flaming Rainbow University/Westminster College, Fulton, Missouri, and Tahlequah, Oklahoma. He is a Mentor in the Prescott College off-campus degree program and served as Adjunct Faculty at Oklahoma State University-Oklahoma City, teaching courses on social ecology and environmental policy. Mr. Hatley has extensive research and grant management experience. His Political Science training included conducting demographic research, developing qualitative survey techniques, and developing quantitative survey instruments. He has utilized these techniques in the political and environmental science arenas. Mr. Hatley is Cherokee/Delaware and belongs to the Long Hair Clan of the Cherokee.

Lisa Heinzerling

Lisa Heinzerling, J.D., is the Associate Administrator of the U.S. Environmental Protection Agency's (EPA) Office of Policy, Economics, and Innovation. Prior to this, she was a member of the Presidential Transition Team for EPA and served as Senior Climate Policy Counsel to Administrator Jackson. After finishing law school, where she served as editor-in-chief of the *University of Chicago Law Review*, Ms. Heinzerling clerked for Judge Richard A. Posner of the U.S. Court of Appeals for the Seventh Circuit and Justice William J. Brennan Jr. of the U.S. Supreme Court. She was a Skadden Fellow at Business and Professional People for the Public Interest in Chicago and, for 3 years, practiced environmental law in the Massachusetts Attorney General's office. She has served as a law professor at Georgetown University Law Center since 1993, and has been a visiting professor at the Harvard and Yale Law Schools. Her scholarship in environmental law has been published in, among other places, the *Yale Law Journal*, *Harvard Law Review*, *University of Chicago Law Review*, and *Georgetown Law Journal*. She is the author, with Frank Ackerman, of *Priceless: On Knowing the Price of Everything and the Value of Nothing* (The New Press, 2004). She was the lead author of the winning briefs for petitioners in Massachusetts v. EPA, in which the Supreme Court held that the Clean Air Act gives EPA the authority to regulate greenhouse gases.

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Jonathan Heller

Jonathan Heller, Ph.D., co-founded Human Impact Partners (HIP) in 2006. HIP believes that health should be considered in all decision making. It raises awareness of and collaboratively uses innovative data, processes, and tools that evaluate health impacts and inequities to transform the policies, institutions, and places people need to live healthy lives. Through training and mentorship, HIP also builds the capacity of impacted communities and their advocates, workers, public agencies, and elected officials to conduct health-based analyses and use them to take action. Dr. Heller has worked on more than a dozen Health Impact Assessments (HIA), conducted many HIA trainings, and provided technical assistance to others conducting HIAs. Prior to HIP, he worked for 9 years in the biotechnology industry, where his focus was on data analysis for projects utilizing innovative technologies for cancer and diabetes detection and treatment. Dr. Heller received his bachelor's degree with Honors in Applied Mathematics from Harvard University in 1989. He then spent 1990 and 1991 in the Peace Corps in Papua, New Guinea. Upon his return, he earned his doctorate at the University of California at Berkeley in Biophysics, where he was a Howard Hughes Pre-doctoral Fellow. Dr. Heller currently serves on the board of the Center for Community Change.

Barbara A. Israel

Barbara Israel, Dr.P.H., is a Professor in the Department of Health Behavior and Health Education at the School of Public Health, University of Michigan. She received her M.P.H. and Dr.P.H. degrees in Health Behavior and Health Education at the School of Public Health, University of North Carolina at Chapel Hill. Dr. Israel has published widely in the areas of: the social and physical environmental determinants of health and health inequities; the relationship among stress, social support, control, and physical and mental health; community empowerment and health; and community-based participatory research (CBPR). Dr. Israel has extensive experience conducting CBPR in collaboration with partners in diverse communities. Since 1995, she has worked together with academic and community partners to establish and maintain the Detroit Community-Academic Urban Research Center, initially funded by the Centers for Disease Control and Prevention. The Center involves multiple National Institutes of Health and foundation-funded basic etiologic research and intervention research projects aimed at increasing knowledge and addressing factors associated with health inequities and the quality of life of residents in Detroit, Michigan. Dr. Israel is actively involved in several of these CBPR projects examining and addressing, for example, the social and physical environmental determinants of cardiovascular disease, the environmental triggers of childhood asthma, access to food and physical activity spaces, diabetes management and prevention, and capacity building for and translating research findings into policy change.

Lisa P. Jackson

Administrator Lisa Jackson leads the U.S. Environmental Protection Agency's (EPA) efforts to protect the health and environment for all Americans. She and a staff of more than 17,000 professionals are working across the nation to usher in a green economy, address health threats from toxins and pollution, and renew public trust in EPA's work. As Administrator, Ms. Jackson has pledged to focus on core issues of protecting air and water quality, preventing exposure to toxic contamination in our communities, and reducing greenhouse gases. She has promised that all of EPA's efforts will follow the best science, adhere to the rule of law, and be implemented with unparalleled transparency. Ms. Jackson is the first African American to serve as EPA Administrator. She has made it a priority to focus on vulnerable groups, including children, the elderly, and low-income communities that are particularly susceptible to environmental and health threats. In addressing these and other issues, she has promised all stakeholders a place at the decision-making table. Before becoming EPA's Administrator, Ms. Jackson served as Chief of Staff to New Jersey Governor Jon S. Corzine and as Commissioner of the State's Department of

Environmental Protection (DEP). Prior to joining DEP, she worked for 16 years as an employee of the EPA. Ms. Jackson is a *summa cum laude* graduate of Tulane University and earned a master's degree in chemical engineering from Princeton University.

David Jacobs

David Jacobs, Ph.D., C.I.H., is the Director of Research at the National Center for Healthy Housing. He has published numerous articles in the peer-reviewed literature on the association between housing and health, including work on asthma, lead poisoning, green building health outcomes, energy conservation, and other areas. He has testified before Congress on several occasions and has collaborated with the World Health Organization. Dr. Jacobs is the former Director of the Office of Healthy Homes and Lead Hazard Control at the U.S. Department of Housing and Urban Development. He also is an adjunct professor at the University of Illinois at Chicago and Johns Hopkins University.

Daniel Kass

Daniel Kass, M.S.P.H., is the Assistant Commissioner for the Bureau of Environmental Surveillance and Policy (BESP) at the New York City (NYC) Department of Health. The Bureau provides epidemiologic, analytic, and policy analysis and other services; promotes public awareness of environmental health; and works on a variety of urban environmental concerns. The Bureau led the environmental biomonitoring component of the NYC Health and Nutrition Examination Survey, which evaluated adult population exposures to heavy metals and pesticides. Mr. Kass also serves as the Principal Investigator on the agency's Environmental Public Health Tracking grant, a Centers for Disease Control and Prevention-funded effort to enhance environmental surveillance. Mr. Kass oversees NYC's pesticide use reduction program and is an appointed member of the U.S. Environmental Protection Agency's (EPA) Pesticide Program Dialogue Committee. Before joining the Department, he directed the Hunter College Center for Occupational and Environmental Health. He earned an Sc.B. degree from Brown University and an M.S.P.H. degree from the University of California at Los Angeles School of Public Health, and completed doctoral studies at New York University's Wagner School. In 2008, he and other staff at BESP received the EPA Regional Children's Environmental Health Champion Award for their work in understanding and preventing exposures to methylmercury. Mr. Kass currently serves as the Acting Deputy Commissioner for Environmental Health, overseeing the programs in food safety, child care, pest control, public health engineering, poison control, environmental disease prevention, and emergency preparedness.

Martha H. Keating

Martha Keating, M.S., is Director of Research Translation at the Children's Environmental Health Initiative, Nicholas School of the Environment, Duke University. Her work focuses on addressing health disparities through regulatory and policy change. Her research includes risk communication, impacts of environmental exposures on vulnerable populations, environmental justice, and regulatory policy development. Ms. Keating's prior experience includes policy analysis at the U.S. Environmental Protection Agency and as a consultant to national advocacy groups. She has recently served as Project Manager for a National Institute of Environmental Health Sciences funded project focusing on communicating complex environmental health messages to the Latino population. Ms. Keating also is a member of the Southern Center on Environmentally Driven Disparities in Birth Outcomes and serves as Principal Investigator of the Community Outreach and Translation Core.

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Roger Kim

Roger Kim is the Executive Director of the Asian Pacific Environmental Network (APEN). APEN organizes and builds the leadership of Asian immigrant and refugee communities to achieve environmental and social justice. APEN has successfully developed cutting-edge community organizing models in the Laotian refugee community in Richmond and the Chinese immigrant community in Oakland. APEN's grassroots members have won several significant environmental justice campaigns and, through APEN's Vote Action program, have educated and turned out thousands of Chinese and Laotian voters in their native languages on key ballot issues. APEN is a nationally recognized leader in the fields of environmental and social justice, environmental health, and civic participation. Mr. Kim brings his background in the social justice, environmental, and philanthropic sectors to the environmental justice mission of APEN. Before becoming APEN's executive director, he was previously the organization's associate director and policy director. He also worked at the San Francisco Foundation as the Environment Program Fellow and at Global Green USA on advancing energy-efficient and green building practices in affordable housing developments. Mr. Kim is currently on the board of the Center for Environmental Health and the Advisory Committee to Congresswoman Barbara Lee.

Amy D. Kyle

Amy Kyle, Ph.D., M.P.H., is on the faculty of the School of Public Health at the University of California at Berkeley. She leads a multidisciplinary team working on cumulative impacts and conducted a December symposium on "Assessing and Addressing Cumulative Impacts in California Communities." She works on policies to promote environmental health at the community level, environmental justice, and protection for infants and children. She leads research translation for the largest program in environmental health research at Berkeley and is a co-investigator at the Center for Excellence in Environmental Public Health Tracking and the Center for Integrative Research on Childhood Leukemia and the Environment. She teaches graduate students about public policy and how to participate in and learn from discussions with people of different backgrounds. She works with community-based and non-governmental organizations, executive and legislative agencies, and academic partners. She was a founding member of the State Environmental Health Indicators Collaborative and works with many state environmental protection and public health agencies. She spent her formative years in public service, serving for 5 years as Deputy Commissioner for the Alaska Department of Environmental Conservation and, before that, working for three governors on a variety of environmental, health, and natural resource issues. Her M.P.H. and Ph.D. in Environmental Health Sciences and Policy are from the University of California at Berkeley and her B.A. in Environmental Sciences is from Harvard College. She was elected Councilor to the Environment Section of the American Public Health Association and serves on the federal Children's Health Protection Advisory Committee.

Peter Langlois

Peter Langlois received his Ph.D., in community health sciences from the University of Texas School of Public Health, with concentrations in epidemiology and environmental health. For the past 15 years, he has worked as the senior epidemiologist for the Birth Defects Epidemiology and Surveillance Branch of the Texas Department of State Health Services and has conducted several birth defect cluster investigations and small area analyses. He is also the Co-Principal Investigator for the Centers for Disease Control and Prevention-funded Texas Center for Birth Defects Research and Prevention. Dr. Langlois's research interests include the environmental and occupational causes of birth defects. He has co-authored several papers on the association of selected birth defects with maternal residence near hazardous waste sites and industrial facilities, and on urban-rural patterns of birth defect occurrence.

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Jonathan I. Levy

Jonathan Levy, Sc.D., is the Mark and Catherine Winkler Associate Professor of Environmental Health and Risk Assessment in the Department of Environmental Health at the Harvard School of Public Health in Boston, Massachusetts. He received his Sc.D. from the Harvard School of Public Health in Environmental Science and Risk Management, with a B.A. in Applied Mathematics from Harvard College. His primary research interests involve methods and applications related to air pollution exposure assessment and health risk assessment, with a focus on urban environments and issues of heterogeneity and equity. He recently served as Principal Investigator on a grant involving development of quantitative indicators of equity for use in risk assessment and benefit-cost analysis, and he has been involved in multiple case studies demonstrating the application and interpretation of these indicators. Current research efforts include evaluating spatial patterns of air pollution in urban settings with complex terrain and developing discrete event simulation models of the influence of indoor environmental exposures on pediatric asthma in low-income housing. Dr. Levy was the recipient of the Walter A. Rosenblith New Investigator Award from the Health Effects Institute in 2005. He recently served on the National Research Council (NRC) Committee on Improving Risk Analysis Methods Used by the U.S. Environmental Protection Agency, and he currently serves on the NRC/Institute of Medicine Committee to Develop Framework and Guidance for Health Impact Assessment. He teaches graduate and undergraduate courses at Harvard related to risk assessment and the urban environment.

Corine Li

Corine Li is Manager of the Drinking Water Office at the U.S. Environmental Protection Agency's (EPA) Pacific Southwest Region in San Francisco, California. In this capacity, she works with a complement of engineers and scientists responsible for overseeing delegated drinking water programs in Arizona, California, Hawaii, Nevada, Navajo Nation, and the outer Pacific islands of American Samoa, the Commonwealth of Northern Marianas, and Guam. Her office also works closely with 147 federally recognized Native American Tribes and the 530 tribal water systems to meet federal drinking water requirements pursuant to the Safe Drinking Water Act. Many of the underserved communities (tribes, territories, rural) in the United States are vulnerable to serious public health and environmental problems as a result of limited access to safe drinking water supplies; ineffective or nonexistent systems for collecting and managing residential and municipal wastewater; and impacts from water supply contamination due to current and past agricultural, industrial, and mining practices. Current regional efforts are underway on tribal lands and in the Pacific Islands to address and mitigate exposure to microbial and chemical contamination from the water supply and to improve collection and management of wastewater. The challenges are further exacerbated by the lack of technical, managerial, and financial capability of the utility; jurisdictional issues and misconception over the true costs for providing safe drinking water; and basic sanitation. She is a registered Professional Engineer in the State of California and has been with EPA for more than 25 years.

Debbie Lowe Liang

Debbie Lowe Liang, M.P.H., is an environmental scientist at the U.S. Environmental Protection Agency Region 9 in San Francisco. She currently is working in the Environmental Justice Program, which works to better protect public health and the environment for the most vulnerable and most heavily impacted communities. Her current projects are geographically focused on the San Joaquin Valley in California and Hawaii. She also works on science issues relevant to environmental justice, such as cumulative impacts and community vulnerability. Ms. Liang received her Masters in Public Health from the University of California (UC) at Berkeley, where she conducted research on schistosomiasis in rural China. She also holds a Masters in Environmental Engineering from the University of Southern California, and a B.A. from UC Berkeley in

Environmental Sciences. In addition, she recently completed the Centers for Disease Control and Prevention's Environmental Public Health Leadership Institute.

Stephen H. Linder

Stephen Linder, Ph.D., currently is a Professor at the University of Texas School of Public Health, with appointments in three Divisions at the School—Management, Policy, and Community Health; Health Promotion and Behavioral Science; and Environmental and Occupational Health. He also is the Associate Director of the Institute for Health Policy. He received his doctorate in political science from the University of Iowa and was trained in conflict resolution at the University of Texas Law School. He was on the faculty of the University of California at Los Angeles and Tulane University before coming to the School of Public Health in 1984. In 2004, he was named a Piper Professor by the Minnie Stevens Piper Foundation for excellence in teaching. He has served on the Texas Public Utility Commission's Study Panel on Electric and Magnetic Field Effects, on the Scientific Advisory Board of the Electric Power Research Institute, and on the Environmental Advisory Committee of the Greater Houston Partnership. His environmental research has focused on risk theory and risk communications, electric and magnetic field mitigation, regulatory enforcement, adaptation to climate change, and most recently on the assessment of air toxics and cumulative risk in the Greater Houston Area.

Kathryn R. Lundquist

Kathryn Lundquist, M.S., is a third-year Ph.D. student in the Environmental Engineering program in the Civil Engineering Department at the University of Minnesota in Minneapolis, Minnesota.
Ms. Lundquist earned an A.B. in Engineering Sciences and Russian Language and Literature and a B.E. in Engineering Sciences from Dartmouth College, and an M.S. in Civil Engineering with a minor in Public Health from the University of Minnesota. Prior to pursuing her Ph.D., Ms. Lundquist worked for an environmental consulting firm as a human health risk assessor. Her responsibilities included characterizing risks for various sites, drafting reports, and developing a Geographic Information System-based method of evaluating large sites for potential hazards to residents, workers, and citizens.
Ms. Lundquist's dissertation research uses air dispersion modeling and time-activity information to model exposure and the effects of emission reductions on that exposure. One key objective of the research is to be able to prioritize pollution prevention from those sources that have the greatest effect on exposure and environmental justice. She plans to continue pursuing an interdisciplinary approach to her research and produce results that are relevant to engineering, public health, ethical, and political challenges.

Juliana A. Maantay

Juliana Astrud Maantay, Ph.D., is Professor of Urban and Environmental Geography and Acting Chair in the Department of Environmental, Geographic, and Geological Sciences at Lehman College, City University of New York (CUNY), and Director of Lehman's Geographical Information Science (GISc) Program, and the Urban GISc Lab. She also is a faculty member in Lehman's M.P.H. program, the Earth and Environmental Sciences Ph.D. program at the CUNY Graduate Center, and the doctoral program in Public Health (D.P.H.), as well as a research scientist with NOAA-CREST, the National Oceanic and Atmospheric Administration Center of Remote Sensing Science and Technology at City College, CUNY.
Dr. Maantay has more than 20 years' experience as an urban and environmental planner and policy analyst with governmental agencies, non-profit organizations, and private sector consulting firms, and has been active in environmental health justice research and advocacy for more than 15 years. Her research interests include using GISc for spatial analyses of environmental health justice issues; environmental modeling; land use, the built environment, and health impacts; urban hazards and risk assessment; and

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community-based participatory research. She currently is Co-Principal Investigator in grant-funded projects with NOAA, the National Institute of Environmental Health Sciences (NIEHS), the U.S. Department of Agriculture, and the National Center for Minority Health and Health Disparities, conducting research on the relationship between air pollution and respiratory and cardiovascular disease, diabetes/obesity and location of active recreational spaces and healthy food choices, urban agriculture and health, segregation and disease, and geovisualization of health data. Her research on environmental health justice has been published in journals such as the *American Journal of Public Health*, *Environmental Health Perspectives*, *Health and Place*, *International Journal of Health Geographics*, *Applied Geography*, *Urban Geography*, and the *Journal of Law, Medicine, and Ethics*, and her work also appears in a number of edited volumes on urban public health issues and environmental health justice. Her book, *GIS for the Urban Environment* (2006), promotes the ethical use of GIScience for environmental awareness and community empowerment. She is co-authoring a new book, *Geospatial Analysis of Environmental Health*, with Dr. Sara McLafferty (forthcoming, 2010). Dr. Maantay has been invited to present her environmental health justice research at the New York Academy of Sciences, U.S. Environmental Protection Agency, National Research Council of the National Academy of Sciences, NIEHS, and the United Nations, among others. Dr. Maantay has a Ph.D. in Urban Environmental Geography from Rutgers University, a Master of Urban Planning (M.U.P.) from New York University, an M.A. in Environmental Geography/Geographic Information Systems from Hunter College/CUNY, and a B.Sc. in Environmental Analysis from Cornell University.

Kelly Maguire

Kelly Maguire, Ph.D., is an Economist in the National Center for Environmental Economics within the U.S. Environmental Protection Agency's Office of Policy, Economics, and Innovation. Her work has focused on a developing technical guidance for conducting environmental justice (EJ) analysis in a rule-making setting, as well as EJ issues related to municipal solid waste host fees and hazardous waste taxes. She also provides technical assistance within the Agency and conducts research on valuing mortality risk reductions from environmental policy. She holds a B.A. in Economics from the University of Rochester (1991) and a Ph.D. in Economics from Georgia State University (1999).

Bruce S. McEwen

Bruce S. McEwen, Ph.D., is the Alfred E. Mirsky Professor and Head of the Harold and Margaret Milliken Hatch Laboratory of Neuroendocrinology at The Rockefeller University. He is a member of the U.S. National Academy of Sciences and the Institute of Medicine. He served as Dean of Graduate Studies from 1991-1993 and as President of the Society for Neuroscience in 1997-1998. As a neuroscientist and neuroendocrinologist, his laboratory combines molecular, anatomical, pharmacological, physiological, and behavioral methodologies and relates their findings to human clinical information. His current research focuses on stress effects on the amygdala and prefrontal cortex as well as hippocampus, and his laboratory also investigates sex hormone effects and sex differences in these brain regions. In addition, he served on the MacArthur Foundation Research Network on Socioeconomic Status and Health, for which he helped to reformulate concepts and measurements related to stress and stress hormones in the context of human societies. This led to the concept of "allostatic load," which describes the wear and tear on the body and brain from chronic stress and related lifestyle behaviors that lead to dysregulation of physiological stress pathways that normally are protective. He also is a member of the National Council on the Developing Child, which focuses on healthy brain development as a key to physical and mental health. He is the co-author of a book with science writer Elizabeth Lasley for a lay audience called *The End of Stress as We Know It*, published in 2002 by the Joseph Henry Press and the Dana Press, and another book with science writer Harold M. Schmeck Jr. called *The Hostage Brain*, published in 1994 by The Rockefeller University Press.

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Michael Metzger

Michael Metzger currently is the chief of Risk Assessment Branch 7 in the Health Effects Division (HED) of the Office of Pesticide Programs (OPP) at the U.S. Environmental Protection Agency (EPA). Mr. Metzger came to EPA in 1985 and worked as a chemist in the Office of Toxic Substances (now OPPT) for a short time, then moved to OPP in 1986. He became chief of the Chemistry Branch in OPP in 1995, then chief of the Risk Characterization and Analysis Branch shortly after. Most of his career at EPA has been as chief of multidisciplinary science branches performing risk assessments for pesticides. He authored the first guidance document on conducting aggregate exposure assessments for pesticides and has been involved in much of the policy development related to implementation of the requirements of the Food Quality Protection Act (FQPA). He currently is a member of the Environmental Justice Training team in OPP.

Vernice Miller-Travis

Vernice Miller-Travis is a policy consultant to the Lawyers' Committee for Civil Rights Under Law and is a co-author of their forthcoming report *Now Is the Time*. A seasoned urban planner focusing on the interrelationship between racial segregation, land use, and environmental protection, as well as on environmental policy and civil rights advocacy, Ms. Miller-Travis is the Principal of Miller-Travis & Associates, an environmental consulting firm. She also serves as Vice-Chair of the Maryland State Commission on Environmental Justice and Sustainable Communities. Ms. Miller-Travis launched the Ford Foundation's U.S. environmental justice (EJ) portfolio while serving as a program officer in the Community and Resource Development Unit. Prior to that, she was the Director of the Environmental Justice Initiative of the Natural Resources Defense Council (NRDC) for 6 years. While at NRDC, Ms. Miller-Travis was on the front lines, advocating for EJ reform under the Clinton Administration, which ultimately led her to participate in the Oval Office signing ceremony for the Executive Order on Environmental Justice on February 11, 1994, with President Bill Clinton and other political leaders. Ms. Miller-Travis' many achievements in the field of EJ include co-founding West Harlem Environmental Action (currently known as We ACT for Environmental Justice), and her work while serving as a research assistant for the United Church of Christ Commission for Racial Justice, where she helped to research, write, and publish, in 1987, the landmark report, *Toxic Wastes and Race in the United States*. She also served on the U.S. Environmental Protection Agency's National Environmental Justice Advisory Council (NEJAC) from 1996 until 2001, and chaired its Waste and Facility Siting Subcommittee. She continues to work with NEJAC, currently as Co-Chair of the Working Group on School Air Toxics Monitoring.

Marie Lynn Miranda

Marie Lynn Miranda, Ph.D., is an associate professor in Duke University's Nicholas School of the Environment and Department of Pediatrics and serves as the founding Director of the Children's Environmental Health Initiative. Dr. Miranda's educational background is rooted in economic and mathematical modeling; her professional experiences integrate environmental health sciences with sound social policies. She has taught courses and conducted research on children's environmental health, with a particular emphasis on reproductive and developmental toxicants, childhood lead exposure, and allergen and asthma triggers. Dr. Miranda has applied spatial analytic approaches to a wide range of environmental issues. She also has extensive experience running training, research translation, and outreach programs, especially as they relate to disadvantaged populations. Dr. Miranda has an active research portfolio, with funding from the U.S. Environmental Protection Agency, National Institutes of Health, Centers for Disease Control and Prevention, National Association of Chronic Disease Directors, U.S. Department of Agriculture, State of North Carolina, Mary Duke Biddle Foundation, and The Duke

Endowment. She maintains a deep and abiding personal and professional interest in environmental and social justice.

Mark Mitchell

Mark Mitchell, M.D., is a physician specializing in epidemiology and public health, including environmental health. He grew up in St Louis, MO, and earned his M.D. degree at the University of Missouri at Kansas City and his Masters Degree in Public Health at the Johns Hopkins University. He also completed his Preventive Medicine Residency at Johns Hopkins. Dr. Mitchell served as Deputy Director of the Kansas City, MO, Health Department for 7 years, before coming to Hartford, where he was Director of Health for 4 years. He is also founder and President of the Connecticut Coalition for Environmental Justice. He has been a member of the U.S. Environmental Protection Agency's (EPA) National Environmental Justice Advisory Committee, in addition to serving on the Board of Directors of the American Lung Association of Connecticut and the Hispanic Health Council. He chairs the Hartford Advisory Commission on the Environment. His work is focused on environmental justice, asthma, and air pollution.

Rachel Morello-Frosch

Rachel Morello-Frosch, Ph.D., teaches at the University of California at Berkeley's Department of Environmental Science, Policy, and Management and the School of Public Health. Her research examines race and class determinants of environmental health among diverse communities in the United States. A focus of her current work is on the relationship between segregation and environmental health inequalities; air pollution and children's health; community-based participatory research; and the intersection between climate change, economic restructuring, and community environmental health. Dr. Morello-Frosch examines links between community- and individual-level stressors and environmental health disparities, and conducted the first study to examine the relationship between racial residential segregation and the estimated cancer risks associated with ambient air toxics exposures in the United States. She is collaborating with Silent Spring Institute in Massachusetts, Brown University, and Communities for a Better Environment in Northern California on a household exposure study in Richmond, California, that examines indoor and outdoor sources of exposure to probable endocrine-disrupting chemicals and particulates. As part of this work, she is exploring the scientific challenges and bioethical considerations of exposure assessment and chemical biomonitoring research in economically and racially marginalized communities. In collaboration with academic and community colleagues, Dr. Morello-Frosch is developing methods for assessing the cumulative impacts of chemical and non-chemical stressors to advance decision-making in the policy and regulatory arenas. She is assessing the application of these methods for implementation of climate change policies. Her work is funded by the National Institute of Environmental Health Sciences, National Science Foundation, California Air Resources Board, California Environmental Protection Agency, U.S. Environmental Protection Agency, Wellness Foundation, and California Endowment, among others. She has published widely in the environmental health, social science, public health, and risk assessment fields. She is the lead author of a recent report, *The Climate Gap: Inequalities in How Climate Change Hurts Americans and How to Close the Gap*.

Mahasin Mujahid

Mahasin Mujahid, Ph.D., M.S., is an Assistant Professor of Epidemiology in the School of Public Health at the University of California, Berkeley. Dr. Mujahid received her B.S. in Mathematics from Xavier University, New Orleans, Louisiana, and her M.S. in Biostatistics/Ph.D. in Epidemiology from the University of Michigan, Ann Arbor, Michigan. She also was a Robert Wood Johnson Health and Society

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Scholar at Harvard University. Dr. Mujahid's primary area of research is social epidemiology, with a particular focus on the multi-level determinants of chronic disease and chronic disease health disparities. She has a particular interest in understanding how features of neighborhood environment impact cardiovascular disease and subsequent race/ethnic differences in cardiovascular disease over the lifecourse. This work allows her to address methodological and theoretical challenges related to the study of upstream health determinants. Dr. Mujahid also is interested in racial/ethnic differences in breast cancer treatment and survivorship-related outcomes.

Keeve E. Nachman

Keeve Nachman, Ph.D., M.H.S., is the Science Director for Food Production, Health, and Environment and the Director of the Farming for the Future Program at the Center for a Livable Future (CLF) at the Johns Hopkins Bloomberg School of Public Health. His research focuses on characterizing the environmental, public health, and social consequences of industrial food animal production and animal waste management. Prior to joining the CLF, Dr. Nachman was an environmental health scientist and postdoctoral fellow in the National Center for Environmental Economics (NCEE) at the U.S. Environmental Protection Agency (EPA). Dr. Nachman's research at NCEE involved linking nationally representative air quality and health datasets to investigate the relationship between exposures to fine particulate matter and asthma and other respiratory conditions in adults. Dr. Nachman was a member of the EPA Probabilistic Risk Assessment Workgroup and a participant in Agency efforts to establish the incorporation of probabilistic methods and uncertainty analyses into Agency assessments of environmental risks. As an Agency scientist, Dr. Nachman served as a peer reviewer for chemical toxicity assessments (for the Integrated Risk Information System) and regulatory technical and policy documents**.**

Ngozi T. Oleru

Ngozi Oleru, Ph.D., currently is the Director of the Environmental Health Services Division for Public Health, Seattle and King County, Washington. In this leadership role, she is responsible for leading and managing environmental health programs serving a population of more than 1.9 million residents, which encompass Food Protection, Water and Wastewater, Solid and Hazardous Wastes, Chemical/Physical Hazards, Vector Control, and all issues related to the living environment, including the health effects and relationships of land use/built environment decisions. Prior to coming to Seattle, Dr. Oleru served in various capacities on the East Coast: as the Director of Environmental Health for the Boston Public Health Commission, Chief of Toxicology for the Massachusetts Department of Public Health, and Region 1 U.S. Environmental Protection Agency Environmental Justice Coordinator. Dr. Oleru leads the team that developed and launched King County's Equity and Social Justice Initiative. She is a member of the National Association of County and City Health Officials Health and Social Justice Committee and serves on its Health Equity Workgroup. She also served multiple terms on the Board of Scientific Counselors to the Director of the Centers for Disease Control and Prevention's National Center for Environmental Health/Agency for Toxic Substances and Disease Registry. In these different roles, Dr. Oleru has provided leadership in establishing partnerships, initiating and implementing new programs, and advocating for community revitalization, equity, and social justice. She has graduate degrees from the University of Massachusetts, Amherst, and the University of Oklahoma in Public Health**.**

Theresa L. Osypuk

Theresa Osypuk, S.D., S.M., is a social epidemiologist researching racial, socioeconomic, and nativity disparities in health, their geographic patterns, and their causes. Dr. Osypuk has a previous record of published research on neighborhood environment, residential segregation, and housing policy influences

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on health and racial/ethnic health disparities, as well as on tobacco use and smoking ban inequality. She is a Co-Investigator on a Eunice Kennedy Shriver National Institute of Child Health and Human Development-funded cohort study in the Detroit, Michigan, metropolitan area focused on racism, neighborhoods, and preterm birth (R01 HD058510). Her research has appeared in leading epidemiology, social epidemiology, public health, and urban studies journals, including *American Journal of Epidemiology, Social Science & Medicine*, and *American Journal of Public Health*. To stimulate translation of research into policy, she and her collaborators have developed a data-driven indicator Web site that illustrates racial/ethnic inequality in social, economic, political, and health domains across U.S. metropolitan areas at www.diversitydata.org. Dr. Osypuk received her doctorate and master's degrees from Harvard University School of Public Health, and training in the University of Michigan Robert Wood Johnson Foundation Health & Society Scholar postdoctoral fellowship. She currently is an Assistant Professor at Northeastern University, Bouvé College of Health Sciences, in Boston, Massachusetts.

Jennifer D. Parker

Jennifer Parker, Ph.D., is a research scientist at the National Center for Health Statistics, Centers for Disease Control and Prevention. She received her doctorate in Biostatistics from the University of California at Berkeley and did postdoctoral training at the Institute for Health Policy Studies at the University of California at San Francisco. Currently, Dr. Parker's research focuses on the linkage of national health and environmental data for environmental health research, with emphases on pregnancy and children's health outcomes and measures of traffic, air quality, and climate environmental indicators. These research activities follow from many years examining disparities in pregnancy outcomes and children's health. Dr. Parker participated in the transition from single to multiple race data collection and dissemination within the federal statistical system and has presented summaries of data suppression standards for National Center for Health Statistics data systems.

Romel Pascual

Romel Pascual currently serves as the Interim Deputy Mayor for Energy and Environment and also served as the Director of Environment for Mayor Antonio Villaraigosa of Los Angeles, California. He is responsible for developing and implementing the Mayor's environmental and energy agenda. He is an advisor on environmental priorities for the Mayor, including climate change, environmental justice (EJ), green economy, open space, Brownfields redevelopment, and sustainability. Mr. Pascual was one of the principal authors of the Mayor's GreenLA Climate Change Action Plan, released in 2006. He represents the City of Los Angeles on the steering committee for the C40 Large Cities Climate Group. Prior to coming to the Mayor's office, Mr. Pascual served as California's first Assistant Secretary for Environmental Justice from 2000-2004, where he led efforts in developing the State's inaugural EJ program—spearheading the State Advisory Committee on EJ; establishing the EJ Community Grant Program; and assisting in the passing of several key pieces of EJ legislation. Mr. Pascual also was the Regional Coordinator of the U.S. Environmental Protection Agency's (EPA) Region 9 Environmental Justice Program, where he led regional efforts to advance the Agency's EJ agenda. His involvement with environmental issues began in community organizations and grassroots leadership. Mr. Pascual worked with the Urban Habitat Program, a non-profit organization based in San Francisco whose focus is to build multicultural urban environmental leadership. He was the Program Director of the Brownfields Leadership and Community Revitalization Project. He also worked with the Asian Pacific Environmental Network,where he conducted research on the impacts of environmental pollution on communities.
He has a B.A. in Political Science from the University of California (UC) at Los Angeles, and a Master's in City and Regional Planning from UC Berkeley. He has served on several environmental organization

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boards, and currently serves as vice-chair of the board of directors for Urban Habitat, a non-profit environmental organization based in Oakland, California.

Manuel Pastor

Manuel Pastor, Ph.D., is Professor of Geography and American Studies & Ethnicity at the University of Southern California (USC). Dr. Pastor currently directs the Program for Environmental and Regional Equity at USC and is Co-Director of USC's Center for the Study of Immigrant Integration. He holds a Ph.D. in Economics from the University of Massachusetts, Amherst, and has received fellowships from the Danforth, Guggenheim, and Kellogg foundations and grants from the Irvine Foundation, Rockefeller Foundation, Ford Foundation, National Science Foundation, Hewlett Foundation, MacArthur Foundation, California Environmental Protection Agency, W.T. Grant Foundation, California Air Resources Board, and many others. Dr. Pastor's research generally has focused on issues of environmental justice (EJ), regional inclusion, and the economic and social conditions facing low-income urban communities. His most recent EJ academic publication is *The Climate Gap: Inequalities in How Climate Change Hurts Americans & How to Close the Gap (*co-authored with Rachel Morello-Frosch, Jim Sadd, and Seth Shonkoff), which helps to document the Climate Gap, connecting the dots between research on heat waves, air quality, and other challenges associated with climate change. Previous EJ reports include: *Justice in the Air: Tracking Toxic Pollution from America's Industries and Companies to Our States, Cities, and Neighborhoods (*co-authored with Michael Ash, James K. Boyce, Grace Chang, Justin Scoggins, and Jennifer Tran), and *Still Toxic After All These Years: Air Quality and Environmental Justice in the San Francisco Bay Area* (co-authored with Rachel Morello-Frosch and James Sadd).

Zachary Pekar

Zachary Pekar holds an M.S.P.H. and a Ph.D. in Environmental Management and Policy from the University of North Carolina's School of Public Health. His areas of specialization include exposure analysis and human health risk assessment, with an emphasis on modeling population health impacts through the use of Geographic Information Systems. Dr. Pekar has been at the U.S. Environmental Protection Agency (EPA) since 2003 and currently works in the Office of Air Quality Planning and Standards. While at EPA, Dr. Pekar has led the design and implementation of a number of complex human health risk assessments, including analyses supporting the Agency's review of National Ambient Air Quality Standards for lead and particulate matter (PM), as well as a national-scale assessment of recreational and subsistence fisher exposure to methylmercury associated with power plant emissions. Dr. Pekar also has participated in several international training and collaboration initiatives focused on demonstrating the use of health impact analysis and cost-benefit analysis as potential tools in regulatory decision-making involving ambient air pollution.

James W. Ransom

James Ransom is Tribal Chief for the St. Regis Mohawk Tribe, located in northern New York State along the St. Lawrence River. Chief Ransom has more than 30 years' experience working on environmental issues in Indian Country. In 1978, he established the St. Regis Mohawk Tribe's Environment Division, and he served as its Director until 1990. From 1992 to 1997, he served as the Director, Environment Unit, for the Assembly of First Nations, the largest Aboriginal organization in Canada. From 1997 to 2003, he served as the Director of the Haudenosaunee Environmental Task Force, helping the Cayuga, Tuscarora, and Tonawanda Seneca Nations develop environmental programs. Chief Ransom was appointed last year by the Governor of the State of New York to the New York Environmental Board, a statewide board that oversees the New York State Department of Environmental Conservation. He also previously served on the U.S. Environmental Protection Agency-Tribal Science Council. He currently holds the portfolio for

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Environment on behalf of the St. Regis Mohawk Tribal Council. Chief Ransom has a Bachelor of Science degree in Civil and Environmental Engineering from Clarkson University and an associate degree in Applied Science from Canton Agricultural and Technical College in Civil Technology.

Henry Roman

Henry Roman, M.S., is a Principal with Industrial Economics, Incorporated. He specializes in regulatory benefits analysis, human health risk assessment, and uncertainty analysis and is particularly interested in the intersection between risk assessment and economic analysis. Mr. Roman has employed these skills for clients including the U.S. Environmental Protection Agency (EPA), Health Canada, the U.S. Department of Homeland Security, and the U.S. Department of the Interior. For EPA, his work has included benefits and uncertainty analysis in support of the Section 812 analyses of the Clean Air Act for both criteria pollutants and air toxics, benefits analysis for the recent lead National Ambient Air Quality Standards rulemaking, and most recently, an expert workshop on the cardiovascular impacts of methylmercury exposure. Mr. Roman holds an M.S. in Environmental Health Management from the Harvard School of Public Health.

Ana Diez Roux

Ana Diez Roux, Ph.D., M.P.H., is Professor of Epidemiology and Director of the Center for Social Epidemiology and Population Health at the University of Michigan. Dr. Diez Roux received her medical degree from the School of Medicine of the Universidad de Buenos Aires and subsequently completed clinical training in pediatrics at the National Children's Hospital in Buenos Aires. She obtained an M.P.H. and a Ph.D. in Health Policy from Johns Hopkins School of Hygiene and Public Health, where she also completed postdoctoral training in the Department of Epidemiology. After working as a consultant for the Pan American Health Organization on the surveillance of chronic diseases, she joined the faculty at the Schools of Medicine and Public Health of Columbia University in New York City. Since 2003, she has been on the faculty of the Department of Epidemiology of the University of Michigan School of Public Health, where she also is Director of the Robert Wood Johnson Health and Society Scholars' program. Dr. Diez Roux's research areas include social epidemiology, environmental health effects, urban health, psychosocial factors in health, health disparities, and cardiovascular disease epidemiology. She has been an international leader in the investigation of neighborhood health effects and the application of multilevel analysis in public health. Other areas of research include the integration of social and biologic factors in health research, complex systems approaches to population health, the impact of stress on cardiovascular disease, and air pollution effects on health. She has been Principal Investigator of several National Institutes of Health-funded projects and is a frequent invited speaker at international conferences on the social determinants of health, neighborhood health effects, and multilevel analysis. Dr. Diez Roux is an elected member of the Institute of Medicine and serves on numerous national review and advisory committees. She recently was awarded the Wade Hampton Frost Award for her contributions to public health by the American Public Health Association.

John Ruffin

John Ruffin is the Director of the National Center on Minority Health and Health Disparities (NCMHD). He oversees the NCMHD budget of approximately $210 million. In addition, he provides leadership for the minority health and health disparities research activities of the National Institutes of Health (NIH), which constitutes an annual budget of approximately $2.8 billion. He is a well-respected leader and visionary in the field of minority health and health disparities. As an academician and a scientist, he has devoted his professional career to improving the health status of racial and ethnic minorities and other medically underserved populations in the United States. He has an impressive track record of developing

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and supporting programs to increase the cadre of minority scientists, physicians, and other health professionals, as well as in attracting a diverse group of researchers to the health disparities field. His success has been due in large part to his ability to motivate others and gain the support of key individuals and organizations, as well as to his expertise in strategic planning, administration, and the development of numerous collaborative partnerships. For almost 20 years, he has led the transformation of the NIH minority health and health disparities research agenda from a programmatic concept to an institutional reality. He has served as the Associate Director for Minority Programs, Office of Minority Programs; and the Associate Director for Research on Minority Health, Office of Research on Minority Health. As the NIH federal official for minority health disparities research, through multifaceted collaborations, he has planned and brought to fruition the largest biomedical research program in the nation to promote minority health and other health disparities research and training. In his quest to eliminate health disparities, the hallmark of his approach is to foster and expand strategic partnerships in alliance with the NIH Institutes and Centers, various federal and state agencies, community organizations, academic institutions, private sector leaders, and international governments and non-governmental organizations. Under his leadership, the NIH convened its first summit on health disparities, "The NIH Science of Eliminating Health Disparities Summit," in December 2008. The summit showcased the work, progress, and challenges of the NIH Institutes and Centers and many of their federal and non-federal government partners involved in minority health and health disparities research around the theme of Integrating Science, Practice, and Policy. The summit attracted more than 4,000 individuals from around the world representing various disciplines and sectors. Dr. Ruffin is committed to conceptualizing, developing, and implementing innovative programs that create new learning opportunities and exposure for individuals, communities, and academic institutions interested in eliminating health disparities. His efforts have impacted local, regional, national, and international communities. He has established and continues to expand a growing portfolio of research, training, and capacity-building programs to train health professionals and scientists from health disparity populations; conduct cutting-edge health disparities research; and build the capacity at academic institutions and within the community to support a promising health disparities research enterprise. His life-long commitment to academic excellence, improving minority health, and promoting training and health disparities research has earned him distinguished national awards. Dr. Ruffin has received honorary Doctor of Science degrees from Spelman College, Tuskegee University, the University of Massachusetts in Boston, North Carolina State University, Morehouse School of Medicine, and Meharry Medical College. He has been recognized by various professional, non-profit, and advocacy organizations, including: the National Medical Association, the Society for the Advancement of Chicanos and Native Americans in Science, the Association of American Indian Physicians, the Hispanic Association of Colleges and Universities, the Society of Black Academic Surgeons, and the National Science Foundation. The John Ruffin Scholarship Program is an honor symbolic of his legacy for academic excellence bestowed by the Duke University Talent Identification Program. He also has received the Martin Luther King Jr., Legacy Award for National Service, the Samuel L. Kountz Award for his significant contribution to increasing minority access to organ and tissue transplantation, the NIH Director's Award, the National Hispanic Leadership Award, the Beta Beta Beta Biological Honor Society Award, the Department of Health and Human Services' Special Recognition Award, and the U.S. Presidential Merit Award. Dr. Ruffin received a B.S. in Biology from Dillard University, an M.S. in Biology from Atlanta University, and a Ph.D. in Systematic and Developmental Biology from Kansas State University, and completed post-doctoral studies in Biology at Harvard University.

B. Suzi Ruhl

B. Suzi Ruhl, J.D., M.P.H., currently is Senior Attorney Advisor for the U.S. Environmental Protection Agency's (EPA) Office of Environmental Justice. Prior to this position, she was the Director of the Public Health and Law Program for the Environmental Law Institute. She also is the founder and former

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President of the Legal Environmental Assistance Foundation, Inc. Ms. Ruhl has been an Assistant Clinical Professor of Epidemiology and Public Health at the New York State University School of Optometry and has had a Courtesy Faculty Appointment to the Institute of Public Health at Florida A&M University. In addition to her law degree, Ms. Ruhl has a master's degree in Public Health Epidemiology. Throughout her career, Ms. Ruhl has provided legal and health expertise on a variety of environmental issues including EJ, community health, Brownfields redevelopment, contaminated site response, and drinking water protection, among other issues. She has provided legal assistance to citizens throughout the nation, Eastern Europe, Russia, and Australia; engaged in policy development at the local, state, and federal levels of government; and authorized legislation on EJ, community environmental health, Brownfields and public health, and other issues that has been adopted into law in Florida.

James L. Sadd

James Sadd, Ph.D., is Professor of Environmental Science at Occidental College, Los Angeles, California. He earned his doctorate in Geology at the University of South Carolina, Columbia. His research focuses on evaluating questions related to environmental exposure, health risk, and environmental justice, primarily through the use of spatial analysis using geographic information systems and remote sensing tools. He is part of a three-person research team whose research currently is supported by contracts and grants from the California Environmental Protection Agency; California Air Resources Board; California Energy Commission; Hewlett, Annenberg, and Energy Foundations; and California Endowment.

William H. Sanders III

William Sanders III, Dr.P.H., serves as Director of the National Center for Environmental Research (NCER) in the U.S. Environmental Protection Agency's Office of Research and Development (ORD). NCER's mission is to support high-quality research by the nation's leading scientists that will improve the scientific basis for decisions on national environmental issues. NCER supports leading-edge, extramural research in all aspects of the National Academy of Sciences' risk assessment paradigm by focusing on exposure, effects, risk assessment, and risk management—all the areas of national environmental concern. NCER technical employees have backgrounds in engineering, ecological and health sciences, communications, and information management. Dr. Sanders holds a Dr.P.H. in Environmental and Occupational Health Sciences from the University of Illinois at Chicago School of Public Health; an M.S. in Management of Public Service, Quantitative Methods, from DePaul University, Chicago; and a B.S. in Civil Engineering, Structural Design, from the University of Illinois at Chicago; and is a Leadership in Energy and Environmental Design Accredited Professional. Prior to his current assignment, Dr. Sanders served as Deputy Assistant Administrator in the Office of Prevention, Pesticides, and Toxic Substances. The office is responsible for implementation of the country's laws governing pesticides, industrial chemicals, and pollution prevention, and works in multiple international venues to ensure harmonization and coordination of our domestic activities. Dr. Sanders also served as the Acting Director, Office of Children's Health Protection and Environmental Education.

Erika N. Sasser

Erika Sasser, Ph.D., is a Senior Policy Advisor in the Health and Environmental Impacts Division within the Office of Air Quality Planning and Standards, part of the U.S. Environmental Protection Agency's Office of Air and Radiation (OAR). She has worked on a range of policies and initiatives related to the health and environmental impacts of air pollution, including the National Ambient Air Quality Standards for particulate matter, ozone, and lead. In this capacity, she participates actively in helping to design environmental justice analyses appropriate for different regulatory contexts for both criteria pollutants and

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air toxics. She also is concerned with the linkages between air quality and climate, including the roles of black carbon and ozone as short-lived climate forcers, and the development of policies and strategies that integrate traditional public health and environmental goals with climate mitigation efforts. She holds a B.A. from the Woodrow Wilson School of Public and International Affairs at Princeton University (1993) and a Ph.D. from the Nicholas School of the Environment and Earth Sciences at Duke University (1999).

Andrew E. Schulman

Andrew Schulman, Ph.D., is a statistician in the Office of Compliance in the U.S. Environmental Protection Agency (EPA). He has helped to develop EJSEAT, a screening tool for environmental justice concerns, since 2005. He develops online tools for enforcement targeting and public access for Online Tracking Information System and Enforcement and Compliance History Online, EPA's primary Web sites for searching and reporting on regulated facilities.

Alex Scott-Samuel

Alex Scott-Samuel, M.B., Ch.B., M.Comm.H., graduated in medicine at the University of Liverpool in 1971 and took his Master's in Public Health there in 1976. He is Senior Clinical Lecturer in Public Health at the University of Liverpool, where he teaches health promotion on the M.P.H. course and does research on health politics and policy, health and gender inequalities, and health impact assessment. He is Director of IMPACT, the International Health Impact Assessment Consortium; Liverpool Public Health Observatory; and EQUAL, the Equity in Health Research and Development Unit. Mr. Scott-Samuel was a member of the Women and Gender Equity Knowledge Network of the World Health Organization's (WHO) Commission on Social Determinants of Health, and is a member of the WHO Scientific Resource Group on Equity Analysis and Research. He founded the journal *Radical Community Medicine* (now *Critical Public Health*) in 1979. He co-founded the Public Health Alliance (now the United Kingdom Public Health Association) in 1986, and the Politics of Health Group in 2002.

Joel Schwartz

Biosketch not available at time of printing.

Peggy M. Shepard

Peggy Shepard is executive director and co-founder of WE ACT For Environmental Justice, also known as West Harlem Environmental Action. Founded in 1988 in West Harlem, WE ACT works to build community power to fight environmental racism and improve environmental health, policy, and protection in communities of color. Ms. Shepard is a recipient of the 2008 Jane Jacobs Lifetime Achievement Award from the Rockefeller Foundation. Ms. Shepard received the Calver Award from the Environmental Division of the American Public Health Association in November 2007, the 10th Annual Heinz Award For the Environment in 2003, and the Dean's Distinguished Service Award from the Columbia Mailman School of Public Health in 2004. WE ACT is a nationally recognized organization in the field of community-based participatory research in partnership with the Mailman School of Public Health at Columbia University. Ms. Shepard is a member of the National Academy of Sciences Committee on America's Climate Choices that is drafting a report of recommendations to Congress. A member of the National Institute of Environmental Health Sciences (NIEHS) Public Interest Partners, she served as chair of the National Environmental Justice Advisory Council (NEJAC) to the U.S. Environmental Protection Agency (EPA), and is co-chair of the Northeast Environmental Justice Network. She is a member of the Environmental Justice Advisory Committee to the New York State (NYS) Department of Environmental Conservation and the New York City (NYC) Mayor's Sustainability

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Advisory Board. She is a former member of the National Advisory Environmental Health Sciences Council of the National Institutes of Health (NIH) and the National Children's Study Federal Advisory Committee to the NIH. Ms. Shepard served as guest editor of an *Environmental Health Perspectives* monograph, *Advancing Environmental Justice Through Community-Based Participatory Research*, April 2002; and is co-author of *Promoting Environmental Health Policy Through Community Based Participatory Research*: *A Case Study from Harlem, New York*, published January 2006, *Journal of Urban Health, Bulletin of the New York Academy of Medicine*. She served on the Committee on Ethical Issues in Housing-Related Health Hazard Research Involving Children, Youth, and Families, a project of the National Research Council and the Institute of Medicine, which published its report in 2006. Ms Shepard is co-author of The Challenge of Preventing Environmentally Related Disease in Young Children: Community-Based Research in New York City; Airborne Concentrations of PM (2.5) and Diesel Particles on Harlem Sidewalks: A Pilot Study; and Diesel Exhaust Exposure Among Adolescents In Harlem: A Community-Driven Study; and a contributor to Urban Air Pollution and Health Inequities: A Workshop Report, all articles that were published in *Environmental Health Perspectives* between 1999 and 2002. She also has authored Issues of Community Empowerment, and The Federal Advisory Committee's Proposal For Justice, *Fordham Environmental Law Journal*, 1996 and 1999. Ms. Shepard is a board member of the NYS League of Conservation Voters, Environmental Defense, NY Earth Day, Audubon NY, the Children's Environmental Health Network, and the Public Health Association of NYC. She is an advisory board member of the Environmental Leadership Project; Mt. Sinai's Children's Environmental Health Center; the Genetics and Public Policy Center at Johns Hopkins; the Harvard/MGI Center on Genomics, Vulnerable Populations and Health Disparities; and the NIEHS Public Interest Liaison Group. A lecturer on issues of environmental justice and community-based health research, she graduated from Howard University and Solebury and Newtown Friends Schools.

Carol Ann Siciliano

Carol Ann Siciliano, J.D., is the Associate General Counsel of the Cross-Cutting Issues Law Office, within Office of General Counsel. Under her direction, the Cross-Cutting Issues Law Office provides legal counsel to all EPA programs and offices on environmental justice, Indian law, and other issues. Ms. Siciliano also directs attorneys with expertise in international environmental law, Administrative Procedure Act, the Endangered Species Act, and the National Environmental Policy Act, and in a wide array of legal matters related to rulemaking. She began her EPA career in the Office of General Counsel's Water Law Office, where she acquired expertise in Clean Water Act and Safe Drinking Water Act matters. Ms. Siciliano clerked for the Honorable Charles L. Brieant of the U.S. District Court for the Southern District of New York. She obtained her J.D. from Fordham Law School, where she served on the editorial board of the Fordham Law Review. Ms. Siciliano obtained her undergraduate degree with honors from Princeton University.

Patrice L. Simms

Patrice Simms, Deputy Assistant Attorney General, joined the Environment and Natural Resources Division (ENRD) as an accomplished environmental attorney, most recently serving on the law faculty at Howard University School of Law in Washington, DC. Prior to this, Mr. Simms served as a government attorney and as an environmental advocate in many high-profile environmental cases and other matters involving important legal, technical, and policy issues. His experience includes more than 5 years as a staff attorney in the Environmental Protection Agency (EPA) Office of General Counsel, and stints as a legal counsel to the EPA's Environmental Appeals Board and as a senior attorney with the Natural Resources Defense Council. His career has focused on issues regarding the implementation and enforcement of the Clean Air Act and issues related to clean water, solid waste, public health, climate change, and environmental justice (EJ). Mr. Simms has received many professional awards, including the

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EPA Office of General Counsel Award for Excellence. In 2009, he was elected to serve on the Steering Committee for the D.C. Bar's Energy, Environment and Natural Resources Section. Mr. Simms is a graduate of Howard University School of Law.

Ron Sims

Ron Sims was unanimously confirmed by the U.S. Senate on May 6, 2009, and sworn in as the Deputy Secretary for the U.S. Department of Housing and Urban Development on May 8, 2009. As the second most senior official at HUD, Sims is responsible for managing the Department's day-to-day operations, a nearly $40 billion annual operating budget, and the agency's 8,500 employees.

Sims previously served as the Executive for the King County, Washington, the 13th largest county in the nation in a metropolitan area of 1.8 million residents and 39 cities including the cities of Seattle, Bellevue and Redmond.

While serving three terms, Sims was nationally recognized for his work on transportation, homelessness, climate change, health care reform, urban development and affordable housing. His leadership in affordable housing and multiple community and housing partnerships have funded 5,632 units of housing during his 12 years.

One of the hallmarks of the Sims Administration in King County was the integration of environmental, social equity and public health policies that produced groundbreaking work on climate change, health care reform, affordable housing, mass transit, environmental protection, land use, and equity and social justice.

Sims is also a proponent of Smart Growth programs and the preservation of green space before it is lost to development. The policies he implemented in King County stopped costly sprawl and resulted in 96 percent of new construction being concentrated in urban areas with only 4% in rural areas.

Over the years Sims developed a reputation as a tireless legislator, working on a diverse palette of issues that led to advances in the areas of the environment, education, public safety and the protection of workers' rights. He credits his drive in part with marching alongside his politically active parents in the 1950's and 1960's during the civil rights movement led by Dr. Martin Luther King Jr. Those experiences honed in him a passion for civil rights issues that has been a guidepost throughout his career.

Sims was named Leader of the Year by American City and County Magazine in July, 2008 and was recognized as one of Governing Magazine's Government Officials of the Year in 2007. He has been honored with national awards from the Sierra Club, the Environmental Protection Agency and the National Committee for Quality Assurance. Sims joined Senator Edward Kennedy and California Governor Arnold Schwarzenegger as recipients of the 2008 Health Quality Award from the National Committee for Quality Assurance. Sims and King County are also recipients of HUD's prestigious Robert L. Woodson Jr. Affordable Communities Award for 2005.

Matthew C. Small

Matthew Small, Ph.D., P.G., is the Regional Science Liaison (RSL) for the Office of Research and Development (ORD) in U.S. Environmental Protection Agency Region 9 (R9), San Francisco, California. As RSL, Dr. Small works to facilitate communication, collaboration, and technical support between ORD and R9. He is one of the Region's hydrogeology experts, and led the effort to create national EPA Office of Solid Waste and Energy Response directives and ASTM standards for remediation by natural

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attenuation. Dr. Small spent 5 years in private consulting before joining EPA. He has a B.S. in Geology from CSU Hayward, an M.Eng. in Mineral Engineering, and a Ph.D. in Civil and Environmental Engineering from the University of California at Berkeley. He also is a licensed professional geologist in the State of California.

Brian D. Smedley

Brian Smedley, Ph.D., is Vice President and Director of the Health Policy Institute of the Joint Center for Political and Economic Studies in Washington, DC. In this position, Dr. Smedley oversees all of the operations of the Institute, which was started in 2002 with funding from the W.K. Kellogg Foundation. The Institute has a dual focus: to explore disparities in health and to generate policy recommendations on longstanding health equity concerns. Formerly, Dr. Smedley was Research Director and co-founder of a communications, research, and policy organization, The Opportunity Agenda (www.opportunityagenda.org), where he led the organization's effort to center equity in state and national health reform discussions and to build the national will to expand opportunity for all. To that end, Dr. Smedley is a co-editor, along with Alan Jenkins, of a book, *All Things Being Equal: Instigating Opportunity in an Inequitable Time*. Prior to helping launch The Opportunity Agenda, Dr. Smedley was a Senior Program Officer in the Division of Health Sciences Policy of the Institute of Medicine (IOM), where he served as Study Director for the IOM reports, *In the Nation's Compelling Interest: Ensuring Diversity in the Health Care Workforce* and *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*, among other reports on diversity in the health professions and minority health research policy. Dr. Smedley came to the IOM from the American Psychological Association (APA), where he worked on a wide range of social, health, and education policy topics in his capacity as Director for Public Interest Policy. Prior to working at the APA, Dr. Smedley served as a Congressional Science Fellow in the office of Rep. Robert C. Scott (D-VA), sponsored by the American Association for the Advancement of Science. Among his awards and distinctions: in 2004, Dr. Smedley was honored by the Rainbow/PUSH coalition as a "Health Trailblazer" award winner; in 2002, he was awarded the Congressional Black Caucus "Healthcare Hero" award; and in August 2002, he was awarded the Early Career Award for Distinguished Contributions to Psychology in the Public Interest by the APA.
Dr. Smedley holds an undergraduate degree from Harvard University and a Ph.D. in Psychology from the University of California at Los Angeles.

Mathy Stanislaus

Mathy Stanislaus began work as Assistant Administrator for the U.S. Environmental Protection Agency's (EPA) Office of Solid Waste and Emergency Response (OSWER) after being confirmed by the U.S. Senate on June 8, 2009. As Assistant Administrator for OSWER, Mr. Stanislaus is responsible for EPA's programs on hazardous and solid waste management; hazardous waste cleanup, including Resource Conservation and Recovery Act corrective action; Superfund and federal facilities cleanup and redevelopment; Brownfields; oil spill prevention and response; chemical accident prevention and preparedness; underground storage tanks; and emergency response. Prior to assuming the position of Assistant Administrator for EPA's OSWER, Mr. Stanislaus co-founded and co-directed the New Partners for Community Revitalization, a not-for-profit organization whose mission is to advance the renewal of New York's low- and moderate-income neighborhoods and communities of color through the redevelopment of Brownfields sites. In collaboration with community, commercial, government, and nonprofit partners, Mr. Stanislaus led the development of policies, programs, and projects aimed at achieving the remediation and sustainable reuse of Brownfields sites in New York. He is a former counsel for EPA's Region 2, senior environmental associate in the environmental department of the law firm Huber Lawrence & Abell, and director of environmental compliance for an environmental consulting firm. He has served on the board of the New York City Environmental Justice Alliance. Mr. Stanislaus also has been an advisor to other federal government agencies, Congress, and the United Nations on a

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variety of environmental issues. He chaired an EPA workgroup in 1997 that investigated the clustering of waste transfer stations in low income and communities of color throughout the United States. In June 1994, as a member of the United Nations Environment Programme Environmental Advisory Council, he served as counsel to the United Nations' summit that examined environmental issues affecting New York's indigenous communities of the Haudaunosaunee Confederacy, as part of the United Nations' International Year of the Indigenous Communities.

Dean B. Suagee

Dean Suagee, J.D., L.L.M., is Of Counsel to the law firm of Hobbs, Straus, Dean & Walker, LLP, Washington, DC, a firm that specializes in serving as legal counsel for American Indian and Alaska Native tribal governments and tribal organizations. His practice emphasizes environmental law and cultural resources law, and he has worked with a number of tribes in developing tribal legislation and regulations. Mr. Suagee is the author of a number of law journal articles on environmental and cultural resources law in Indian country and is a contributing author of the 2005 edition of *Cohen's Handbook of Federal Indian Law*. His published work in the field of environmental justice includes *Dimensions of Environmental Justice in Indian Country and Native Alaska*, a commissioned paper for the Second People of Color Environmental Leadership Summit (EJ Summit II), Washington, DC, October 2002 (available on the Web Site of the Clark Atlanta University Environmental Justice Resource Center: www.ejrn.cau.edu). As a member of the American Bar Association, Section of Environment, Energy & Resources, he serves as a vice-chair of the Native American Resources Committee and as an Assistant Editor for *Natural Resources & Environment*, a quarterly journal. He received his B.A. from the University of Arizona in 1972, J.D. from the University of North Carolina in 1976, and LL.M. in International Legal Studies from the American University in 1989. He is a citizen of the Cherokee Nation.

Wilma Subra

Committed to protecting the environment and the health and safety of citizens, Wilma Subra started the Subra Company in 1981. Subra Company is a chemistry laboratory and environmental consulting firm in New Iberia, Louisiana. Mrs. Subra provides technical assistance to citizens across the United States and in foreign countries concerned with their environment by combining technical research and evaluation. This information then is presented to community members so that strategies may be developed to address their local struggles. Utilizing the information gained from community involvement, the needs identified are translated into policy changes at the State and Federal level through service on multi-stakeholder committees. She just completed a 7-year term as Vice-Chair of the U.S. Environmental Protection Agency (EPA) National Advisory Council for Environmental Policy and Technology, a 5-year term on the National Advisory Committee of the U.S. Representative to the Commission for Environmental Cooperation; and a 6-year term on the EPA National Environmental Justice Advisory Council (NEJAC), where she served as a member of the Cumulative Risk and Impacts Working Group of the NEJAC Council and chaired the NEJAC Gulf Coast Hurricanes Work Group. Mrs. Subra holds degrees in Microbiology/Chemistry from the University of Southwestern Louisiana. She received the MacArthur Fellowship "Genius" Award from the MacArthur Foundation for helping ordinary citizens understand, cope with, and combat environmental issues in their communities and was one of three finalists in the Environmental Category of the 2004 Volvo for Life Award.

Diane Takvorian

Diane Takvorian, M.S., has led the struggle for social and environmental justice (EJ) for more than 30 years. She is Executive Director and a Founder of Environmental Health Coalition (EHC), an EJ

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organization based in the San Diego/Tijuana region. Founded in 1980, EHC works to protect public health and the environment threatened by toxic pollution through efforts that create a just society. Under Ms. Takvorian's direction, EHC's community organizing and policy advocacy work with disenfranchised communities has eliminated many health risks and enabled thousands of residents to develop into community leaders. EHC successfully advocated for one of the first community Right-to-Know laws in the nation (1982) when local communities lacked information about chemicals used and stored at nearby businesses. That law led to a report identifying communities at highest risk (1990) and decades of community health victories, including: the stoppage of fruit cargo fumigation with the toxic pesticide methyl bromide at the Barrio Logan port terminal (1997), the shutdown of a chrome-plating business operating next to homes in Barrio Logan (2002), and approval of an ordinance to phase polluting business operations out of the residential areas of National City (2006). Another EHC-sponsored law made California the first state to ban the sale of lead-contaminated candies imported from Mexico (2005). EHC's advocacy also led to $22 million in federal funding for San Diego for programs to reduce lead hazards in almost 1,500 neighborhood homes (2001-2009). Ms. Takvorian served as Co-Chair of the California Environmental Protection Agency's Environmental Justice Advisory Committee from 2001-2005. In 2003, this committee adopted historic recommendations to address community EJ issues. She is a co-founder of the California Environmental Justice Alliance—a coalition of organizations working to address EJ issues throughout California—and was appointed to the California Global Warming Environmental Justice Advisory Committee in 2007. In 2008, the James Irvine Foundation honored Ms. Takvorian with its Leadership Award, which recognizes individual leaders who are advancing innovative and effective solutions to significant state issues. The Environment Section of the American Public Health Association honored Ms. Takvorian with the Calver Award in 2008. Ms. Takvorian holds a master's degree in Social Work, with an emphasis in public policy and community organization. She served on the faculty at the San Diego State University School of Social Work, teaching graduate and undergraduate courses on community organization and administration.

Heather J. Tanana

Heather J. Tanana is a third-year law student at the S.J. Quinney College of Law at the University of Utah. She is the Secretary of the Native American Law Student Association and an Article Editor for the *Journal of Land Resource and Environmental Law*. As a Quinney fellow, Mrs. Tanana conducts legal research on environmental issues, including watershed planning, children's environmental health, and waste management. Mrs. Tanana also concurrently is pursuing her M.P.H. at the Bloomberg School of Public Health at Johns Hopkins University, where she received advanced training in American Indian Health as an American Indian Scholar. She received her B.A. from Dartmouth College in Biology modified with Psychology.

Nicholas Targ

Nicholas Targ is a Partner in Holland & Knight's Public Policy and Regulation Group. His practice concentrates on land use, environmental law, and natural resources. He represents private- and public-sector project proponents in land use and environmental permitting, compliance, and due diligence matters for complex land use, acquisition, and natural resources projects. Before joining Holland & Knight, Mr. Targ served with the U.S. Environmental Protection Agency's Office of Enforcement and Compliance Assurance, including as Counsel and Associate Director to the Office of Environmental Justice in Washington, DC. He also served in the Solicitor's Office of the U.S. Department of the Interior, representing the Bureau of Reclamation and Bureau of Land Management on a wide range of natural resources and hazardous materials issues. Committed to service, Mr. Targ co-founded the Howard University Environmental Law and Sustainability Program and taught environmental law as an adjunct professor for five semesters. Presently, he serves as Chair of the National Brownfields Association's Bay

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Area Council and Co-chair of the American Bar Association's Taskforce on Diversity and Environmental Justice. He also serves on the Board of the Rosie the Riveter Trust in Richmond, California. Mr. Targ was named as a fellow to the American Bar Foundation in 2008.

Kevin Teichman

Dr. Kevin Teichman, is the Deputy Assistant Administrator for Science of the U.S. Environmental Protection Agency's Office of Research and Development (ORD). In this capacity, he is responsible for planning EPA's research program, striving to ensure the research program both responds to the needs of EPA's Program and Regional Offices and maintains its leadership role in the environmental research community. In addition, he is responsible for coordinating ORD's participation in EPA's policymaking in all media (air, water, waste, pesticides and toxics) to ensure the Agency's policies are based on sound science.

Dr. Teichman has B.S. and M.S. degrees from the Massachusetts Institute of Technology and a Ph.D. degree from the University of California at Berkeley, all in mechanical engineering. He lives in Derwood, Maryland with his wife Marsha and has three children – and cites this as his most important accomplishment.

Pamela Tucker

Pamela Tucker, M.D., is a medical officer for the Division of Toxicology and Environmental Medicine at the Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia. She originally trained as a psychiatrist at the University of South Alabama, College of Medicine, in Mobile, but has worked in the new field of environmental public health for the last 15 years. Her area of expertise is in the psychosocial effects of hazardous waste sites, and she is the leader of community stress activities for ATSDR. Since 1995, she has conducted an expert panel workshop on the Psychological Effects of Hazardous Substances and been involved in numerous field responses involving the physical and psychological health of communities affected by hazardous substances. As part of the ATSDR Community Stress initiative, Dr. Tucker has trained social workers, medical personnel, and field responders from state and federal agencies in countering the stress involved in field work and assisting communities affected by the psychosocial stress of potential chemical exposures. Also, she responds to requests from communities to help them conduct their own efforts to mitigate the stresses associated with exposures to hazardous substances.

James A. VanDerslice

James VanDerslice, Ph.D., is an Associate Research Professor and the Associate Chief of the Division of Public Health at the University of Utah. He has a wide variety of experience in drinking water issues, including implementing community-based household water treatment programs along the U.S.-Mexico border, epidemiologic research on the effects of drinking water quality on infants in the Philippines and rural areas of the United States, development of Geographic Information System methods for exposure assessment, and leading an effort to develop national indicators of drinking water quality. Before joining the University of Utah, he was the Senior Environmental Epidemiologist at the Washington State Department of Health, where he worked closely with state drinking water regulators to assess risk scenarios and provide technical support to water purveyors during contamination events.

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Kenneth Warren

Kenneth Warren, J.D., has been practicing environmental law for more than 25 years. He practices extensively in the field of water resources, including wastewater and stormwater permitting, development of water quality standards and total maximum daily loads, and water supply and water allocation matters. He counsels clients on environmental compliance, permitting, and transactional matters as well as site remediations, sustainability and climate change, and alternative energy issues. He has handled numerous enforcement actions, citizen suits, cost recovery actions, and other environmental cases in courts and tribunals throughout the United States. Mr. Warren is listed in the leading national and international guides of lawyers for environmental law. He served as Chair of the American Bar Association's Section of Environment, Energy, and Resources from 2003 to 2004, during which time he led the Section's 10,000 lawyers. Mr. Warren writes a regular column for *The Legal Intelligencer* on environmental law and is the author of numerous articles on environmental issues. He is the author of a chapter in *The Law of Environmental Justice*. Mr. Warren is a frequent speaker on environmental matters before sections of the American Bar Association and other groups. Mr. Warren was appointed by the U.S. Environmental Protection Agency (EPA) Administrator to serve as an industry stakeholder representative on EPA's National Environmental Justice Advisory Council. He served on the Council from 2000 to 2006. He also serves as general counsel to the Delaware River Basin Commission, a federal interstate agency managing the water resources of the Delaware River Basin.

Suzanne Wells

Suzanne Wells, M.S., is Director of the Superfund Community Involvement and Program Initiatives Branch. She has a B.S. degree in Environmental Science from Texas Christian University and an M.S. degree in Technology and Human Affairs from Washington University. Ms. Wells has been with the U.S. Environmental Protection Agency (EPA) for 26 years, the past 23 years in the Superfund program. In addition to her work at EPA, Ms. Wells has been active in her community. She founded the Capitol Hill Public School Parent Organization in 2005 and was the co-chair of the School Libraries Project, a $2.4 million public/private partnership that renovated eight public elementary and middle school libraries.

Leah R. Williams

Leah Williams, M.P.H., is a doctoral candidate in the Department of Health Promotion, Education, and Behavior at the University of South Carolina Arnold School of Public Health. Ms. Williams is interested in the following public health topics: health disparities (racial/ethnic, women, environmental), community-based participatory research, underserved populations, community-university partnerships, and EJ issues. Her graduate research focuses on HIV/STI prevention among vulnerable populations, including women of color. Her dissertation topic is "The Association Between Body Image and Sexual Risk Behaviors Among Female College Students: The Moderating Effects of Race and Sexual Orientation." Ms. Williams also is performing EJ research as a graduate assistant at the Institute for Families in Society at the University of South Carolina, where she serves as the University of South Carolina project manager for the National Institutes of Health/National Institute of Environmental Health Sciences-funded community-university partnership research project entitled "Assessment of a Novel Environmental Justice Community-University Partnership." This is a partnership between the West End Revitalization Association (WERA), a community-based EJ and protection organization in Mebane, North Carolina, and the University of South Carolina. Ms. Williams received her Masters of Public Health in Health Behavior from the University of Kentucky in 2008, where she authored a thesis on "The Association Between Recreational Marijuana Use and Risky Sex Behaviors." She also is an alumna of the University of North Carolina at Chapel Hill, where she obtained her Bachelor of Arts in English.

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Steve Wing

Steve Wing, Ph.D., Associate Professor of Epidemiology at the University of North Carolina School of Public Health, conducts research on occupational and environmental health. Recent work has focused on environmental justice, health effects of ionizing radiation, community impacts of industrial swine production, and the built environment. He has collaborated on health and exposure studies with communities and workers impacted by the nuclear industry, industrial animal production, and other environmental and occupational threats.

Valarie Zartarian

Valerie Zartarian, Ph.D., is an environmental engineer with the U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD), National Exposure Research Laboratory. Prior to joining EPA in 1998, she was a researcher at Stanford, California, and a water resources engineering consultant with Camp, Dresser, & McKee, Inc., Cambridge, Massachusetts. Dr. Zartarian holds Ph.D. and master's degrees in Environmental Engineering from Stanford University, and a B.S. in Civil Engineering from Princeton University. Dr. Zartarian's primary areas of expertise as a Principal Investigator are the development and application of ORD's probabilistic human exposure model for multimedia chemicals (Stochastic Human Exposure and Dose Simulation Model, SHEDS-Multimedia), and ORD's Web-based tool to assess cumulative exposures from multiple stressors in communities (Community-Focused Exposure and Risk Screening Tool, C-FERST). Dr. Zartarian has published more than 20 peer-reviewed journal articles and technical reports; briefed high-level EPA officials; organized workshops; co-chaired national and international conference sessions; and collaborated with groups in government, academia, and industry. She has been an officer and committee chair of the International Society for Exposure Science (ISES), and in 2000 she received ISES's Outstanding Young Scientist Award. In addition to receiving numerous awards from EPA's ORD and Office of Pesticide Programs, Dr. Zartarian received EPA's 2007 Gold Medal for Exceptional Service, EPA's 2007 Children's Environmental Health Excellence Award for Science Achievement (team award), and EPA's 2001 Bronze Medal for Commendable Service in recognition of outstanding work in the area of human exposure and health science.

Harold Zenick

Harold Zenick, Ph.D., is Director, National Health and Environmental Effects Research Laboratory (NHEERL), in the Office of Research and Development in the U.S. Environmental Protection Agency (EPA). Dr. Zenick earned a Ph.D. in Physiological Psychology from the University of Missouri (Columbia). He also completed a post-doctoral fellowship in Toxicology at the University of Cincinnati. Before coming to EPA, Dr. Zenick spent 13 years in academia with the Department of Environmental Health in the University of Cincinnati Medical School, preceded by an appointment at New Mexico Highlands University. Dr. Zenick serves on the Executive Board to the National Toxicology Program and as EPA's liaison to the National Center for Environmental Research-Agency for Toxic Substances and Disease Registry's Board of Scientific Councilors. He co-chairs, respectively, two cross-EPA workgroups: one on the Futures of Toxicity Testing; the other on Biomonitoring. He has received numerous awards, including being a two-time recipient of the prestigious Presidential Meritorious Executive Rank Award and the Office of Research and Development Statesmanship and Diversity awards. Dr. Zenick has participated on a number of prominent national and federal work groups and currently serves as co-chair of the federal Pharmaceuticals in the Environment Work Group within the Toxics and Risk Subcommittee under the auspices of the Office of Science, Technology, and Policy. Within the Society of Toxicology, he has served as the President of three specialty sections; the most recent being the Occupational and Public Health Specialty Section, and recently was elected to the Awards Committee. Dr. Zenick has more than 100 publications. His current interests are in integrating

human health and ecological risk assessment; strengthening the linkages between environmental and public health agendas and agencies; and the application of emerging computational, informational, and molecular sciences in improving toxicity testing and risk assessment practices.

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SPEAKER BIOSKETCH

Michelle DePass

Michelle DePass was confirmed by the Senate as the Assistant Administrator, Office of International Affairs (OIA), on April 28, 2009. DePass comes to the United States Environmental Protection Agency (EPA) after serving as an Environment and Community Development Program Officer at the Ford Foundation. As Program Officer, she was responsible for supporting the development of sound environmental policies and practices in the local, national and international arenas. As Assistant Administrator, she leads EPA's international program and is responsible for the full range of EPA's international environmental policy development and program implementation. In this capacity, DePass represents the EPA within the United States government and before foreign governments and international organizations on matters relating to environmental foreign affairs.
DePass is a lawyer, public administrator and policy analyst who has worked with environmental and human and civil rights organizations, academic institutions, and labor. She has also worked in all levels of government, including city, state, and federal. She received her B.A. in Political Science from Tufts University, her law degree from Fordham University School of Law, and a Master's degree in Public Administration from Baruch College School of Public Affairs.

Before her time at the Ford Foundation, DePass taught federal environmental law and policy at the City University of New York, and developed a job training program for aspiring youth in conjunction with the National Institute for Environmental Health Sciences. She also served as Executive Director of the New York City Environmental Justice Alliance. As Executive Director, she was an advocate to local communities and community organizations in environmental policy negotiations. DePass obtained experience in the regulatory realm as an environmental manager of the City of San Jose. She went on to practice law with the Center for Constitutional Rights in New York as a William Kunstler Racial Justice Fellow. DePass then returned to government as a Senior Policy Advisor at the New Jersey Department of Environmental Protection (NJDEP).

DePass was born in Queens, New York. She is the daughter of Rupert and Marsyl DePass from Jamaica, West Indies, and married to Joshua Paulson.

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Poster Discussion Sessions

Data and Methodology Needs: Proximity
Wednesday, March 17, 2010, 3:00 – 5:00 p.m.

Skewed Riskscapes and Environmental Injustice in St. Louis and Seattle
Troy Abel, Assistant Professor of Environmental Policy, Department of Environmental Studies, Western Washington University

Place-Based Targeting: Using a Novel Method To Identify Disproportionalities in Causes and Effects
Mary Collins, Bren School of Environmental Sciences and Management, University of California, Santa Barbara

Comparison of Methods for Nationwide Environmental Justice Analysis of Predicted SO_2 Levels
Mark Corrales, Regulatory Policy Analyst, Office of Policy, Economics, and Innovation, Office of the Administrator, U.S, Environmental Protection Agency

Using Geographically Weighted Regression for Analyzing Disproportionate Environmental Impacts: Adverse Health Risks From Air Toxics in Florida
Angela Gilbert, University of South Florida

Proximal Exposure of Utah Schoolchildren to Airborne Pollutants From Major Roadways
William McDonnell, Assistant Professor of Pediatrics, Adjunct Professor of Law, Department of Pediatrics, University of Utah, and Director, Center for Children's Environmental Health Law and Policy

Demographic Distribution of Exposure to Diesel Particulate Matter at Selected Harbor Areas
Arlene Rosenbaum, Technical Director, ICF International

Data and Methodology Needs: Multiple and Cumulative Impacts/Effects
Wednesday, March 17, 2010, 3:00 – 5:00 p.m.

Using Children's Environmental Health Indicators To Identify Disparities in Exposure and Health
Daniel Axelrad, Office of the Administrator, Office of Policy, Economics, and Innovation, EPA

Multiple Impacts and Health Disparities in Port Arthur, TX: A Community Profile of Cumulative Risk
Hilton Kelley, National Environmental Justice Advisory Council/Member/Community In-Power and Development Association Inc.
John Sullivan, Center to Eliminate Health Disparities, University of Texas Medical Branch - Galveston

Creating an Overall Environmental Quality Index: Assessing Available Data
Danelle Lobdell, Chief (Acting), Epidemiology Branch, EPA

Human Exposure and Health in EPA's Report on the Environment: An EPA Resource for Data and Indicators for Informing Environmental Justice Policy Discussions
Patricia Murphy, ROE Health Coordinator, National Center for Environmental Assessment, EPA

Innovations in Environmental Justice Research for Action: the San Joaquin Valley Cumulative Health Impacts (SJV-CHIP)
Sarah Sharpe, Environmental Health Director/Coordinator, Fresno Metro Ministry/San Joaquin Valley Cumulative Health Impact Project

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Data and Methodology Needs: Susceptibility and Vulnerability
Wednesday, March 17, 2010, 3:00 – 5:00 p.m.

A Framework for Examining Social Stress and Susceptibility in Air Pollution and Respiratory Health
Jane Clougherty, Senior Air Quality Scientist, New York City Department of Health and Mental Hygiene and Research Associate, Department of Environmental Health, Harvard School of Public Health

Community- and Family-Level Factors Influence Caregiver Choice To Screen Blood Lead Levels of Children in a Mining Community
Sue M. Moodie, Department of Environmental Health, Johns Hopkins School of Public Health

Disparities in Race/Ethnicity in Relation to Air Pollution Exposure and Asthma in Adults
Keeve Nachman, Director, Farming for the Future Program, Bloomberg School of Public Health, Johns Hopkins Center for a Livable Future

Identifying "At-Risk Populations": Applying High-Resolution Air Quality, Demographic, and Baseline Health Data To Define and Locate At-Risk Populations
Tamara Saltman*, Policy Analyst, EPA

Mapping of Human Vulnerability to Climate Change at the County Level Across the United States
Sacoby Wilson, Research Assistant Professor, Institute for Families in Societies, University of South Carolina

Data and Methodology Needs: Unique Exposures
Wednesday, March 17, 2010, 3:00 – 5:00 p.m.

Traditional Knowledge and Community-Specific Living as the Basis for Relevant Risk Assessment: New Tools and Approaches
Christine Chaisson, Director, The LifeLine Group

Asian American and Pacific Islander American Seafood Consumption Studies in Washington State
Roseanne Lorenzana, Science Liaison, Region 10, EPA

Collaborative Investigation of Odors, Air Quality, and Health in a Community Bordering a Landfill
David Richardson, University of North Carolina at Chapel Hill

Contaminants in the Traditional Foods of the Yupik People of St. Lawrence Island, Alaska—Exposure Pathways, Collaborative Interventions, and Prevention
Viola Waghiyi, Environmental Health and Justice Program Director, Alaska Community Action on Toxics

Data and Methodology Needs: Psychosocial Stress
Thursday, March 18, 2010, 1:00 – 3:00 p.m.

Spatial Correlations Among Air Pollution and Social Stressors Across NYC Communities
Jessie Carr, Mailman School of Public Health, Columbia University

Chronic Social Stress and Susceptibility to Concentrated Ambient Fine Particles in Rats
Jane Clougherty, Harvard School of Public Health and New York City Department of Health

Natural Disasters and Human Health: Measuring the Prevalence of Stress-Related Disease After the 2002-2003 Illinois Storm, Tornado, and Flood Events
Richard Salkowe, Department of Geography, University of South Florida

*Presenter

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Data and Methodology Needs: Psychosocial Stress (continued)
Thursday, March 18, 2010, 1:00 – 3:00 p.m.

Allostatic Load, an Indicator of Chronic Stress, Modifies the Impact of Blood Lead Levels on Hypertension
Ami Zota, Program on Reproductive Health and Environment, University of California, San Francisco

Data and Methodology Needs: Physical Infrastructure
Thursday, March 18, 2010, 1:00 – 3:00 p.m.

Exposure Disparities Within the Indoor Environment: Understanding Critical Pathways and Implications for Policy Responses
Gary Adamkiewicz, Research Scientist, Department of Environmental Health, Harvard School of Public Health

Collaborative Investigation of Water Quality in a Community Bordering Landfills
Christopher Heaney, Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill

Examining Determinants of Pesticide Exposures in Public Housing Using Classification and Regression Tree (CART) Analysis
Rhona Julien, Environmental Health Scientist, EPA

The CEHI Community Assessment Project: A Tool for Linking the Built Environment With Key Health Outcomes
Gretchen Kroeger, Children's Environmental Health Initiative, Nicholas School of the Environment, Duke University

EPA Inspection and Enforcement Actions Under TSCA To Protect Vulnerable Populations
Max Weintraub, EPA

Use of Community-Owned and -Managed Research To Assess Infrastructure Disparities and the Quality of Water and Sewer Services in Marginalized and Underserved Environmental Justice Communities
Sacoby Wilson, Research Assistant Professor, Institute for Families in Societies, University of South Carolina

Data and Methodology Needs: Social Capital and Community Capacity To Participate in Environmental Decision Making
Thursday, March 18, 2010, 1:00 – 3:00 p.m.

Enhancing Worker Advocacy: OSHA's Outreach to Diverse Worker Populations
Diane Ballerino-Regan*, Occupational Safety and Health Administration (OSHA), Office of Occupational Medicine Resident/Duke University

Building Community Capacity in Environmental Decision-Making Through Community Lawyering: A Case Study
Steven Fischbach, Community Lawyer, Rhode Island Legal Services

Zinc Residues in Caribou: A Dilemma Presented to the Selawick, AK, Community: Community Decisions About Risk and Benefit
Claire Franklin, The LifeLine Group

*Presenter

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Data and Methodology Needs: Social Capital and Community Capacity To Participate in Environmental Decision Making (continued)
Thursday, March 18, 2010, 1:00 – 3:00 p.m.

Synthesizing Environmental Justice Planning Into Transportation Planning for Projects in the Southeastern United States Through Enhanced Public Involvement
Myra Immings, Community Planner, Planning and Program Development, Atlanta Regional Office, Federal Transit Administration

Forgotten People CDC—The Navajo Nation Laboratory
Don Yellowman, President, Forgotten People
Marsha Monestersky, Program Director, Forgotten People

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Data and Methodology Needs: Proximity

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Skewed Riskscapes and Environmental Injustice in St. Louis and Seattle

Troy D. Abel
Department of Environmental Studies, Huxley College of the Environment, Western Washington University, Bellingham, WA

Objective: This paper presents a case study of Toxics Release Inventory (TRI) air emission risks across metropolitan St. Louis, Missouri, and Seattle, Washington.

Methods: This study first presents a conventional analysis of the spatial patterns of TRI facilities and their surrounding census block group demographics for the St. Louis Metropolitan Statistical Area and the city of Seattle. Second, the use of a risk characterization analysis for 268 manufacturers and their air releases of more than 126 toxic air pollutants leads to more practical resolutions of urban environmental injustices. Third, longitudinal analysis in Seattle also illuminates how inequitable development and gentrification exacerbate environmental injustices.

Results: Spatial concentrations of minority residents averaged nearly 40 percent within 1 kilometer of St. Louis TRI sites compared to 25 percent elsewhere, but 10 facilities were responsible for 70 percent of the region's relative risk. In Seattle, cluster analysis reveals a concentration of risk and inequitable development, making the city's most socially vulnerable neighborhood even more vulnerable.

Conclusions: This disproportionate concentration of some of the greatest pollution risks would never be considered in most conventional environmental justice approaches. Not all pollution is created equally and, at the very least, the very worst toxic pollution and the trends concentrating it in the most socially vulnerable neighborhoods deserve more attention among policy analysts and practitioners crafting environmental injustice remedies.

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Place-Based Targeting: Using a Novel Method To Identify Disproportionalities in Causes and Effects

Mary B. Collins
Donald Bren School of Environmental Science and Management, University of California, Santa Barbara, CA

Background and Objectives: A small but striking body of literature suggests that the majority of human health risk from industrial sources is produced by a small number of facilities that emit disproportionately high levels of toxic substances. Such emissions often disproportionately affect environmental justice (EJ) communities. Using an integrated framework, this study applies a novel analytic approach to identify priority EJ communities and connect them with the industrial polluters responsible for excess health risk. Such knowledge allows regulators to more selectively target polluters for enforcement, thereby reducing health risk more efficiently and effectively.

Methodology: Using EJSEAT, RSEI, and Census data, this project spatially links enforcement data, relative health risk, and demographics at the census tract-level to identify industrial polluters that disproportionately contribute to health risk in Milwaukee, Wisconsin's EJ communities. It couples disproportionality measurements from two perspectives: the health risk *borne* by communities and the harms *produced* by polluters.

Results: Results reveal empirically that certain EJ communities are disproportionately bearing the region's greatest relative health risk. Striking variations in the production of risk also exist between polluters. Of the area's 299 facilities, 30 (or 10%) contribute 90 percent of all relative health risk.

Conclusions: The greatest gains in EJ and human health protection may be garnered by directing enforcement efforts at disproportionate polluters within heavily impacted EJ areas rather than by targeting full industrial sectors. If environmental regulation can be designed to effectively target the major contributors to cumulative health risk and ecological damage, it will maximize risk reduction at a lower cost.

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Comparison of Methods for Nationwide Environmental Justice Analysis of Predicted SO_2 Levels

Mark A. Corrales and Bridgid Curry
U.S. Environmental Protection Agency, Washington, DC

Background and Objectives: To explore the feasibility of environmental justice (EJ) assessment for a national regulation related to air quality, we implemented three different methods, ranging from simple to more complex.

Methods: A screening-level air quality model (SCREEN3) was applied to more than 15,000 facilities, to predict 1-hour maximum concentrations of SO_2 using default assumptions and sensitivity analysis. Approximately 2,000 key facilities with a potential for elevated ambient levels were identified. Three methods were compared for EJ analysis: (1) Co-location-based analysis—We analyzed demographics of census tracts containing the key facilities; (2) Proximity-based analysis—We analyzed demographics of persons within 1 km and 10 km of the key facilities; and (3) Ambient exposure-based analysis—We analyzed demographics of persons within zones predicted to exceed a selected ambient concentration. Facility locations were obtained from the U.S. Environmental Protection Agency's 2005 National Emissions Inventory and tract-level demographics from Census 2000. ArcGIS was used to locate relevant populations.

Results: Simple co-location analysis demonstrated that tracts containing the key facilities were similar to the United States overall with respect to percentage of households in poverty and percentage African American or black. However, these tracts were only 7 percentage Hispanic or Latino, well below the national average of 12.5 percent in 2000. Results for proximity-based analysis and exposure-based analysis will be presented and compared to the simpler analysis.

Conclusions: Screening-level analysis of EJ implications is feasible for a nationwide series of point sources with defined locations. However, nationwide EJ analysis may require the use of GIS software, even if simple co-location or proximity-based analysis is used.

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Using Geographically Weighted Regression for Analyzing Disproportionate Environmental Impacts: Adverse Health Risks From Air Toxics in Florida

Angela Gilbert and Jayajit Chakraborty
Department of Geography, University of South Florida, Tampa, FL

Background and Objectives: Previous quantitative research on racial/ethnic and socioeconomic inequities in the distribution of environmental hazards has been limited by a focus on residential proximity to pollution sources and the use of traditional regression techniques that fail to discern spatial variations in the statistical relationships between environmental risk and race/ethnicity or socioeconomic status (SES). These methodological gaps are addressed through a case study that seeks to determine: (1) if potential health risks from exposure to hazardous air pollutants in Florida are distributed inequitably with respect to race/ethnicity and SES, and (2) how the nature and significance of the statistical association between cancer risk and race/ethnicity or SES varies across the state.

Methods: This study integrates census tract-level estimates of cumulative cancer risk from the U.S. Environmental Protection Agency's 1999 National-Scale Air Toxics Assessment with Census 2000 sociodemographic data. An innovative local spatial statistical technique known as geographically weighted regression (GWR), which produces a separate regression equation for each tract, is utilized to explore spatial variations in statistical relationships between cancer risk and explanatory factors within Florida.

Results: Results indicate that race and ethnicity are significantly associated with cancer risks in Florida. Furthermore, maps of model parameters demonstrate that these statistical relationships differ significantly across Florida.

Conclusion: Conventional multivariate regression can mask important local variations in statistical relationships relevant to the analysis of environmental justice (EJ). Future use of statistical methods in EJ should be sensitive to the local processes of spatial effects.

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Proximal Exposure of Utah Schoolchildren to Airborne Pollutants From Major Roadways

William M. McDonnell[1,2], Phoebe B. McNeally[3], and Sean D. Firth[1]
[1]Department of Pediatrics, [2]Center for Children's Environmental Health Law and Policy,
[3]Department of Geography, University of Utah, Salt Lake City, UT

Background and Objectives: Air pollutants from motor vehicle exhaust cause adverse health effects in children, increased by close proximity. Roads with higher speed limits generally have higher traffic volumes and more pollution. We examined the proximity of schoolchildren to these pollutants and assessed the effects of socioeconomic factors.

Methods: We obtained geographic location data for all schools in Salt Lake County, Utah. We reviewed Census Bureau data for each school's census tract. Using geographic information systems, we determined the distance from each school to the nearest "major roadway," defined as the road with the highest speed limit within 150 m. Roads were grouped as: ≤ 30 mph; 31-50 mph; and > 50 mph. We used non-parametric analyses for statistical comparisons.

Results: We identified 349 schools. Seven percent ($n = 24$) were within 150 m of > 50 mph roads, while 12 percent ($n = 41$) and 81 percent ($n = 284$) were within 150 m of 31-50 mph and ≤ 30 mph roads, respectively. Poverty was directly related to school proximity to higher mph roads. Poverty rates increased from 1.0 percent in communities with ≤ 30 mph schools, to 1.5 percent at 31-50 mph schools, and 2.8 percent at > 50 mph schools ($p < 0.05$). Lower educational achievement was associated with higher mph roads. In communities with ≤ 30 mph schools, 5.5 percent of the population had less than a high school education, with 6.4 percent at 31-50 mph schools, and 13.7 percent at > 50 mph schools ($p < 0.05$).

Conclusions: Many children attend schools close to medium- and high-traffic roads. Schoolchildren in lower socioeconomic communities may be at increased risk of close exposure to traffic pollutants.

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Demographic Distribution of Exposure to Diesel Particulate Matter at Selected Harbor Areas

Arlene Rosenbaum[1], W. Seth Hartley[1], Jeffrey Hoye[1], Andy Shapiro[1], Mark Bethoney[2], Patricia Rowley[2], Lucie Audette[2], Ken Davidson[2], and Chad Bailey[2]
[1]ICF International, Rohnert Park, CA; [2]Office of Air and Radiation (OAR), U.S. Environmental Protection Agency, Ann Arbor, MI

Background and Objectives: There is current evidence that nearby residents of marine harbor areas are exposed to significantly higher concentrations of pollution, including particulate matter. In March 2008, the U.S. Environmental Protection Agency (EPA) promulgated new emission standards for marine compression ignition engines to help address these issues. The population exposure analysis presented here was performed as part of the technical support for that regulation. The purpose was to estimate the size and demographic composition of populations exposed to enhanced diesel particulate matter (DPM) concentrations resulting from activity in harbor areas across the United States.

Methods: For each of 45 U.S. marine harbor areas, EPA's AERMOD dispersion model was applied to harbor-specific EPA emissions estimates to estimate a 3-year average spatial distribution of DPM concentrations resulting from activity at each of the harbors. Geographic Information System (GIS) analysis and U.S. Census data were used to estimate the total population residing at locations with enhanced DPM concentrations, as well as its demographic composition with respect to household income and race/ethnicity.

Results: The results suggest that more than 630,000 people reside in locations with annual average DPM concentrations exceeding 2.0 $\mu g/m^3$ above urban background levels from emission sources at the 45 harbor areas studied, and approximately 17 million with annual average DPM concentrations exceeding 0.2 $\mu g/m^3$. Low-income households, non-Hispanic blacks, and Hispanics are over-represented in the aggregate affected population compared to the overall U.S. population at both concentration levels.

Conclusion: Low-income households, non-Hispanic blacks, and Hispanics are disproportionately impacted by enhanced DPM concentrations resulting from activities at marine harbors.

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Data and Methodology Needs: Multiple and Cumulative Impacts/Effects

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Using Children's Environmental Health Indicators To Identify Disparities in Exposure and Health

Daniel A. Axelrad[1], Julie Sturza[1], Onyemaechi Nweke[2], Gregory G. Miller[3], and Louis D'Amico[4]
[1]Office of Policy, Economics and Innovation, [2]Office of Environmental Justice, [3]Office of Children's Health Protection, U.S. Environmental Protection Agency, Washington, DC; [4]AAAS Science and Technology Policy Fellow, Office of Children's Health Protection, U.S. Environmental Protection Agency, Washington, DC

Background and Objectives: Children's environmental health indicators are useful for monitoring trends and identifying disparities in exposure to critical environmental contaminants and related childhood health effects. *America's Children and the Environment* is the U.S. Environmental Protection Agency's (EPA) compilation of children's environmental health indicators, presenting information on environmental contaminants in air, water, food, and soil; contaminants measured in the bodies of mothers and children; and childhood diseases that may be influenced by environmental factors. EPA is currently preparing several new indicators along with updates to the indicators previously published. Many of the indicators provide interesting information on differences in exposure or health status for different groups of children defined by race/ethnicity or household income.

Methods: Topics for the updated *America's Children and the Environment* were selected based on their importance to children's environmental health and the availability of nationally representative data suitable for indicator development. For each indicator, the ability to assess differences by race/ethnicity and income was evaluated based on the characteristics of the data source.

Results: Indicators of body burdens and childhood illnesses, drawn from national surveys such as the National Health and Nutrition Examination Survey and the National Health Interview Survey, provide extensive opportunities for evaluating disparities in exposure and health. Indicators of environmental contaminants, drawn from national monitoring databases such as the Air Quality System, also can be useful for evaluating differences by race/ethnicity or income.

Conclusion: Children's environmental health indicators provide important information to illustrate the cumulative impacts of multiple exposures and disparities in children's exposures and health outcomes by race/ethnicity and income.

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Multiple Impacts and Health Disparities in Port Arthur, TX: A Community Profile of Cumulative Risk

Hilton Kelley[1], Sharon Petronella[2], Alexandra Nolen[3], Jonathan Ward[4], and John Sullivan[5]
[1]Community In-Power & Development Association (CIDA), Port Arthur, TX; [2]National Institute of Environmental Health Sciences (NIEHS), Center in Environmental Toxicology, Community Outreach and Education Core (COEC), [3]Center for Elimination of Health Disparities, [4]NIEHS, COEC, [5]Public Forum and Toxics Assistance, NIEHS, COEC, University of Texas Medical Branch, Galveston, TX

Background: Port Arthur, in the upper Texas Gulf Coast, ranks in the top 10 percent of polluted U.S. communities in terms of: (1) chemical releases, (2) cancer risk, (3) recognized/suspected carcinogens, (4) developmental toxicants, and (5) recognized reproductive toxicants. West Port Arthur is 91 percent African American, with 23 percent of the households having incomes equal to or less than poverty level and unemployment at 14 percent. In conjunction with the U.S. Environmental Protection Agency's (EPA) Environmental Showcase Community Program, CIDA, the University of Texas Medical Branch's Center to Eliminate Health Disparities, and the National Institute of Environmental Health Sciences' Center in Environmental Toxicology have initiated a cumulative risk-health disparities study/action project.

Methods: Geographic Information System correlation of survey census data; aggregated TDSHS health data; TRI/Texas Commission on Environmental Quality monitoring data; Occupational Safety and Health Administration (OSHA) safety data, documentation of industrial accidents, explosions, flaring, integrated with results of community symptom surveys, community interviews, focus groups, and arts-based popular education/communication interventions.

Results: Port Arthur shows a wide-ranging cumulative risk burden: (1) residential neighborhoods proximate to a petrochemical complex; (2) high HAPs emissions; (3) frequent industrial upsets, flaring, explosions/fires; (4) diesel particulates from transport; (5) absence of local health facilities; (6) lack of neighborhood business/accessible county/city social services; (7) neighborhood school closures; (8) high rates of asthma, respiratory distress, cancer, skin irritations; (9) significant impacts on vulnerable segments of the population; and (10) significant impacts by Hurricanes Rita and Ike.

Conclusion: Results show that west Port Arthur is disproportionately impacted by multiple stressors and health disparities/significant cumulative risk burdens. Targeted ambient monitoring and biomarker studies are needed to establish exposure levels/health effects linkage; use of EPA environmental justice SEAT, Healthy Development Measurement Tool, National Oceanic and Atmospheric Administration community resiliency index to clarify relationship of environmental factors to health disparities and guide green development; intensive outreach/education to increase environmental health literacy and promote neighborhood engagement/empowerment in development, climate disaster preparedness, and environmental justice advocacy.

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Creating an Overall Environmental Quality Index: Assessing Available Data

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Background and Objectives: The interaction between environmental insults and human health is a complex process. Environmental exposures tend to cluster, and disamenities such as landfills or industrial plants are often located in neighborhoods with a high percentage of minority and poor residents. Yet, no single exposure can be held responsible for either good or poor health. To address this need, we propose to develop an overall environmental quality index (EQI) for all counties in the United States. This project focuses on the assessment of potential data sources for use in the development of the EQI.

Methods: Four main domains were identified that contribute to environmental quality: air, water, land, and built environment/social determinants. An inventory of possible data sources representing each of the four domains was created; data sources were identified using Web-based search engines (e.g., Google), site-specific search engines (e.g., federal data sites, state data sites), literature-reported data sources (e.g., PubMed, Science Direct, Toxnet), and word of mouth (e.g., colleagues, other data owners). Data sources were evaluated for appropriate spatial and temporal coverage and data quality.

Results: The data inventory identified 7, 80, 40, and 7 data sources for the air, water, land, and built environment/social determinants domains, respectively. Currently, 3 air sources, 6 water sources, 25 land sources, and 7 built environment/social determinants sources are being further evaluated for use in the EQI.

Conclusion: Potential data sources are available for each domain. However, differences in data quality, geographic coverage, and data availability exist among the four domains.

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Human Exposure and Health in EPA's Report on the Environment: An EPA Resource for Data and Indicators for Informing Environmental Justice Policy Discussions

Patricia A. Murphy
National Center for Environmental Assessment, Office of Research and Development, U.S. Environmental Protection Agency, Edison, NJ

Background and Objectives: With five main chapters encompassing air, water, land, human exposure and health, and ecological condition, the U.S. Environmental Protection Agency's (EPA) 2008 Report on the Environment (ROE) compiles in one place the most reliable national-level indicators currently available to help answer 23 questions EPA believes are critically important to its mission. The data and indicators from the Human Exposure and Health Chapter—presented by population sub-groups and geographic regions—are particularly relevant resources for characterizing status and trends in conditions among populations that could be disproportionately impacted by various environmental policies.

Methods: The Human Exposure and Health Chapter addresses three questions using 19 indicators reflecting exposure biomonitoring; general health status; acute, chronic, and infectious diseases; and birth outcomes. Questions include: "What are the trends in human exposure to environmental contaminants?", "What are the trends in health status in the United States?", and "What are the trends in human disease and conditions for which environmental contaminants may be a risk factor?" The underlying indicator data come from the Centers for Disease Control and Prevention (CDC).

Results: The poster will present examples of exposure and health condition indicators that address each of the three stated ROE questions and display trends across age, race, and ethnic group. Envisioned linkages to CDC's Environmental Health Tracking Network as well as possible new measures of disease burden will be described and discussed.

Conclusion: The ROE Human Exposure and Health Chapter provides a valuable online information source for EPA policy and decision makers needing age- , race-, and ethnic-specific information to support informed environmental policy discussions.

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Innovations in Environmental Justice Research for Action: the San Joaquin Valley Cumulative Health Impacts (SJV-CHIP)

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Background and Objectives: Quantifying the spatial distribution of environmental hazards and communities' demographic characteristics can provide valuable knowledge for environmental justice (EJ) advocacy work, policy formation, and academic study. Cumulative impacts from multiple hazards and vectors and the spatial and temporal patterns of suffering they incur have just begun to be studied in public health and EJ literature. The San Joaquin Valley Cumulative Health Impacts (SJV-CHIP) project is a coalition of EJ and public health activists that seeks the adoption of a cumulative impacts policy by regional environmental regulators. SJV-CHIP activists have joined with researchers at the University of California at Davis and elsewhere to document cumulative health impacts in the San Joaquin Valley and to build capacity for community-based participatory action research.

Methods: In this poster, the spatial patterns of multiple environmental hazards and communities' demographic characteristics are quantified in the San Joaquin Valley of California using Geographic Information System (GIS) and spatial statistics. Indexes of environmental, social, and economic vulnerability are refined and applied on a census block group and regional scale.

Results: Health impacts from agricultural, industrial, development, and transportation sectors are shown to disproportionately affect the region's most vulnerable populations—the low-income, immigrant, and communities of color—while dynamics of environmental racism also restrict democratic participation in shaping policy decisions. TRI data are shown to be an incomplete proxy for environmental hazards and are complemented by exposure and health data.

Conclusion: Cumulative impacts—especially through a community-based participatory research approach—are shown to be a compelling way to analyze and frame EJ issues.

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Data and Methodology Needs: Susceptibility and Vulnerability

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A Framework for Examining Social Stress and Susceptibility in Air Pollution and Respiratory Health

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Background and Objectives: There is growing interest in disentangling the health effects of spatially clustered social and physical environmental exposures, and in exploring potential synergies among these, with particular attention to the combined effects of psychosocial stress and air pollution. Both exposures may be elevated in lower income urban communities; and it has been hypothesized that stress, which can influence immune function and susceptibility, may potentiate the effects of air pollution in respiratory disease onset and exacerbation.

Methods: In this paper, we attempt to synthesize the relevant research from social and environmental epidemiology, toxicology, immunology, and exposure assessment to provide a useful framework for environmental health researchers aiming to investigate the health effects of environmental pollution in combination with social or psychological factors.

Results: We review the existing epidemiological and toxicological evidence on synergistic effects of stress and pollution, then describe the physiologic effects of stress and key issues related to measuring and evaluating stress as it relates to physical environmental exposures and susceptibility. Finally, we identify some of the major methodological challenges ahead as we work toward disentangling the health effects of clustered social and physical exposures and accurately describing the interplay among these.

Conclusions: There still is tremendous work to be done toward understanding the combined and potentially synergistic health effects of stress and pollution. As this research proceeds, we recommend careful attention to the relative temporalities of stress and pollution exposures, to non-linearities in their independent and combined effects, to physiological pathways not elucidated by epidemiological methods, and to the relative spatial distributions of social and physical exposures at multiple geographic scales.

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Community- and Family-Level Factors Influence Caregiver Choice To Screen Blood Lead Levels of Children in a Mining Community

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Background and Objectives: The Bunker Hill Superfund site, in Kellogg, Idaho, formerly a lead mine (1884-1981) and smelter (1917-1981), has widespread lead contamination of concern for child exposure and health risks. The U.S. Environmental Protection Agency has used child blood lead levels to inform the clean-up standards since 1983. The goal of this research project was to define community- and family-level factors that influence caregiver choice to screen child blood lead levels.

Methods: This study used mixed methods of formative research and was composed of three research components: (1) preliminary interviews using community-based participatory research methods to define key research questions; (2) quantitative analysis of a child blood lead screening survey; and (3) ethnographic community rapid assessment methods forming the in-depth interview process and qualitative analysis.

Results: The survey showed the likelihood of child blood lead screening increases 34 percent with each 1-year increase in current age of the child (95% CI, 1.08-1.67, p value = 0.009), and decreases 45 percent with annual household income greater than $10,000 (95% CI, 0.35-0.88, p value = 0.013). Across all levels of interviews, Kellogg's long history as a mining town influences attitudes and actions of caregivers to access child blood lead screening through instilling stigmas, parental blame, and a sense of shame about lead exposure and resultant health effects.

Conclusion: Health communication and environmental followup should prioritize methods to reduce parental feelings of blame, shame, guilt, and stigmas associated with the health effects of lead in a way that respects the pride of former mine workers, their families, and the history of the town.

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Disparities in Race/Ethnicity in Relation to Air Pollution Exposure and Asthma in Adults

Keeve E. Nachman[1] and Jennifer D. Parker[2]
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Background and Objectives: Relationships between chronic exposures to air pollution and various respiratory health outcomes have yet to be clearly articulated for adults. Recent data from nationally representative surveys suggest increasing disparity by race/ethnicity regarding asthma-related morbidity and mortality. The objectives of this study are to evaluate the relationship between exposure to fine particulate matter ($PM_{2.5}$) and the prevalence of respiratory outcomes for black and white adults using modeled air pollution and health outcome data and to examine potential differences in $PM_{2.5}$ sensitivity across race/ethnicity.

Methods: Respondents from the 2002-2005 National Health Interview Survey (NHIS) were linked to annual kriged $PM_{2.5}$ data from the U.S. Environmental Protection Agency's AirData system. Logistic regression was employed to investigate relationships between increases in ambient $PM_{2.5}$ concentrations and self-reported prevalence of asthma status and asthma attacks. Models examined relevant health, behavioral, demographic, and resource-related covariates. Stratified analyses were conducted to determine whether sensitivity to exposure varied by race/ethnicity.

Results: Of nearly 110,000 adult respondents, approximately 8,000 and 4,000 reported current asthma and recent attacks, respectively. Overall, odds ratios (OR) for current asthma (0.97 [95% Confidence Interval: 0.87-1.07]) and recent attacks (0.90 [0.78-1.03]) did not suggest an association with $PM_{2.5}$. Stratified analyses revealed significant associations for non-Hispanic blacks (OR = 1.73 [1.17-2.56] for current asthma and OR = 1.76 [1.07-2.91] for recent attacks) but not for non-Hispanic whites. These inferences were unaffected by further examination by insurance status and urbanicity.

Conclusion: Non-Hispanic blacks, but not non-Hispanic whites, may be at increased sensitivity of asthma outcomes from $PM_{2.5}$ exposure.

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Identifying "At-Risk Populations": Applying High-Resolution Air Quality, Demographic, and Baseline Health Data To Define and Locate At-Risk Populations

Neal Fann and Karen Wesson
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Background and Objectives: The U.S. Environmental Protection Agency recently undertook a pilot project for Detroit that simulated two contrasting air quality management strategies: both met $PM_{2.5}$ and ozone air quality targets, while one minimized costs for each pollutant and the other aimed to maximize health benefits (i.e., reducing population-level air pollution risks). This supplemental analysis introduces a technique for identifying high-risk populations and investigates whether a multi-pollutant, risk-based strategy can more effectively reduce health impacts among these at-risk groups.

Methods: Applying fine-scale, multi-pollutant air quality modeling, we identified populations experiencing the highest concentrations of air pollution. Next, we utilized 1 km-level demographic data and ZIP code level hospitalization rates to detect those most likely to experience pollution-related health impacts: populations that frequently seek hospital care for respiratory or cardiovascular symptoms. Using Geographic Information Systems (GIS), we combined these data layers and assessed whether the least-cost or maximum risk reduction strategy achieves the larger exposure reduction specifically among these at-risk populations.

Results: The GIS-based technique identifies several clusters of populations of African American children. Among these populations, the multi-pollutant, risk-based strategy produces three times larger reductions in $PM_{2.5}$ exposure than the traditional "least-cost" strategy.

Conclusion: Considering spatially refined air quality, health, and demographic data jointly allows us to locate at-risk populations. Risk-based strategies can maximize air quality improvements among both general and high-risk populations.

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Mapping of Human Vulnerability to Climate Change at the County Level Across the United States

Lesley Joseph[1], Sacoby Wilson[2], and Roland Richard[3]
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Background and Objectives: Many disadvantaged populations of color, particularly poor African Americans, may be at higher risks of experiencing the negative effects of climate change due to their geographic location and underlying vulnerabilities. The objective of this study is to explore the use of Geographic Information Systems (GIS) to assess areas that may be vulnerable to climate change.

Methods: The mean vulnerability score for each county in the United States was derived from 39 variables. Data for population density, poverty level, and race/ethnicity were obtained from the U.S. Census Bureau. Several health status and risk factor variables were used, including heat-related mortality rate, primary care physician rate, and cardiovascular disease mortality. Data on air pollution levels, toxic facility distribution, and elevation were used. ArcGIS 9.3 was employed to map the vulnerability scores, and Moran's I was used to assess statistically significant clusters.

Results: The results of spatial analysis showed that 15 of the 25 highest vulnerability scores, including the 7 highest vulnerability scores, were in counties/parishes in the South region. Despite having 15 counties at the top of the vulnerability score scale, the South region did not have the highest overall regional score. The Northeast Region had the highest mean score of 3.25, followed by the South (3.04), the West (2.79), and the Midwest (2.75).

Conclusions: The study shows the utility of using GIS spatial analysis to assess human vulnerability to climate change at the county level. Additional mapping is needed to assess vulnerability at census tract and census block group levels.

US EPA ARCHIVE DOCUMENT

Data and Methodology Needs: Unique Exposures

US EPA ARCHIVE DOCUMENT

Traditional Knowledge and Community-Specific Living as the Basis for Relevant Risk Assessment: New Tools and Approaches

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Background and Objectives: Until now, risk assessment approaches were designed with the typical Westernized commercial community in mind, using averaged values for critical parameters, thus disguising subpopulations bearing disproportionate risk. Because daily activities and diet define exposure opportunities, people eating subsistence foods or living culturally unique lifestyles are invisible in risk assessments. The objective was to develop new tools and approaches that reflect the real community diets, activities, and characteristics, including seasonal and personal variability. These tools also should expand community capacity to harvest their traditional knowledge and participate in health and policy decision-making.

Methods: New software and methods were developed to: (1) utilize any form of information to construct relevant community-specific dietary and activity profiles; (2) accomplish aggregate risk assessment reflecting possible disproportionate exposure and risk; and (3) consider cultural and nutritional benefits together with the risks in the food, water, and environment. Communities in Alaska and Canada tested early versions of the software to assess its relevance and ability to assist their decision-making.

Results: Software has been developed and tested that utilizes all forms of information and accomplishes community-specific risk assessment. Multiple chemicals and stressors can be simultaneously considered. Traditional knowledge can be applied. Software operation and interpretation require technical assistance.

Conclusions: New software and methodological approaches now exist that are relevant to unique communities and people with unique diets and lifestyles or cultural practices. These tools can expand community capacity in health and policy decision-making. Nutritional profiling capacity and community training are critical next steps. The software is available and free.

US EPA ARCHIVE DOCUMENT

Asian American and Pacific Islander American Seafood Consumption Studies in Washington State

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Background and Objectives: As characterized on the 2000 U.S. census, there are 28 Asian and 19 Pacific Islander groups that could be included in the American & Pacific Islander American (AAPI) category. Because of cultural and language differences, seafood consumption risk assessments involving AAPI groups require culturally appropriate methods to collect exposure data. Purposes of this study are to: (1) demonstrate the effectiveness of a community-centered approach in which the community plays a major role in determining study design, developing and administering the survey instrument, and producing a final product; and (2) obtain documentation of AAPI rates of seafood consumption, types of species, and preparation methods that can be used in risk assessment.

Methods: Under the leadership of an AAPI social services organization, a community group was formed to develop a questionnaire and study approach that would elicit accurate results. The community worked with an advisory committee for technical assistance and in partnership with scientists at the U.S. Environmental Protection Agency and the University of Washington who provided oversight for the scientific design, data analyses, and development of the final report.

Results: This community-centered approach was successful with respect to including 10 AAPI ethnicities in the survey. Consumption rates for a wide variety of fish, shellfish, and seaweed were documented. The consumption of internal organs and cooking water also was documented.

Conclusion: Results suggest there are some AAPIs who have very high rates of consumption, and the community-centered approach is a successful method for obtaining this type of data.

US EPA ARCHIVE DOCUMENT

Collaborative Investigation of Odors, Air Quality, and Health in a Community Bordering a Landfill

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Background and Objective: The Rogers-Eubanks community is a historically black neighborhood that predates the Orange County Municipal Landfill sited along its border in 1972. The Rogers-Eubanks Neighborhood Association (RENA) collaborated with scientists at the University of North Carolina at Chapel Hill (UNC) with the aim of investigating residents' health and quality of life concerns about malodor from the landfill in their community.

Methods: Utilizing a community-driven research approach, RENA members and UNC researchers enrolled individuals to complete odor diaries detailing the intensity, frequency, and nature of malodors and how odors impacted individuals' daily activities, physical symptoms, and mood twice daily over a 2-week period. In addition to the odor diaries, continuous air monitoring of hydrogen sulfide (H_2S) was conducted.

Results: Study partners enrolled a total of 38 individuals for diary data collection. More than 29,000 5-minute H_2S measures were recorded over a period of 82 days (mean = 0.414 ppb, SD = 0.569, range = 0–14.862 ppb).

Conclusions: The project built community capacity for research to quantify community exposures to airborne H_2S emissions from the landfill; characterized relationships between H_2S exposures and odor, physical symptoms, irritation, quality of life, and mood measures; and supported RENA's efforts to replicate this research approach in landfill communities facing similar environmental and health disparities.

US EPA ARCHIVE DOCUMENT

Contaminants in the Traditional Foods of the Yupik People of St. Lawrence Island, Alaska—Exposure Pathways, Collaborative Interventions, and Prevention

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Background and Objectives: The Yupik people of St. Lawrence Island (SLI), in the Bering Sea region of Alaska, receive disproportionate exposures from contaminants through long-range transport and military sources. Community concerns prompted a study that demonstrated that Yupik serum contained PCB levels significantly above those of the general North American population. Because the Yupik people sustain cultural ways of life that rely on traditional foods, dietary exposure likely is a significant source of the PCBs. Researchers examined Yupik traditional foods for contaminants to inform community decisions and interventions.

Methods: Community researchers, working with traditional hunters, collected 500 samples of the diverse species that people of SLI depend on for their traditional diets. The samples were analyzed using dual-column gas chromatography with electron capture detection.

Results: Results show the meat/muscle tissue for most species and the plant species to be lowest in contaminant concentrations. For unlimited fish consumption, the U.S. Environmental Protection Agency's risk-based consumption limit for PCBs in fish is 1.5 ppb to avoid excess risk of cancer. Concentrations of PCBs in the blubber of marine mammals ranged from 35 ppb in walrus blubber tissue to 450 ppb for PCBs in polar bear blubber. The rendered oil samples contained the highest PCB concentrations of all samples tested other than polar bear blubber, ranging from 200 ppb in bearded seal to 450 ppb in ringed seal.

Conclusion: We conclude that rendered oils and blubber are the major dietary sources of PCBs. Researchers are working with community leadership on SLI to develop collaborative interventions that will eliminate and reduce exposures.

US EPA ARCHIVE DOCUMENT

Data and Methodology Needs: Psychosocial Stress

US EPA ARCHIVE DOCUMENT

Spatial Correlations Among Air Pollution and Social Stressors Across NYC Communities

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Introduction: Chronic psychological stress has been linked to respiratory health, both independently and in combination with air pollution exposures. There is growing interest in methods to explore synergistic effects among these exposures as well as the extent to which they disproportionately impact lower income communities and other susceptible populations. Understanding this interplay could help elucidate the relationships among psychosocial stressors, air pollution, and health in urban communities.

Methods: Building on the New York City Community Air Survey (NYCCAS), a year-round study of intra-urban variation in multiple air pollutants across NYC neighborhoods, we are using Geographic Information System (GIS)-based methods to identify and map relevant, community-level social stressors for comparison with intra-urban patterns in air pollution exposures.

Results: Under NYCCAS, we recently completed spatial models describing significant intra-urban variation in fine particles ($PM_{2.5}$), elemental carbon (EC), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and pollution sources (e.g., traffic, building density). Through mapping neighborhood-level indicators of social stressors, including mental health data, violent crime statistics, noise complaints, neighborhood percent poverty, and quality of life variables (e.g., park/playground conditions), we are providing information on clustering and inter-neighborhood variability. Additional variables related to childhood stress experiences (e.g., abuse/neglect, percent students in schools exceeding capacity), a subpopulation of concern for asthma, will be explored.

Conclusions: Comparison of spatial distributions of community stressors and air pollutants will allow disentangling of these separate patterns of exposure. Future epidemiological investigations using these data will enable assessment of the independent and synergistic effects of different but potentially spatially correlated exposures in predicting the onset and exacerbation of respiratory and cardiovascular illness.

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Chronic Social Stress and Susceptibility to Concentrated Ambient Fine Particles in Rats

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Background and Objectives: Epidemiologic evidence suggests that chronic stress may alter susceptibility to air pollution. Persistent spatial confounding, however, may limit the utility of epidemiologic methods to disentangle these effects and cannot identify physiologic mechanisms for this differential susceptibility. Using a rat model of social stress, we compared respiratory response to concentrated fine ambient particles (CAPs), and examined biologic markers of inflammation.

Methods: Twenty-four 12-week-old male Sprague-Dawley rats were randomly assigned to four groups (Stress/CAPs; Stress/Filtered Air (FA); Non-stress/CAPs; Non-stress/FA). Stress group animals were individually introduced into a dominant male's home cage twice weekly. Blood drawn at sacrifice was analyzed for immune and inflammatory markers. CAPs were generated using the Harvard fine particle concentrator, drawing real-time urban ambient fine particles, which enriched concentrations approximately 30 times. CAP/FA exposures were delivered in single-animal phethysmographs, 5 hours/day for 10 days, with respiratory function continuously monitored using a Buxco system.

Results: Stressed animals displayed greater average CRP, TNF-alpha, and white blood cells. Among non-stressed animals, CAP exposures conferred higher flows and volumes, with briefer pauses. Among stressed animals, CAP exposures conferred greater respiratory frequency and lower flows and volumes. Only with both exposures did we observe rapid, shallow breathing patterns, with lower total airflows.

Conclusions: CAP effects on respiratory function differed significantly by stress group. CAPs conferred a shallow, rapid breathing pattern, exacerbated under chronic stress. Blood measures provided evidence of inflammatory responses. Results support epidemiologic findings that chronic stress may alter susceptibility to air pollution and may help elucidate pathways for differential susceptibility.

US EPA ARCHIVE DOCUMENT

Natural Disasters and Human Health: Measuring the Prevalence of Stress-Related Disease After the 2002-2003 Illinois Storm, Tornado, and Flood Events

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Background and Objectives: Prior research has revealed that disaster events are associated with an increased prevalence of stress-related illness that may persist for a prolonged period of time after the initial threat has subsided. The severity of post-disaster disease morbidity is contingent on the magnitude of the respective event and the associated loss of personal and community resources. This study examines stress-related post-disaster disease incidence that is of sufficient severity to require inpatient hospitalization.

Methods: A longitudinal pre-event and post-event comparison of hospital admissions for diagnostic groupings of stress-related disease was performed to determine if there was a significantly higher rate of admissions in disaster-stricken rural communities of Southern Illinois.

Results: Inferential statistical analysis revealed a significant increase in hospital admissions for stress-related illness in the year following the 2002-2003 storm, tornado, and flood disasters that affected Southern Illinois. There was no evidence of a significant increase in similar hospital admissions for control groups or for non-stress-related conditions.

Conclusion: This cohort study of pre-event and post-event stress-related hospital admissions provides an additional method for evaluating the consequences of disasters and focuses attention on the critical need for post-disaster preventive health interventions that address community vulnerability and well-being with respect to stress-related illness. Adverse reactions to environmental contaminants may be potentiated by the observation of an increased level of post-event stress-related hospital admissions in rural communities affected by natural disasters.

US EPA ARCHIVE DOCUMENT

Allostatic Load, an Indicator of Chronic Stress, Modifies the Impact of Blood Lead Levels on Hypertension

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Background: Environmental justice advocates argue that agencies should account for the cumulative impacts of multiple hazards, yet few health studies have assessed interactions between environmental and social stressors. We examined whether allostatic load, a biological indicator of chronic stress, amplifies the effects of lead exposure on hypertension among middle-aged adults.

Methods: We assessed the interaction of allostatic load on lead exposure on hypertension among 5,067 National Health and Nutrition Examination Survey (NHANES) participants (aged 40-65). General hypertension was defined as systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg. Models were adjusted for: age, sex, race/ethnicity, education, marital status, smoking, alcohol consumption, and blood pressure medication.

Results: Blood lead levels in this population were generally low (mean = 2.20 μg/dL). Hypertension risk increased with increasing blood lead levels only among those with high allostatic load. Compared to the lowest lead exposure group (quintile 1), participants with the highest lead exposure (quintile 5) had elevated risks of general hypertension (odds ratio [OR] = 1.65, 95% CI: 1.05-2.59). A similar risk was observed for systolic hypertension, while the magnitude of risk was higher for diastolic hypertension (OR = 3.43; 95% CI: 1.76-6.67). There was no difference in hypertension risk between the highest and lowest lead exposure groups among participants with low allostatic load (general hypertension OR = 0.82; 95% CI: 0.5-1.3).

Conclusions: Results suggest that the effect of lead on hypertension is more pronounced among those who are chronically stressed. Interactions between environmental and social stressors should be accounted for in regulatory policies.

US EPA ARCHIVE DOCUMENT

Data and Methodology Needs: Physical Infrastructure

US EPA ARCHIVE DOCUMENT

Exposure Disparities Within the Indoor Environment: Understanding Critical Pathways and Implications for Policy Responses

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Background and Objectives: Disparities in indoor environmental quality have not been fully incorporated into the dialog on environmental justice. Studies of the residential environment frequently ignore fundamental physical and chemical processes that drive exposure in these spaces, limiting efficient mitigation. This study explores these proximate (i.e., causal) determinants of environmental exposures and their relationships to observed disparities.

Methods: A review of the peer-reviewed literature on exposure disparities within indoor environments and potential driving forces was conducted. This evidence is placed in the context of physical and chemical models of indoor exposure dynamics to provide insight on the development of mitigation strategies.

Results: Exposure to lead, secondhand smoke and asthma triggers continue to disproportionately affect low socioeconomic status populations. Recent evidence highlights additional determinants of disparities in indoor environmental exposures, including: age of household furnishings, history of pesticide usage, product usage profiles, lack of mechanical ventilation in kitchens and bathrooms, and air infiltration pathways (multifamily setting). Physical models of emissions, dynamic partitioning, deposition, re-suspension and other critical processes can aid in the evaluation of risk-reduction strategies. Shared pathways (i.e., root causes) and disparities in susceptibility may also contribute to disproportionate cumulative risks.

Conclusion: Understanding specific physical and chemical pathways aids in the development of residential interventions that may reduce disparities. The persistence of some chemical residues may contribute to a "legacy" effect within older housing stock. These linkages will become increasingly relevant in buildings where energy-saving retrofits or weatherization efforts, motivated by climate change benefits, may reduce air exchange rates.

US EPA ARCHIVE DOCUMENT

Collaborative Investigation of Water Quality in a Community Bordering Landfills

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Background and Objective: The Rogers-Eubanks community is a historically black neighborhood that predates the Orange County Municipal Landfill sited along its border in 1972. The Rogers-Eubanks Neighborhood Association (RENA) collaborated with scientists at the University of North Carolina (UNC) at Chapel Hill with the aim of investigating long-time concerns of public health and well-water quality in their community.

Methods: Utilizing a community-driven research approach, RENA members and UNC researchers surveyed households to collect information about signs of private well vulnerability and septic system failure, and collected and analyzed community drinking water samples for microbial water quality.

Results: Study partners surveyed a total of 27 households. All households with a private well reported one or more signs of well vulnerability, and 68 percent of households with private septic systems reported one or more signs of failure. Partners collected and analyzed drinking water samples from 20 households. There was evidence of higher drinking water turbidity and fecal coliform concentrations at households with private wells than at those with regulated public water. Levels of fecal coliform and *E. coli* in household well water exceeded the maximum contaminant limit (MCL) of zero, and enterococci levels suggest fecal contamination of household drinking water supplies.

Conclusions: The results of this collaborative study provide evidence of noncompliance with federal public health statutes and a difference between the quality of private well water and regulated public water in the Rogers-Eubanks community. These results led to community actions to encourage compliance and initiated a dialogue with national public health and environmental policy leaders.

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Examining Determinants of Pesticide Exposures in Public Housing Using Classification and Regression Tree (CART) Analysis

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Background and Objectives: The use of chemical pesticides to control cockroach and rodent infestation in inner-city households is a growing public health concern as pest management practices often include the use of banned and restricted-use products to control pests. This practice can result in elevated levels of pesticide residues in the home, but due to prohibitive costs to measure these levels, it is often challenging to detect highly exposed households. The aim of this study was to devise a low-cost approach to identify homes in public housing with high levels of pesticide residues, using a screening approach based on housing characteristics.

Methods: As part of the Healthy Public Housing Initiative, we collected environmental samples from 42 public housing apartments in Boston, Massachusetts, in 2002 and 2003 and obtained information on household demographics, questionnaire information (e.g., self-reported pesticide use), and home visits. Focusing on five organophosphate and pyrethroid pesticides, we used classification and regression tree analysis (CART) to disaggregate the pesticide concentration data into homogenous subsamples according to housing characteristics, which allowed us to identify households impacted by the mismanagement of pesticides.

Results: The CART analysis demonstrated reasonable sensitivity and specificity given more extensive household information, but generally poor performance using only information available without a home visit.

Conclusion: This method has the potential to detect highly exposed households with reasonable sensitivity and specificity given appropriate information that can subsequently lead to the design of effective interventions.

US EPA ARCHIVE DOCUMENT

The CEHI Community Assessment Project: A Tool for Linking the Built Environment With Key Health Outcomes

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Background and Objectives: Research shows evidence of associations between the built environment (BE) and health outcomes. However, there is less research describing instruments able to assess the spatial variation of the BE and its impact on birth outcomes. The Children's Environmental Health Initiative's (CEHI) Community Assessment Project (CAP) documents the spatial variation of the BE using a comprehensive assessment tool. The CAP objectives are to: (1) systematically characterize BE conditions over a substantial geography; and (2) assess the relationship between BE conditions and health outcomes.

Methods: Trained assessors canvassed more than 17,000 tax parcels in Central Durham, North Carolina, using a standardized visual assessment of 40 distinct BE variables. Data were summarized by eight indices: housing damage, property damage, territoriality, tenure, vacancy, crime, amenities, and nuisances. Census blocks were assigned an index based on the summary score of primarily and secondarily adjacent blocks. As a first public health outcome application, the indices were then spatially linked to birth weight data in Durham.

Results: Regression analysis indicates a strong relationship between the indices and birth weight. That is, pregnancies in neighborhoods characterized by poor housing conditions and high rates of renter-occupancy and vacancies are associated with lower birth weights. Furthermore, this association strengthens with increasing spatial aggregation, indicating that depauperate BEs that manifest over a wider geography have a greater impact on health outcomes.

Conclusions: The CAP offers a comprehensive inventory of the BE, facilitating the generation of indices describing neighborhood quality. Clear linkages exist between neighborhood quality and public health outcomes.

US EPA ARCHIVE DOCUMENT

EPA Inspection and Enforcement Actions Under TSCA To Protect Vulnerable Populations

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Background and Objectives: U.S. Environmental Protection Agency (EPA) inspectors are moving beyond sector-based approaches to addressing vulnerable populations. Childhood lead poisoning disproportionately harms children of color from low-income families. This study illustrates how an EPA inspector can provide the greatest benefit to this vulnerable population while enforcing the Section 1018 disclosure requirements for residential lead-based paint under the Toxic Substances Control Act (TSCA).

Methods: Compare different methods to identify inspection targets, collect information during inspections, and take enforcement actions, to identify best practices.

Results: Inspection targets should be selected based on a cross section of risk factors and the capacity for potential violators to respond. Existing databases (e.g., HHELPSS, EJ SEAT, EJ GAT, Dun & Bradstreet, Lexis/Nexis, NAHMA 100, etc.) provide such information. Data collected during inspections should include the age of children present, as younger children are at greater risk of lead exposure and trigger greater penalties under the enforcement policy. When violations are identified, supplemental environmental projects (SEPs) should be negotiated in lieu of penalty payments to the U.S. Treasury. SEPs will diminish risks to children and, under SEP policy, can be expanded when Medicaid support to protect children from lead is unavailable.

Conclusion: TSCA inspections and enforcement can focus on vulnerable populations (i.e., children of color from low-income families) rather than sectors (i.e., owners and managers of pre-1978 housing). The most effective actions incorporate components of both approaches. This comprehensive approach may serve as a model to other statutory inspection and enforcement programs.

US EPA ARCHIVE DOCUMENT

Use of Community-Owned and -Managed Research To Assess Infrastructure Disparities and the Quality of Water and Sewer Services in Marginalized and Underserved Environmental Justice Communities

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Background and Objectives: The West End Revitalization Association (WERA) is a community-based organization (CBO) in Mebane, North Carolina, that was organized in 1994 to address the illegal planning of a local highway without the input of impacted stakeholders and with infrastructure disparities—particularly the lack of basic amenities (sewer and water services). WERA built a partnership with local researchers to address the planning inequities and infrastructure disparities.

Methods: WERA employed its community-owned and -managed research (COMR) approach to collect data on infrastructure disparities and environmental hazards. Maps were created of sewer and water infrastructure and environmental hazards. Community monitor (CM) training workshops, household water and sewer service surveys, and drinking water and surface water tests of fecal pollution were completed at private (target) and regulated public (referent) service households in WERA neighborhoods.

Results: Maps illustrated infrastructure and exposure disparities in WERA neighborhoods. CMs collected survey data showing a mixture of failing private wells and septic systems and regulated public drinking water and sewer lines. Septic system failure ranged from 11-18 percent. Higher turbidity levels were observed in private wells compared to regulated public drinking water ($p < 0.0001$). There was little evidence of differences in surface water fecal pollution at target and referent sites. Drinking water and surface water fecal pollution levels exceeded limits protecting health at target and referent households.

Conclusions: COMR methods built community capacity to document infrastructure disparities and fecal contamination of well water and surface water. The COMR approach can be used by other CBOs to document infrastructure disparities.

US EPA ARCHIVE DOCUMENT

Data and Methodology Needs: Social Capital and Community Capacity To Participate in Environmental Decision Making

US EPA ARCHIVE DOCUMENT

Enhancing Worker Advocacy: OSHA's Outreach to Diverse Worker Populations

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Background and Objectives: The Occupational Safety and Health Administration (OSHA) has a number of outreach programs for underserved, diverse worker populations. Throughout the country, OSHA Area Offices have formed alliances with consulates, worker centers, unions, media, community, and faith-based organizations to bring worker health and safety information and training to these populations. The objectives of this poster presentation are to:

- Identify successful approaches to communication with low-income and minority worker groups.
- Explore the role of worker centers, clinics, and other community organizations as worker representatives for occupational safety and health actions, such as submitting an OSHA complaint.
- Discover other positive outcomes of these programs, such as enhanced community self-advocacy for both occupational and environmental health threats.

Methods: A questionnaire will be designed to describe and quantify outreach programs to minority and underserved worker populations and will include outcome measures and roles of collaborative organizations. The questionnaire will be sent to OSHA Area Offices. Questionnaires will be analyzed. Interviews with Area Office representatives will be performed to clarify and highlight successful initiatives.

Results: OSHA's programs that promote increased worker participation and self-advocacy will be summarized. Outcome metrics will be described and evaluated. Occupational health programs that have led to environmental health policy concerns will be illustrated.

Conclusions: Through OSHA's efforts to collaborate with diverse organizations, underserved workers have increased access to health and safety information and improved ability to take action to create safer work and home environments.

US EPA ARCHIVE DOCUMENT

Building Community Capacity in Environmental Decision-Making Through Community Lawyering: A Case Study

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Community Lawyering is an emerging approach to the practice of poverty law where representation decisions are based on community-identified needs. In addition to litigation, Community Lawyering involves policy research, community education, and transactional work aimed at increasing the capacity of communities to affect government decision-making. Rhode Island Legal Services' (RILS) Community Lawyering Project helped build the capacity of low-income residents to affect environmental policy decisions. First, RILS represented residents in a lawsuit challenging the Rhode Island Department of Environmental Management's (DEM) decision approving the siting of public schools on the former Providence City Dump. The lawsuit was successful, and DEM was ordered to convene a Stakeholder Group that included RILS' clients to develop policy proposals on community involvement and environmental justice. Before the court's ruling, RILS obtained U.S. Environmental Protection Agency (EPA) funds to conduct policy research on state agency environmental justice programs. The Stakeholder Group used the research's results to develop policy proposals. This year, DEM adopted a comprehensive environmental justice policy developed by the Stakeholder Group, and additional proposals will be considered by DEM in 2010. With other EPA funding, RILS conducted several community educational forums on environmental issues residents expressed interest in, culminating in the first statewide conference on environmental justice. Thereafter, conference attendees decided to form the Environmental Justice League of Rhode Island (EJLRI). RILS helped EJLRI incorporate and obtain funds to hire staff. Changes in DEM policies and creation of a new organization have significantly increased the capacity of environmental justice communities to participate in environmental policy decisions.

US EPA ARCHIVE DOCUMENT

Zinc Residues in Caribou: A Dilemma Presented to the Selawick, AK, Community: Community Decisions About Risk and Benefit

Claire A. Franklin[1], Christine F. Chaisson[2], and Anne Marie Chaisson[3]
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Background and Objectives: Zinc residues were repeatedly found in caribou of herds migrating near Selawick, Alaska—an Inupiat Eskimo community. The consequences of ending caribou consumption to avoid zinc exposure could cause cultural upheaval, food insecurity, and nutritional deficiencies. Most Western science risk assessment approaches are poor aids to community leaders facing such choices for their people. The objective was to introduce new LifeLine risk assessment tools and assess how they performed in expanding community capacity and how they fit into the overall needs of the decision-makers.

Methods: Selawick community leaders and an advisor worked with LifeLine to create realistic dietary profiles, including caribou consumption by age and season, which were applied with zinc residue data to Customized Dietary Assessment Software© yielding community-specific risk estimates and inherent variability. Selawick's advisor interpreted results to community members. Leaders considered this information with their existing cultural parameters for decision-making. Together, we evaluated the contribution of the new methodological approaches and tools toward building community capacity and sensitivity to this example of disproportionate exposure and potential health impact.

Results: Risk assessments were deemed relevant to the community and reflected variables due to personal preference, seasonality, and other factors. Zinc exposure from caribou presented less problems than consequences of ending the hunt and food source. With the aid of technical advisors, LifeLine tools aided the decision-makers in three of four criteria.

Conclusions: New software and methodological approaches can expand community capacity in health and policy decision-making. Nutritional profiling capacity and community training are critical next steps.

US EPA ARCHIVE DOCUMENT

Synthesizing Environmental Justice Planning Into Transportation Planning for Projects in the Southeastern United States Through Enhanced Public Involvement

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Federal Transit Administration, Atlanta, GA

Background and Objectives: Although the National Environmental Policy Act (NEPA) of 1969 has since its inception incorporated requirements for evaluation of potentially adverse social effects associated with federally funded transportation projects, the traditional interagency consultation and public involvement processes supporting NEPA have inadequately represented low-income and minority factions. This study strives to investigate the potential for infusing specific public involvement activities, techniques, and special accommodations to attract and sustain high-quality participation by at-risk groups in such a manner as to best integrate salient social dynamic information into the NEPA project recommendation.

Methods: Structured interviews with environmental justice (EJ) advocates, leaders representing business and faith-based communities, elected officials, representatives of key Metropolitan Planning Organizations (MPO), State Departments of Transportation (DOT), and federal agencies within the Southeastern Region were supplemented by a 50+ question written survey that explored participation preferences and correlated specific techniques with successful project development. Federal Highway Administration (FHWA)/Federal Transit Administration (FTA) Planning Certification Reviews monitored quality assurance of the MPO and DOT public involvement program efforts over 15 years. Interagency consultations pursuant to tribal, brownfields reclamation, Clean Water Act, and Clean Air Act conformity issues provide viable vehicles for continual refinement of best practices in EJ-directed public engagement.

Results: Neighborhood association and homeowners' association meetings, public hearings, informational open houses hosted by project sponsors, stakeholder meetings (beginning at the problem-identification stage of scoping), and planning charrettes are the most effective public involvement plan activities. They are most effective when generated using plain language and visualization techniques such as Visual Preference Surveys and computer animations. Sponsor provision of fully accessible facilities, transportation, childcare, and meals further enhances full participation by at-risk groups.

Conclusion: Communities (MPO, state and federal agencies [EPA, FHWA, ACHP, FTA, et al.]) can collectively influence enhancement of public involvement mechanisms through focused interagency consultation and development of plain language, highly visual presentation techniques using specifically identified high-value activities to attract participation by EJ at-risk groups to promote quality projects stimulating community cohesion, livability, and sustainability.

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Forgotten People CDC—The Navajo Nation Laboratory

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In Navajo Nation creation stories, Monster Slayer and Born for Water twins stopped monsters from killing people. The monsters today are uranium and coal.

The Navajo Nation produces most of the energy for the Southwest, but many Navajo homes lack sanitation and piped water. In 1966, the U.S. government imposed the Bennett Freeze denying all infrastructure repairs or construction, meaning today 3 percent of families have electricity and 10 percent have running water.

During the "freeze," more than 100 million tons of mill tailings accumulated in the Four Corners area of the Southwest. These mill tailings contain radium and thorium with a half-life of 80,000 years.

Superfund reports 520 abandoned uranium mines on Navajo Nation land, with 25 percent of the unregulated sources in the western Navajo reservation exceeding drinking water standards for kidney toxicants, including uranium.

Lack of remedial action is discrimination. Policy makers need to be educated about health implications to make informed choices, thereby avoiding unintended harm and costs. The United Nations currently holds consultations on private sector participation under provisions of water and sanitation services. People directly affected need a seat at the Navajo Nation's and the Federal Government's table, with participatory involvement and access to information. Partnerships are needed to deliver safe drinking water and basic sanitation to curb disease.

Traditional principles of indigenous peoples must be incorporated immediately to ensure the U.S. government meets its commitment to protect public health and the environment and reduce indigenous households lacking sanitation and safe drinking water.

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Strengthening Environmental Justice Research and Decision Making: A Symposium on the Science of Disproportionate Environmental Health Impacts

March 17 - 19, 2010

Walter E. Washington Convention Center
Washington, DC

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