

Acknowledgments

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Executive Summary

Preventing Children's Exposures to Environmental Hazards: Research and Policy Issues, the first symposium to address a national research and policy agenda for pediatric environmental health,

generated over one hundred specific recommendations. Two hundred recognized experts on research, policy, clinical practice, and advocacy contributed their expertise and vision for protecting children from exposures to environmental hazards. This meeting is a significant step toward establishing a national framework and direction for pediatric environmental health research and policy. Below are listed the key issues identified by participants, along with general recommendations for action.

Key Issues

Children are exposed to preventable environmental hazards such as lead, solvents, asbestos, pesticides, air pollution, and environmental tobacco smoke.

Children are not little adults-children are at greater risk than adults for exposure to and possible illness from environmental hazards due to their decreased ability to detoxify substances, greater sensitivity during development and growth, behaviors such as crawling and mouthing, greater amount of time spent outdoors near exposures, and greater ingestion of contaminants through different diets than adults.

Children in poverty and children from racial/ethnic communities may suffer more frequent and direct exposures to many more chemicals and other pollutants.

Children are underprotected. No national research or policy agenda exists to address potentially hazardous exposures to children.

There are very few data sources that have information on children's exposures.

Regulations for permissible exposure levels are based on data from adult animals and humans.

Risk assessments do not routinely differentiate between children and adults. and do not consider multiple or cumulative exposures.

Recommendations for Action

Recommendations were generated in plenary and keynote addresses, and in thirteen workshops on specific pediatric environmental health topics.

Policy Recommendations for Action: The Federal Government

Adopt a public health, preventive approach to environmental exposure which protects the most vulnerable subsets of populations. Set standards regulating air, food, water, and homes.

Children must be incorporated into the risk assessment process.

Federal legislation, regulation, and agency mandate should undergo immediate review to identify where children are not taken into account.

A federal inter-agency workgroup should be convened to coordinate policies and activities regarding pediatric environmental health.

Community participation must be an essential part of policy development.

An international approach to pediatric environmental health should be adopted.

Research Recommendations for Action: The Research Community in the Public and Private Sector

New research paradigms need to be developed to study long-term, delayed and potential trans-generational health effects resulting from environmental exposures.

Research priorities must be expanded to include children.

Better and more cost-effective research tools must be developed.

More federal funding must be made available for epidemiological, clinical, applied and basic research.

Research must be conducted in ways that more effectively involve all affected communities.

Education Recommendations for Action: Health Administrators and Educators

- Health care providers, including physicians and nurses, should be trained in the diagnosis, treatment, and prevention of pediatric environmental health hazards.
- A broad spectrum of service providers such as physicians, social workers, teachers, school nurses, community members, and parents should be educated about pediatric environmental health issues.
- Provide funding for patient education regarding pediatric environmental health.

Recommendations for Action: Forging Linkages

- Communication should be improved between researchers, public health officials, policy makers, and the public.
- Comprehensive pediatric environmental health centers should be created and funded with a multi-disciplinary framework, including clinical intervention and environmental toxicant identification. Elements would include basic and applied science, epidemiology, medicine, policy, community, law, urban planning, and education.

Introduction

In the late 19th and early 20th centuries, miners would send canaries into untested mines to determine the safety of the air quality. If the canaries died, the environment was known to be unsafe for humans.

Since the 1940's, thousands of new chemicals have been produced and integrated into every aspect of our lives. Roughly 300 new chemicals are introduced each year. The production of synthetic materials has increased from 1.3 billion pounds in 1940 to 320 billion pounds in 1980.¹ For the majority of compounds, the health effects on children are unknown. Less than 10% of these chemicals have been tested for their effects on the central nervous system, with the exception of drugs controlled by the FDA.² Our children have become the modern day canaries.

Children Are Exposed to Preventable Environmental Hazards.

Children today face an array of exposures to potentially toxic environmental hazards. Hazardous substances such as lead, PCBs, solvents, asbestos, radon, pesticides, and air pollution have found their way into the homes, schools, and playgrounds of our children.

These exposures can have a significant impact on children's health and well-being. All children are at risk of developing learning disabilities, chronic and acute respiratory diseases, cancers, and illnesses caused by damage to the nervous system from hazardous substances. The incidence of chronic childhood diseases such as asthma and bronchitis are increasing. Additionally, cancer rates are increasing, especially childhood cancers such as leukemia.

Children Are Underprotected

Despite their high potential for exposure and illness from environmental hazards, children have no special protections. No national research or policy agenda exists to address potentially hazardous exposures to children. Current research priorities do not include children, regardless of their race, ethnicity, or socio-economic status. There are very few data banks that have information on children's exposures. Regulations for permissible exposure levels are based on data from adult animals and humans. Risk assessments do not routinely differentiate between children and adults.

Pediatric Environmental Health-A National Symposium

Preventing Children's Exposures to Environmental Hazards: Research and Policy Issues was the first symposium to address the need for a national research and policy agenda for pediatric environmental health. The symposium brought together over 200 recognized experts on research,

policy, clinical practice, and advocacy, to share their expertise and their vision for protecting children from exposure. The symposium was the first step toward establishing a framework and direction for pediatric environmental health research and policy.

The purpose of the symposium was to:

Develop a set of recommendations for federal agencies, the research and medical community, and community-based organizations that incorporate a multi-disciplinary and multi-cultural perspective.

Increase communication between the research, policy, clinical practice, and advocacy arenas by building a national network of organizations and individuals who are dedicated to issues of pediatric environmental health.

Plenaries were held on key issues in pediatric environmental health: children's unique vulnerabilities to environmental exposures, environmental justice for children, the federal government's agenda for protecting children from exposures, and successful community models for participatory research.

Workshops were held on such topics as the role of the environment in childhood cancer, and the possible link between childhood asthma and air pollution. The workshops were structured to maximize group discussion, identify the key issues, and develop recommendations for research and for policy. Papers presented in the workshops and plenaries will be published in Environmental Health Perspectives as a supplemental monograph.

This Symposium Summary contains highlights of all plenaries, keynotes, and recommendations, as well as a synopsis of each workshop along with the top five to eight recommendations that resulted. Recommendations resulting from a spontaneous Environmental Justice Caucus that met during the symposium are also included.

For additional copies or for more information on the Children's Environmental Health Network, please contact: Children's Environmental Health Network, 5900 Hollis Street, Suite E, Emeryville, CA 94608, 510-540-3657.

Children: Unique and Vulnerable

Moderator

Joan Spyker Cranmer, PhD, Professor of Pediatrics and Toxicology, University of Arkansas

Panelists

Cynthia Bearer, MD, PhD, Assistant Professor of Pediatrics, Case Western Reserve University

Walter Rogan, MD, Associate Director for Prevention, National Institute of Environmental Health Sciences

Lynn Goldman, MD, MPH, Assistant Administrator, Office of Prevention, Pesticides & Toxic Substances, US EPA

Why Are Children Especially Susceptible To Environmental Hazards? **Children Are Not Little Adults**

Children are not just "little adults." Their biological sensitivity, exploratory behavior, and a diet very different from that of adults make children particularly vulnerable to environmental exposures. Not only do children differ from adults, they differ from each other. There is more to growth than just getting bigger. Their biological sensitivity varies by population, ethnic group, age, and genetic make-up. However, these variations are not usually taken into account when considering environmental exposures to children.

Children Are Biologically Sensitive

Children's biological sensitivity (the capacity to be easily harmed) places them at special risk for harm from a toxic exposure. Because a child is a growing, developing organism, she is especially vulnerable to the effects of exposure. Her metabolic reactions-the body's way of processing and excreting toxic substances-are not as developed as those of an adult. According to Dr. Cynthia Bearer, Assistant Professor of Pediatrics at Case Western Reserve University, children are especially biologically sensitive given their differences in pathways of absorption, tissue distribution, ability to biotransform and eliminate chemicals, and the ways in which they respond differently to environmental chemicals and radiation.

Children Are Developing Organisms

Children go through several stages of development. Examples of these stages are: fetal, newborn, infant, school-age, and adolescent. Each stage of development creates new windows of vulnerability to the effects of an exposure and may result in long-term subtle or acute health problems. For example, an infant's lung capacity is still increasing, making her especially vulnerable to the effects of environmental tobacco smoke. A child's respiratory rate is more rapid than an adult's. Hence, she is exposed to more air and air pollutants than an adult.

Children are, in a sense, moving targets. Exposures which may go unnoticed or be relatively harmless in an adult, can be potentially devastating to a child. Exposures can also have consequences on future generations of children who have not yet been conceived. In an extensive study of PCB-contaminated food in Taiwan, children born to women up to six years after their exposure to the chemical continued to show the same signs of impairment to their central nervous systems-low intelligence and motor-skills scores.

How are Children Exposed?

Exposure Occurs at Every Developmental Stage

Fetal exposure occurs through maternal exposure to environmental toxicants, as the fetus is dependent on the mother and many substances can cross the placenta. Sometimes this is from a mother's self-exposure, such as environmental tobacco smoke. However, lead in a mother's bones which may be harmless to a mother can be transferred to her fetus, causing exposure levels that are potentially harmful. Additionally, maternal and paternal exposures that occur before conception can affect a child. PCBs, for example, bioaccumulate in fatty fish and are stored in the body when eaten. These are passed on to fetuses, newborns and infants through the placenta and maternal breast milk.

Exposures also occur later in a child's development. Adolescents are vulnerable to occupational exposures as they enter the work force through after-school and summer jobs. In addition, some adolescents begin to expose themselves to harmful substances such as cigarettes. According to Dr. Cynthia Bearer, Assistant Professor of Pediatrics, Case Western Reserve University, 50% of all new smokers are age 17 or younger. The rapid metabolic and physiological changes that occur during puberty may increase the impact of these harmful exposures.

Exploring, Mouthing, Playing

Children are growing, developing organisms, whose days are spent exploring their world through touch, taste, and movement. This natural curiosity and wonder put children at greater risk than adults for exposure to and illness from environmental hazards. "Children," notes Dr. Walter Rogan, "find beauty and fascination in both the glittering, such as mercury (found in a thermometer), and the gross, like the slime found on an intake pond." Infants and toddlers put their fingers or objects they find in their mouths. They spend much of their time at a level lower than that of adults, crawling on the ground where household chemicals, pesticides, and other environmental toxins accumulate. Children probably spend more time outdoors than do adults. This, coupled with children's rapid respiration and high activity levels outdoors, increases their exposure to air pollution.

Children Have a Unique Diet

Children's rapid growth during their first years of life requires relatively higher levels of food and liquid consumption than adults. Moreover, their bodies at this particular stage of life naturally absorb more of what they eat and drink. Because a much greater portion of a child's diet is composed of fruits and vegetables than his adult counterpart, he is exposed to higher levels of pesticides and chemicals in his food. The National Academy of Sciences report entitled *Pesticides: Diets of Infants and Children* (June, 1993), found that infants and children consume more of certain foods (such as apples) per unit of body weight than adults, and drink more water, thus increasing their potential exposure to toxins.³

Safe levels of pesticides and food additives, which are calculated for the lifetime exposure of an adult, may be grossly erroneous for a child. Children eat a great deal of certain foods, such as bananas. Pesticide tolerances, or maximum residue limits for pesticides in food, are calculated for adults rather than for children, and do not account for individual variations. Such was the case with aldicarb, a pesticide widely used on bananas. Although bananas tested as a crop had acceptable levels of aldicarb, these levels were based on adult tolerances, and were for the entire crop, without accounting for individual "hot" bananas. As a result, there were unsafe levels of aldicarb for children in one bite of the "hottest" banana.

Children Have Multiple Routes of Exposure

Because children have many routes and sources of exposures, they are at risk not only for multiple exposures, but for exposures which may act synergistically. And, because children have a longer "shelf life" than do their adult counterparts, they will face more exposures throughout their lives. However, little is known about how to add up the effects of multiple chemical exposures-whether they are cumulative or whether they compete with each other, and whether they interact synergistically. For example, tolerances which are set for one chemical within a particular class (such as chlorinated organophosphates) do not consider the effects of exposure to another chemical within that class.

What Can Be Done?

Clinicians as Investigators and Advocates

Clinicians can play an important role in diagnosing environment-related illness and in providing education for families and communities. For example, clinicians have in the past traced chemical exposures causing illness in children to pesticide spraying in homes and to mercury in teething

powders. As a result, these exposures to children were diagnosed as environmental poisonings and the offending chemicals were subsequently removed.

Recommendations

When developing acceptable tolerance levels, fetuses and children must be considered-fetuses and children should be the threshold for regulating toxic substances.

Preventive strategies regarding improving indoor and outdoor air quality must be adopted.

Pesticide legislation should be reviewed to determine how well it is protecting the most vulnerable populations, and reformed when it is not adequate.

EPA should be required to set a course of action that will begin considering the multiple, synergistic, and cumulative effects of exposures to children.

There should be a concentrated effort to get data that will fill the gaps on harmful exposures to children, especially dietary exposure.

Finally, clinicians can help by considering environmental exposures when diagnosing illness.

Environmental Justice and Children

Moderator

Deeohn Ferris, JD, Former Program Director, Environmental Justice Program, Lawyer's Committee for Civil Rights Under the Law

Panelists

Sylvia Herrera, Southwest Network for Environmental and Economic Justice

Raphael Metzger, Director of Special Initiatives, National Coalition of Hispanic Health and Human Services Organizations

Lawrie Mott, MS, Senior Scientist, Natural Resources Defense Council

Raymond "Rico" Gonzalez, Eco Rap

What is Environmental Justice?

All people have the right to a safe and healthy environment, regardless of their age, race, ethnicity, or socio-economic status. Yet, Deeohn Ferris, former attorney with the Lawyer's Committee for Civil Rights Under the Law, notes that, "There are segments of our population who are more affected by environmental hazards than the general population...(and) they are most likely to be overexposed and under-represented." Environmental policies have social implications, particularly regarding who bears the burden of environmental hazards, such as toxic waste facility sitings. This burden often falls on the poor and on people of color.

Like the Civil Rights Movement that preceded it, the environmental justice movement seeks to address these social implications through empowering and educating those communities who bear the greatest burden of pollution.

Do Toxic Hazards Disproportionately Affect Certain Communities?

Hazardous Waste

Formal studies and anecdotal evidence suggest that hazardous waste facility sitings are disproportionately located in African-American and Hispanic communities. According to a survey of toxic areas in Texas conducted by the United Church of Christ's Commission for Racial Justice, 56% of the state's industrial solid waste generators are located in minority communities.⁴ These same communities are also the locales for 37% of commercial waste management facilities and 39% of the state's hazardous waste facilities. Fifty-four percent of pending waste management facilities in Texas are also slated for these communities. In the wake of this path, cancer rates have risen among Hispanic and African-American residents of these communities.

Air Pollution

At least eighty percent of Hispanics in this country live in areas that fail to comply with ambient air quality standards established by the Environmental Protection Agency. Asthma and other respiratory diseases also disproportionately afflict minority communities, particularly Hispanics. Raphael Metzger of the National Coalition of Hispanic Health and Human Services Organizations notes as an example that, "Puerto Rican children are more than three times as likely as non-Hispanic white children to suffer from active asthma."

Pesticides

Exposures to pesticides are also a pervasive health threat to agricultural regions, overwhelmingly inhabited by Hispanic field workers and their families. In one community studied in California's Central Valley, over 50 different pesticides were applied within one mile of the community. Children of agricultural workers suffer frequent exposure to pesticide residues through various exposure routes, including directly in the fields or in the home as their parents track in the toxic residue after returning from work in the fields.

Are Children in Poverty and Children from Racial or Ethnic Communities More at Risk for Diseases Caused by Environmental Hazards?

"Children of color," notes Lawrie Mott of the Natural Resources Defense Council, "are the subgroup of population most exposed, and least protected, from environmental health threats...they may be at the highest risk of any segment of society." Children in poverty and children from racial/ethnic communities may suffer not only more frequent and more direct exposures to environmental hazards, but exposures to many more of the toxic chemicals and other pollutants that pose a risk to human health. These children live in areas which traditionally have been distinguished by toxic-waste landfills, power plants, heavy industry, and heavy pesticide use. Children in those communities are often placed at multiple risk for illness due to poor or inadequate housing, poor nutrition, and limited access to health care, combined with potentially damaging environmental exposures. Mott points out that while cancer incidence rates increased by 19% between 1973 and 1990 among all children, they increased by 23.9% for African-American children, compared to 9.1% for Caucasian children.⁵ While the causes of this disparity are not known, they clearly warrant further investigation.

Cancer is not the only end-point for children's exposures. Severe environmental diseases of the respiratory, nervous, and immune systems may also affect children from these communities. The American Lung Association reports that 615 of pre-adolescent Hispanic children live in counties

failing to meet one or more of the air quality standards established by the Environmental Protection Agency.⁶ Although it is extremely difficult to establish a causal link between a rise in pediatric asthma among Hispanic children and air pollution, again, further investigation is warranted.

Lead

The classic example of children's exposure to environmental hazards is lead. In low-income communities, the manifestations of this health hazard are particularly striking. Between 1976 and 1980, 9.1% of all preschoolers in the US had excessively high blood lead levels; the figure for African-American children in the same age group was 24.5%.⁷ A 1988 report by the Centers for Disease Control revealed that while 36% of poor white children were lead poisoned, the figure for poor African-American children was 68%.⁸ Rico Gonzales of Eco Rap describes the neurological damage to inner-city children caused by lead poisoning, "They can't focus, they have short attention spans, they can't study in school, they're slow, and on, and on. Society sucks the future out of children, and then I hear those who complain that young people today don't care about their future."

Issues in Environmental Justice

Panelists noted several key issues for research and for policy regarding environmental justice:

Poor communities and racial/ethnic communities are subject to unfair siting of hazardous waste facilities, and unequal enforcement of policies that regulate these facilities.

Variability and uncertainty in risk assessment operate to the detriment of racial/ethnic communities. According to Deoohn Ferris, "Environmental decisions based on risk assessment do not protect the overexposed."

Federal and state risk-management approaches to environmental protection attempts to apply uniform standards to communities whose residents run a higher risk of exposure to toxic substances. Ms. Ferris notes that, "Risk management results in unequal protection. The impact is discrimination."

While state and federal regulators have attempted to mitigate these exposures:

their regulatory standards often aim at lowering permissible levels of these toxic chemicals rather than eliminating at the source.

data on cumulative, multiple, and synergistic effects, especially in children and in lactating mothers, is not collected.

Current research priorities do not adequately consider the most sensitive sub-populations. As a result, children in poverty and children from racial/ethnic communities are not adequately protected.

Non-cancer endpoints such as diseases of the immune, nervous, and respiratory systems are not adequately considered.

State and federal officials do not make special allowances for children in collecting data and developing policies for environmental protection.

Recommendations

Children deserve special protection. A fundamental shift is needed in the principles and assumptions that support current governmental policy-making on environmental protection in these communities. In general, such policies do less to protect than to allow people to tolerate substantially higher levels of pollution. Instead, a public health, preventive approach to disease and risk should be adopted. This approach would:

act on the premise of prevention rather than make assumptions about vulnerability and susceptibility.

establish health policies based on protection.

value and encourage community roles.

Specifically:

Special efforts should be made immediately to protect children from racial/ethnic communities from known hazards, including lead, air pollution, and pesticides where data show that these groups face greater risk.

Data collection and analysis must be reformed to include: information on immune response and the respiratory and nervous systems-cancer is not the only endpoint.

data on children from racial/ethnic communities.

Government standards regulating air, food, water, and homes must be strengthened to protect the most sensitive and highly exposed sub-populations. These standards must take into account the cumulative, multiple, and synergistic effects of exposure.

Permits, clean-ups, and industrial decisions should no longer be governed by risk assessments based on how much of one particular toxic substance the neighborhood's residents can absorb before they develop life-threatening diseases like cancer.

Public accountability is essential. The people who inhabit these areas are well acquainted with the sources and the symptoms of pollution in their communities. Officials must solicit active, on-going input from the community most affected by pollution risk.

Youth deserves a prominent place in working with these issues. Because children are also people who have lived through the experience, we should respect what they have to say.

Communities in Action: Initiatives and Success Stories

Moderator

Robert Bullard, PhD, Professor, Center for Afro-American Studies, UCLA

Panelists

Katsi Cook, Former Director, Akwesasne Mother's Milk Project, Albany, NY

Paula Gomez, Executive Director, Brownsville Community Health Center, Brownsville, TX

Patricia Jackson, People for Community Recovery, Chicago, IL

Communities are a tremendous resource to scientists and policy makers in terms of their knowledge about, history of, and personal experience with possible toxic exposures within their communities. Communities are often the most informed about the health of their citizens. Despite their expertise, communities are frequently left out of the process when researchers and policy makers evaluate and determine health risk and discuss appropriate actions. Community members' concerns:

They are not given the opportunity to express concerns regarding their health and their safety.

Their concerns are not addressed in ways that are culturally and/or linguistically appropriate.

Their experiences are not considered relevant "data".

They are not informed of the research results in a timely manner.

The three "success stories" described in this plenary show how grassroots community action is creating a new paradigm: one which is inclusive, responsive, and culturally appropriate. They tell a story of the successful ways in which communities have, and can, organize and work with scientists and health researchers to begin to address the health concerns of their community regarding environmental exposures. It is hoped that the lessons learned from these communities can enable others to take action in their own areas.

Akwesasne Mothers Milk Project

The Akwesasne Mother's Milk Project was the result of an eight-year effort by and for Mohawk women, who were concerned about the possible presence of PCBs and other chemicals in their breast milk. After the birth at the Reservation of three babies with intestinal disorders, expectant mothers in the community voiced concerns over the possibility of miscarriages and birth defects.

This study of mother's milk contamination was, and continues to be implemented at the community level, with Mohawk mothers serving as active participants and co-investigators. Field workers are also study participants. Researchers hold their meetings in the community, and have integrated the cultural customs into the meeting process. An aquaculture project is working to develop alternate sources of fish, which are an essential part of the Mohawk culture and diet.

The present positive research and community activities are in some ways a reaction to many years of negative interaction with research institutions. For example, initial studies of the Reservation's environmental health hazards by state officials and the Mt. Sinai School of Medicine's Environmental Sciences Laboratory failed the community in several respects:

Blood, urine, body fat, and mother's milk specimens of Mohawks were not tested for PCBs.

Researchers did not reveal the study's results to the Mohawks until four years after tests were conducted.

The study did not address the cumulative effects of PCBs and fluorides, and concluded that no adverse effect from fluoride exposure could be found.

This current study is successful for two reasons. First, the Mohawk mothers educated themselves and their community about the science behind the issues. Second, they found researchers who were willing and able to really listen to their concerns, who respected their tribal customs and incorporated those aspects into the study design. Because of this, the study was able to actually help the community in assessing the damage and preventing exposures.

Brownsville Community Health Center

"Health problems do not recognize borders," states Paula Gomez, director of the Brownsville Community Health Center (BCHC). Gomez and the staff of BCHC, located in Brownsville, Texas, created a non-profit corporation to conduct studies on a series of anencephalic births occurring among their patients within a 36-hour time period. They were concerned about exposures to possibly toxic hazards in the nearby maquiladoras (or foreign-owned border factories) of Matamoros, Mexico.

The alert clinician who identified a possible cluster of anencephalic births was able to get the Texas Department of Health and the Centers for Disease Control to extend their on-going study of the effect of folic acid deficiency on preventing neural tube defects to this community. While the preliminary study results were not available at the time

of this symposium, thus far, folic acid has not been found to be a problem in this cluster. Further, legislation has already been effected state-wide and nationally in the development of a birth defects registry.

This project, now under the One Border Foundation, owes its start to the inadequacies of the state, federal, and international response to the Brownsville community and their neighbors in Matamoros, Mexico. "Scientists," notes Paula Gomez, "have a great deal to learn about respect for each other as well as for the community. They have a great deal to learn about urgency,...and...about culturally relevant action." According to Gomez, state and federal studies were inadequate, were poorly conducted, and demonstrated a lack of sensitivity to and understanding of Brownsville's cultural attributes and the community's anxieties regarding the potential for birth defects. Specifically:

Surveys and research instruments used by government investigators to assess the city's problems were out of date, and had not been translated into Spanish, an oversight that left out many of the observations of the city's overwhelmingly Hispanic population.

Interpreters were not adequately trained or certified.

Scientists were more concerned with gathering data and reporting to their supervisors, than sharing their findings with the community.

The imminent passage of NAFTA and the 1992 U.S. presidential election slowed the federal response.

The delayed response from the federal Office of International Health stalled the process of getting help from Mexican health officials in addressing the cross-border aspects.

Brownsville Community Health Center Makes a Difference

In response, BCHC:

Secured a CDC liaison to bring the scientists back into the community to complete the initial study.

Raised funds and created a non-profit corporation (the One Border Foundation) in order to conduct their own research and studies.

Met with State Governor Anne Richards to bring attention to the cross-border health issues.

Launched a cross-border prenatal care program with Matamoros. With the assistance of the March of Dimes, this innovative health care delivery system uses community churches and block captains to promote prenatal care in their neighborhoods.

Continues to push for monitoring of the environmental impact along the US-Mexico border.

People for Community Recovery

One community activist, Mrs. Hazel Johnson, wanted to know why her neighborhood housing project in Chicago's Far South Side had the highest rates of cancer and respiratory disease in the entire metropolitan area. Mrs. Johnson founded People for Community Recovery (PCR) after receiving reports pointing out the heavy concentration of toxic sources surrounding Altgeld Gardens. Built on top of a landfill in 1945, Altgeld Gardens is a community of over 10,000, 97 percent of whom are African-American and 62 percent of whom live below the poverty line. Altgeld Gardens is also known as the "Toxic Donut" since the community is surrounded by more than 50 industries emitting toxics, including landfills, industrial plants, coke ovens, and incinerators.

PCR mobilized the citizens of Altgeld Gardens out of frustration with the local health department over the lack of data on the health problems of their community. Although the Chicago Department of Health had previously

conducted a health survey of the area, information was only provided on five major, reportable diseases. A complete health survey of the area had never been conducted. Furthermore, the existing information was outdated. Unable to get the attention of the city health officials, PCR:

Began their own investigation and education campaign, including conducting a community health survey in collaboration with the University of Illinois School of Public Health.

Applied pressure to the area's industrial polluters to make them aware of how their industries were affecting the health of community residents. These corporations are now being held publicly accountable for their adverse impact on the community's health.

Secured the help of the US EPA to begin the Southeast Chicago Urban Initiative. This initiative offers the Altgelt Gardens community an opportunity to address environmental justice issues through providing not only clean-up, but jobs for the residents.

Recommendations for Change

Although the communities represented on this panel differ from one another in respect to their location, culture, source and route of exposure and consequent health effects, they are united in their recommendations for change:

Models of cultural damage assessment, and of cultural relativism need to be integrated into health risk assessment.

More funding must be made available to communities to increase community-based health research and health education activities.

A crucial role of research is to inform the community of its health problems and potential solutions. However, this must be done in a collaborative way.

Health researchers and scientists must learn to communicate more effectively with lay people (community members), not only in their native language but also in English. Primary care physicians are an excellent model for this.

Research instruments must be up-to-date, culturally relevant, and linguistically appropriate.

Interpreters must be trained properly.

Because pollution does not recognize borders, more attention needs to be paid to cross-border health issues.

The Federal Government's Role in Children's Environmental Health

Moderator

Birt Harvey, MD, Professor and Associate Chair, Dept. of Pediatrics, Stanford University School of Medicine

Federal Panel

Lynn Goldman, MD, MPH, Assistant Administrator, Office of Prevention, Pesticides and Toxic Substances, US EPA

William Harlan, MD, Associate Director for Disease Prevention, National Institutes of Health

Devra Lee Davis, PhD, Senior Advisor, Public Health Service, Dept. of Health and Human Services

Barry Johnson, PhD, Assistant Administrator and Assistant Surgeon General, Agency for Toxic Substances and Disease Registry

Stephen B. Thacker, MD, MSC, Acting Director, National Center for Environmental Health, Centers for Disease Control and Prevention

Discussants

Ellen Widess, JD, Director of Health and Safety Policy, Child Advocacy Institute

Shelley Hearne, Dr. PH, American Public Health Association

Adolph Falcon, MPP, Vice President, Policy and Research, COSSMHO

While the federal government has achieved notable successes in environmental protection over the years, its regulatory initiatives and policy guidelines have generally overlooked the populations most susceptible to environmental hazards-children. Representatives of four federal agencies described what their agency is currently doing to protect children from environmental exposures. A panel of discussants representing child advocacy, environmental justice, public health, and environmental advocacy responded and offered their recommendations.

What are the Following Federal Agencies Doing to Address Children's Environmental Health?

US Environmental Protection Agency

"We can no longer behave as though all environments were created equal," said Dr. Lynn Goldman, Assistant Administrator for the US Environmental Protection Agency (EPA). "Children especially bear the brunt of environmental pollution in our most polluted environments, and they must be protected." EPA seeks to address this concern by revamping its strategic goals to include:

Protection of the Eco-system. EPA plans to pursue the goal of protecting whole eco-systems, allowing the agency to develop comprehensive environmental policies that would address children's multiple exposure pathways to toxic chemicals in the air, in drinking water, and in food.

An emphasis on prevention, rather than the costly and least effective reactive approach to environmental hazards. This will include an emphasis on the preventive approach in line with the Clinton Administration's overall goal of "reinventing government." In such a way, EPA will strive to be more responsive to constituents' concerns over present and potential environmental hazards.

Legislation. First and foremost, EPA supports passage of the Cabinet Reform Act, which would elevate the agency's administrator to a cabinet-level position. EPA's support for other bills on environmental protection pending in Congress includes: the Pesticide and Food Safety Reform Act, re-authorization of the Clean Water Act, the Safe Drinking Water Act, and Superfund re-authorization, which EPA redrafted to incorporate more community

involvement in reclaiming local toxic landfills, and EPA's proposal to double the number of chemicals regulated under the Toxic Release Inventory.

Making scientific data and information more available to the public.

The National Institutes of Health

Comprised of many specific institutes, the National Institutes of Health (NIH) is the federal community's principal research component for investigating the environment's impact on human health.

NIH seeks to emphasize more cross-disciplinary research among its various institutes. In investigating environmental health hazards, particularly as they affect children, such an approach is vital in identifying exposure risks, assessing their biological effects, and developing interventions to prevent further harm to public health.

In addition, NIH is also encompassing specific population groups, as well as general biological processes and general exposures in its research on environmental health risks.

Department of Health and Human Services

At the Department of Health and Human Services (HHS), the link between federal action and children's protection from environmental health hazards is found in the Clinton Administration's health care reform initiative. Recognizing that one out of every four people in this country will eventually lose their health care coverage within the year, HHS advocates passage of the Health Security Act to ensure greater access to health care. Such a preventive strategy places a high priority on maternal and child care.

Beyond health care reform, HHS is also trying to foster basic research on preventing environmental health risks, including environmental sources of asthma, some forms of cancer, and intestinal diseases.

Agency for Toxic Substances and Disease Registry

Prevention is the chief model for federal action at the Agency for Toxic Substances and Disease Registry (ATSDR). Created under Superfund legislation, ATSDR's primary mission is to prevent environmental hazards. In so doing, the agency works closely with EPA in removing and preventing toxic sources from becoming public health hazards.

Perhaps the most important component of ATSDR's prevention-oriented approach is its nationwide toxic exposure registry. Using this registry, ATSDR researchers gain crucial insight into the health impact of toxic substances on affected communities across the country.

National Center for Environmental Health at the Centers for Disease Control and Prevention

Paralleling ATSDR's work is the National Center for Environmental Health (NCEH) at the Centers for Disease Control and Prevention. NCEH also conducts ongoing public health surveillance and data collection programs regarding specific health outcomes of environmental exposures and uses this data in developing prevention and control programs.

One of the Center's programs, the Childhood Lead Poisoning Prevention Program, has channeled grants principally to poor, minority urban populations. In 1993, the Center supervised the screening of nearly 1.5 million children for lead, finding almost 100,000 with elevated blood lead levels.

What is Missing in the Government's Overall Approach to Addressing Environmental Health Hazards?

Despite the vast institutional framework and the resources the federal government provides for these and other agencies' work in studying and mitigating children's exposures to environmental pollutants, much more work is required. Advocates from environmental and children's health groups pointed out the various obstacles that hinder federal action in fully remediating environmental hazards to children's health. These include:

The public's access to federal agencies' information on toxic substances is limited.

There is no established, centralized mechanism to articulate concerns over environmental threats from members of affected communities to federal officials.

Federal environmental and health officials continue to develop policies for children as "little adults," disregarding their unique environments, multiple routes, and multiple exposures to toxic substances.

Federal officials fail to differentiate the adverse health consequences of toxic substance exposures between children in affluent and low-income communities, and fail to distinguish the disparate cultural, nutritional, and other factors among different ethnic groups.

Current federal guidelines and procedures that govern testing and risk assessment of industrial chemicals are based on a chemical-by-chemical approach, looking for one specific chemical's adverse health effects in a single exposure. Such an approach does not take into account the possible adverse effects of both cumulative exposures and simultaneous exposures to different chemicals.

Current workplace policies regarding exposures do not adequately consider children.

Recommendations from the Discussants

Create a central inter-agency advisory group staffed by key officials from the relevant federal agencies. Such a group could not only facilitate a comprehensive review of all federal policies and data collection on children's environmental health, but could also establish concrete guidelines for coordinating federal policies devoted to preventing childhood exposures to toxic substances nationwide.

Federal agencies should conduct an immediate review of all federal statutes and programs to identify and fill current gaps on how to address children's special vulnerability to toxic chemicals. Such a review should include the government's efforts in data collection on children's environmental health risks.

The government should adopt more rigorous testing and licensing standards for chemicals used in industry. Federal officials should thoroughly test these chemicals for their toxic effects on children's health, taking into account multiple exposures and cumulative effects.

The Administration should establish a more aggressive prevention strategy, developing media-specific programs that incorporate prevention in issuing permits and setting standards for registering new commercial chemicals.

Children's health and environmental advocates applaud EPA's proposal to double the number of chemicals regulated under the Toxic Release Inventory, but call for a similar increase in regulating the industries allowed to release these toxic byproducts into the environment.

Some advocates are asking the Administration to ban entire classes of chemicals from commercial use. The Administration is currently initiating a phase-out of chlorine in the pulp and paper industry, but advocates have called for the elimination of chlorinated compounds in manufacturing altogether.

The federal government must expand its research in sustainable agriculture and integrated pest management (IPM) in order to reduce pesticide use. In particular, the government should establish good, solid definitions of IPM so that ambiguity in future regulations will not err on the side of continued pesticide use.

Testing protocols should be changed to discover how different toxic exposures adversely affect children in all age groups, and the Occupational Health and Safety Administration should revise its child labor laws to protect adolescents and teens from such exposures.

An effort needs to be made to assess on an on-going basis environmental risks which are more prevalent in racial and ethnic communities.

Federal, state, and local initiatives in environmental risk screening and public education, should use community-based organizations serving racial/ethnic communities in the planning and implementation of such initiatives.

Luncheon Address

Dr. Joycelyn Elders U.S. Surgeon General

"Children cannot 'just say no' to pollution," stated U.S. Surgeon General, Dr. Joycelyn Elders. Dr. Elders discussed two major threats to children's health today: environmental tobacco smoke and lead poisoning.

The Surgeon General noted that public action to reduce environmental tobacco smoke (ETS) is growing: and pointed out the increased amount of public research from the Environmental Protection Agency and CDC. The Surgeon General described recent testimony on a bill to eliminate ETS from all public places, suggesting that legislation would be one way to reduce ETS. Dr. Elders further urged the audience to join her in educating the American public: "We must tell the public that when we smoke, our children are smoking." She also encouraged continued efforts to eliminate second-hand smoke from the environment.

The second environmental health hazard Dr. Elders described as particularly dangerous to children was lead poisoning. Although lead poisoning is an area "where we have achieved some success,...we still have a lot of work to do," stated Dr. Elders. Dr. Elders emphasized that mainly lower income minority children in urban areas still report elevated blood-levels. She outlined a four-pronged approach: identify more lead hazards, collect appropriate data, educate the public about lead poisoning, and continue screening blood lead levels.

Keynote Address

Congressman Henry Waxman (D-CA) Chair, House Subcommittee on Health and the Environment

Congressman Waxman (D-CA), Chair of the House Subcommittee on Health and the Environment of the Committee on Energy and the Environment, emphasized three environmental hazards that particularly affect children: lead poisoning, environmental tobacco smoke, and pesticides. Waxman stressed that, "People have to understand that when we talk about environmental

protection-when we look at it only in terms of adults-we are neglecting the special impact that some of these environmental hazards have on children...very often they are the most affected [but are] neglected."

The impact on children is not only an important health concern, but is also politically strategic. Waxman further explained this idea using recent lead poisoning regulations as an example of Congress's ability to pass protective environmental health laws in an unfavorable political climate. There are two factors that contributed to Congress's accomplishment: first, a clear, sound scientific case about the hazards that lead poses to children; and second, the ability to capitalize on the strong emotional appeal of protecting children from these hazards. Waxman noted that these two factors would help pass current environmental health proposals for children through Congress.

Waxman presented this years' bills that focus on environmental health. The Pesticide Food and Safety Act will change the way pesticides are regulated. He criticized current pesticide policy: "Our federal pesticide program does not give American consumers, and especially our children, the assurance that our food supply is safe, as incredible as that may seem." A second bill on environmental tobacco smoke (ETS) bans smoking in public places, and is supported by every Surgeon General from the past 25 years.

Workshop Recommendations Summary

Thirteen two-hour workshops were held on a variety of topics in pediatric environmental health. The size was limited to approximately 25 participants to maximize discussion. Participants were charged with reviewing papers prior to the symposium. In workshops participants identified the major research and policy issues, and generated a list of five recommendations each in research and in policy. Several themes emerged from these workshops and are summarized within the recommendations below. Specific recommendations from each workshop are included in the following pages.

Policy Recommendations For Action: The Federal Government

1. When drafting laws and policies, a public health approach, which considers long-term, prevention-oriented and socially equitable policies, should be taken particularly in the absence of information. This approach would establish health-based policies to protect vulnerable populations.

Set environmental standards to protect children, especially in the most vulnerable sub-populations such as low-income and racial/ethnic communities.

In cases where the effects of an environmental hazard are uncertain, policies should be considered which prevent or eliminate exposure to that hazard.

Use a health-based rather than a cost-benefit standard in evaluating policies.

Require industry to estimate and label products regarding risks to children.

Encourage each federal agency to consider policies that are especially protective of children. For example, the USDA and EPA should be encouraged to promote reduced pesticide use in agriculture, schools, and homes.

While public policies should be grounded in science rather than in the public's perception of risk, the availability of scientific data should not be a barrier to timely policy.

Include multi-disciplinary and multi-cultural perspectives in the policy-making process.

Consider the numbers of people exposed when prioritizing environmental hazards. For example, the numbers of men and women of reproductive age, pregnant women, and children exposed to lead and environmental tobacco smoke make the eradication of these exposures of utmost importance. (Ed. note: It is important to consider that high risk groups may be affected at a higher rate, but may not be reflected in the actual numbers.)

2. Children must be incorporated into the risk assessment process.

The risk assessment process must be amended to include:

children's special sensitivities

cumulative, synergistic, and transgenerational effects of exposure

cultural differences

3. Federal legislation, regulation, and agency mandate should undergo immediate review to identify where children are not taken into account.

Review existing laws and regulations, and amend any environmental laws undergoing re-authorization to specifically require that environmental standards incorporate consideration of children and other special subgroups.

Expand the federal government's definition of diversity to include children under the age of 18. This will increase opportunities for capitalizing on the diversity requirement for granting research funding, and will allow for more youth participants at federally funded conferences.

Specific legislative and regulatory mechanisms are listed in the workshop synopses.

4. A federal inter-agency workgroup should be convened to coordinate policies and activities regarding pediatric environmental health.

5. Community participation must be an essential part of policy development.

Develop policy in partnership with members of affected communities to ensure that policy is culturally appropriate and reflects community needs.

6. An international approach to pediatric environmental health should be adopted.

Address transborder regulation, liability, and health issues, such as those addressed in the debate over the North American Free Trade Agreement, and adopt the most stringent standard.

Research Recommendations For Action: The Research Community In The Public And Private Sector

1. New research paradigms need to be developed to study long-term, delayed and potential trans-generational health effects resulting from environmental exposures.

Coordinate research activities in laboratory science, human clinical and population-based epidemiology.

2. Research priorities must be expanded to include children.

Collect more data on children, especially on including low-income children and children from racial/ethnic communities. Specifically, more data is needed on:

How children differ from adults.

Children's unique susceptibilities to environmental exposure.

How health effects resulting from environmental exposures are influenced by the developing physiology of the adolescent.

Effects of cumulative, multiple, and synergistic exposures.

Health effects in later life due to childhood exposures.

Collect more data on specific exposures, risks, and their potential effect on children (see workshop synopses for specific recommendations).

Increase access to existing information on children's environmental exposures by:

Creating data banks of available information on exposure.

Banking biological specimens (e.g. serum, fibroblasts and other tissues, including blood and other cells), both for children and members of high-risk groups.

Developing cost-effective technologies for specimen banks.

Developing resource and referral systems (such as a national birth defects registry) for documenting information about clusters, prevention, and intervention for use by health professionals.

Conduct more epidemiological, clinical, applied and basic research studies (both human and animal), on long-term outcomes of childhood exposure to toxic hazards.

Determine whether present formulas and data used to derive maximum daily exposures or intakes protect children.

Develop a national strategy to follow up on incomplete studies (e.g., hazard assessment on children), and promote monitoring and surveillance of human populations, especially children.

3. Better and more cost-effective research tools must be developed.

Develop systemic and new approaches for the screening of environmental exposures, including monitoring and evaluation methods for testing toxicants.

Develop appropriate population-based methods for assessing adverse developmental outcomes, ranging from spontaneous abortion to functional deficits (not limited to structural defects).

Devote more research to the scientific validation of bio-markers of environmental exposures. Attention should be focused on ethical issues surrounding new bio-markers.

Develop pilot projects to demonstrate effective environmentally-designed architecture and construction in communities, and evaluate the health-based outcomes.

Develop mathematical models in place of animal models when appropriate.

4. More federal funding must be made available for epidemiological, clinical, applied and basic research.

5. Research must be conducted in ways that more effectively involve all affected communities.

Include diverse communities in decisions about the way research is designed and conducted.

Improve education of researchers about the issues and challenges facing communities.

Make research culturally relevant to all affected segments of the population (e.g., it must meet the needs of the people who live in the area being studied with regard to appropriate culture, language, and experience).

Disseminate results to members of the community, and conduct appropriate follow-up.

Education Recommendations For Action: Health Administrators And Educators

Although the Symposium emphasized policy and research, participants generated recommendations regarding improvements in the educational arena as well.

1. Health care providers, including physicians and nurses, should be trained in the diagnosis, treatment, and prevention of pediatric environmental health hazards.

Include pediatric environmental health as a topic in medical, nursing school, and residency curricula.

Provide continuing education on pediatric environmental health topics for physicians, nurses, and other health care providers.

2. A broad spectrum of service providers such as physicians, social workers, teachers, school nurses, community members, and parents should be educated about pediatric environmental health issues.

Develop and evaluate prevention-oriented strategies, programs, and activities in pediatric environmental health.

3. Provide funding for patient education regarding pediatric environmental health.

Recommendations For Action: Forging Linkages

1. Communication should be improved between researchers, public health officials, policy makers, and the public.

Expand cooperation between universities, local health departments, and affected communities to improve risk communication to populations at risk.

Empower and involve children in environmental issues.

Hold interdisciplinary conferences on pediatric environmental health.

2. Comprehensive pediatric environmental health centers should be created and funded with a multi-disciplinary framework, including clinical intervention and environmental toxicant identification. Elements would include basic and applied science, epidemiology, medicine, policy, community, law, urban planning, and education.

Age-Specific Carcinogenesis: Radiation and Genetics

Moderator

Margaret Tucker, MD, Chief, Genetic Epidemiology Branch, National Cancer Institute

Panelists

George Lambert, MD, Associate Professor, Pediatrics, Robert Wood Johnson Medical School, New Jersey

David Malkin, MD, Division of Hematology/Oncology, Univ. of Toronto

Robert Miller, MD, Chief, Clinical Epidemiology Branch, National Cancer Institute (Retired)

Richard Thomas, PhD, Director, Toxicology and Risk Assessment, National Academy of Sciences

This workshop focused on cancer as a genetic disease, stemming from either a mutant gene (e.g. retinoblastoma) or a mutant susceptibility gene requiring an additional mutation (from exposure to an environmental carcinogen, for example). Epidemiological studies were reviewed demonstrating a high correlation between age at time of exposure and the risk of developing cancer.

Findings of the recent National Academy of Sciences/National Research Council reports on pesticides in children's diets and on risk assessment were summarized, highlighting recommendations for achieving better exposure models and more reliable exposure estimates for children.

Recommendations:

Broaden research on age-specific phenomena such as exposure, behavior, enzyme activity. Such research should include children from racial/ethnic communities, who run a higher risk of exposure to carcinogens, and whose genetic make-up puts them at a disadvantage for metabolizing such carcinogens.

Devote more research to exposure assessment, including epidemiological tools and biomarkers.

Promote banking of biological specimens (e.g. serum, fibroblasts and other tissues, including blood and other cells), both for children and members of high-risk groups.

Continue support of long-term follow-up on cohorts that have special exposures (those exposed to high levels of radiation through A-bomb blasts and other groups exposed to radiation), chemical exposures, and cancer survivors.

Focus research on genetic differences between adults and children, and on outcome assessment (in both children and adults).

Develop and evaluate prevention strategies in: health education, including diet; legislation (e.g. smoking bans); correlates of risk-taking behavior (e.g. smoking, sun exposure); the Canadian cigarette-labelling plan.

Asthma Among Children- Does Air Pollution Play a Role?

Moderator

Henry Falk, MD, MPH, Director, Division of Environmental Hazards and Health Effects, Centers for Disease Control and Prevention (CDC)

Panelists

David Bates, MD, Professor Emeritus, Univ. of British Columbia, Dept. of Health Care and Epidemiology

Ruth Etzel, MD, PhD, Chief, Air Pollution and Respiratory Health Branch, CDC

Floyd Malveaux, MD, PhD, Associate Professor and Chair, Dept. of Microbiology, Howard University School of Medicine

Panelists in this workshop delivered presentations on the rising prevalence of childhood asthma and on proven methods for its prevention, including ways to reduce exposure to tobacco smoke and indoor allergens. Panelists discussed the possible role of pesticides in causing asthma. Panelists also discussed the socio-economic conditions that lead to higher incidences of asthma and respiratory disease in general. Participants learned of the higher rates of asthma among children from racial/ethnic communities, particularly African-American children. The greater prevalence of asthma and respiratory diseases among these children can be attributed not only to higher exposures to air pollution, but lack of both access to health care and effective asthma management programs.

The workshop's participants identified five chief issues:

The overall lack of nationwide data on asthma among children from racial/ethnic communities.

The need to direct more research in the area of indoor sources of air pollution, and to recommend effective steps toward prevention.

The need to promote a holistic approach to childhood asthma's prevention.

The need to reduce the increasing levels of environmental emissions.

The need to recognize socio-economic factors that contribute to a higher prevalence of asthma among children.

Recommendations: were not developed. due to time constraints. Workshop participants developed these points for further debate.

To compensate for the lack of national data on air pollution and its effects on respiratory problems among different ethnic groups and low-income communities, relevant agencies should incorporate the guidelines of Office of Management and Budget Directive 15 into their data-collection efforts.

More research should be devoted to the threat of increasing outdoor and indoor (e.g. tobacco smoke) air pollution.

To encourage a more holistic approach to prevention, Congress should examine health care proposals to see if they address environmental factors.

More efforts should be devoted to controlling environmental sources of emissions (e.g. ozone and PM10).

Socio-economic conditions should be improved to mitigate exposures to outdoor and indoor sources of air pollution.

Health-care administrators and policy makers should work to provide both more access for continuous primary care and funding for patient education.

Health care providers should consider cultural attitudes and practices when assessing and treating respiratory problems among people of color.

Relevant officials should increase their efforts to make schools smoke-free. School nurses should provide more education on smoking health hazards among youth and facilitate smoke-free wellness centers in schools.

Building Healthy Environments for Children: **Visions for the Future**

Moderator

Maureen Corry, MPH, Director, Education and Health Promotion, March of Dimes Birth Defects Foundation

Panelists

Sabrina Alimahomed, President, Tree Musketeers

Paul Bierman-Lytle, Masters Corporation, Former Chair, Environmental Health Committee, American Institute of Architecture

Henry Holmes, Associate Director, Urban Habitat Program, Earth Island Institute

This workshop addressed the role of sustainable development as it applies to homes and cities of the future. Panelists discussed examples of sustainable buildings and environmentally sound architecture, and how their incorporation in home construction reduces not only emissions of indoor toxicants (i.e. "sick-building" syndrome) but the continued reliance on non-renewable resources for construction materials. The workshop also addressed the broader concerns of environmentally sound urban planning, which attempts to design cities taking into account the myriad of inter-relationships among land use, transportation policy, and cities' cultural and ethnic diversity.

Participants in the workshop also heard from a young environmental activist, who suggested that the next generation of policy makers will already have an abiding concern for environmental protection. The consciousness of this generation is already informed by years of witnessing environmental pollution's tragic outcomes, and their future participation in the policy-making process will undoubtedly reflect this concern. Even in their adolescence, millions of children are ready to be pressed into service in protecting their generation's and future generations' environmental safety.

Recommendations (developed by three sub-groups):

The Youth Role in Creating a Healthy Future

The federal government should include children under the age of 18 in its definition of diversity, thereby encompassing the diversity requirement for granting research funding and including more participants at federally funded conferences.

Health and Sustainability for Children

Congress should consider a tax on non-renewable resources.

The federal government should create interagency (e.g. among HHS, HUD, EPA, etc.) pilot projects to demonstrate effective environmental architecture and construction in communities and evaluate health-based outcomes.

Disseminate more information on health and sustainable community development to the public (including these recommendations).

Devote more efforts to identifying market incentives that encourage manufacturers to produce more environmentally responsible products.

Establish standard-setting practices that involve more relevant groups.

Hold more interdisciplinary conferences on the link between children's health and sustainable community development.

Healthy Communities

Devote more efforts to better education about the issues and challenges facing communities. Such education should address the community's distinct cultural needs and experiences.

Develop mechanisms to increase community participation that can provide effective influence in the policy-making process.

Coordinate policy making at the regional level.

While better models need to be developed, governmental action on addressing lead pollution should be used as an example of an interagency/interdisciplinary approach to public health issues.

Link public health issues together to show their interrelationships and real-life impacts.

Develop community impact statements as an integral part of community partnerships.

Include prevention and environmental health issues in education curriculums and in practice.

Neurotoxicology-The Role of the Environment in Injuries to the Developing Nervous System

Moderator

Gary E. Goldstein, MD, President, Kennedy Krieger Institute

Panelists

Herbert Needleman, MD, Professor of Pediatrics, Univ. of Pittsburgh School of Medicine

Patricia Rodier, PhD, Senior Scientist, Dept. of OB/GYN, Univ. of Rochester Medical Center

This workshop's panelists discussed the special vulnerability of the developing nervous system to toxins. The particular and unique processes of the developing nervous systems and how toxins might specifically affect them was discussed. Participants heard discussions of how metals, solvents, insecticides, and certain gases are known to damage the adult brain, but that the developing nervous system is more sensitive to these toxins than adult brains.

Panelists reviewed the important findings on long-lasting behavioral deficits caused by lead poisoning during early childhood. In addition, participants also heard presentations on similar effects of childhood exposures to other neurotoxins-such as methylmercury or alcohol-resulting in mental retardation and motor disabilities.

Recommendations

In order to fill in data gaps, more efforts should be devoted to testing and screening the toxic effects of chemicals on the nervous system and developing nervous system.

More education on apparent symptoms of nervous system disorders should be given to service providers (e.g. social workers, teachers, parents, etc.).

"Polluter pays" legislation should be supported.

Federal legislation and federal agency mandate should undergo immediate review.

Health care practitioners and community members should engage in on-going education on toxic sources and their effect on children's nervous-system development.

Support should be encouraged for poison control centers to include environmental health issues.

Integrated pest management should be recommended as an alternative to the use of pesticides.

Pesticides-How Research Has Succeeded and Failed in Informing Policy

Moderator

Barbara Boardman, MD, Instructor, Pediatrics, Harvard Medical School

Panelists

Carolyn Brickey, Project Director, National Campaign for Pesticide Policy Reform

Theo Colborn, PhD, Senior Scientist, World Wildlife Fund

Richard Wiles, Director, Agricultural Pollution Prevention Program, Environmental Working Group

Mary Wolff, PhD, Associate Professor, Mt. Sinai School of Medicine

Though scientists have amassed reams of data on environmental hazards to children's health, they have not been effective in conveying these hazards to policy makers.

Participants in this workshop heard presentations on this problem from several perspectives. Can scientists themselves be more effective in communicating their research findings to the public? Should public advocates take a more active role in "packaging" scientists' messages for the media and for the public at large? How can research mobilize public opinion and inform public policy on complex issues, such as the link between pesticide exposures and their adverse effects on public health? Are there institutional barriers in scientific research itself that makes it harder to arrive at definitive answers?

Panelists in this workshop addressed these questions in their discussions on the successes and failures in translating scientific research into public policy, including DDE and the link with breast cancer, and endocrinologic and reproductive effects on wildlife.

Recommendations were not developed, however workshop participants developed these points for further debate:

Research

Recognize the need to reduce the necessity of continued pesticide use, possibly through alternative agricultural methods such as bio-control (i.e. integrated pest management).

Encourage federal attention on forming an institute of eco-toxicology research (including the on-going research at the National Institute for Environmental Health Sciences, the Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry, and the National Institutes of Health).

Recognize the need for individual review process.

Recognize the need for protocols in monitoring analytical methods; these should be available from companies.

Recognize the need for short-term screening.

Thoroughly test new pesticide products and their metabolites.

Encourage the development of more cancer (including hormonally-related) and reproductive studies on the adverse effects of pesticides.

Design better methods for assessing exposures and evaluating statistical data on subtle effects of pesticide exposures.

Risk assessment

Recognize the need to develop models that assess the impact of additional doses on cancer and non-cancer illnesses.

Develop new models that differentiate the effects of exposures to multiple toxic chemicals with similar adverse effects (e.g. lead poisoning and neuro-toxic pesticides).

Assessment should be geared toward the total health risk from a given compound; tolerance levels should be less than a health-based standard.

Apply toxic equivalency factors to other classes of compounds (i.e. neurotoxins).

Encourage better communication between the research and policy communities.

Encourage better scientific communication with the media and with the public at large. Regarding the former, scientists could hold a workshop just for journalists to communicate new findings.

Apply truth-in-advertising requirements to claims based on scientific data.

Convene "think tank" panels to answer questions from the media.

Policy

Target research to identify highly toxic chemicals and to restrict "bad actors" with specific timeline.

Develop incentives to reduce the use of products that use pesticides or to encourage the development of alternative technologies that don't include pesticides.

Maintain interaction with farmers and growers when developing policies to reduce overall use of pesticides.

USDA should support and help implement alternative methods to pesticide use, and should develop policies that encourage research into less toxic methods.

With concern for the consumer's right to know, investigate the feasibility of full-disclosure laws that could apply to products treated with pesticides.

Investigate the possibility of establishing a system of nationwide reporting on pesticide use.

Grant access to proprietary health data used in pesticide registration.

Technology Exchange: **The Molecular/Clinical Interface**

Moderator

William Suk, PhD, MPH, Chief, Chemical Exposures and Molecular Biology Branch, Division of Extramural Research and Training, National Institute of Environmental Health Sciences (NIEHS)

Panelists

Bert Lubin, MD, Director of Medical Research, Children's Hospital, Oakland Research Institute

Frederica Perera, PhD, Associate Professor, Columbia University School of Public Health

Leslie Robison, MD, Associate Professor, Pediatrics, Univ. of Minnesota

John Durant, PhD, Post Doctoral Student, MIT Center for Environmental Health Sciences

How can research on environmental toxics and technologies be moved from the laboratory to clinical practice and the community? Panelists in this workshop provided examples of applying research conducted in the field and in the laboratory to clinical interventions aimed at mitigating the exposures to and adverse health effects of toxic substances in the environment.

Through discussions of their specific research projects, the panelists suggested ways of establishing comprehensive pediatric environmental health centers which could use a multi-disciplinary approach in both identifying prevalent environmental toxins and developing strategies to prevent continued exposure among children to these toxic substances. Included in the discussion was the practical and ethical use of biomarkers and tissue banks, and the development of biologically-based risk assessments for exposures to chemicals found in the environment.

Recommendations

Multi-disciplinary comprehensive pediatric environmental health centers should be established, using basic and clinical sciences with a multidisciplinary framework (including clinical intervention and identification of environmental toxicants), with a strong emphasis on research.

Develop cost-effective technologies for specimen banks.

Devote more research to the scientific validation of bio-markers. Focus attention on ethical issues surrounding new bio-markers. What do they mean? What about individual risk?

Base risk-assessment on health and biological effects as opposed to economics.

Devote more hours of specialized education to medical residents, practicing clinicians, and lay care providers.

Establish hotlines and other means of disseminating information for community members and clinicians to identify sources and symptoms of well-known toxic substances. Evaluate existing hotlines for effectiveness.

Devote more efforts to minimizing and controlling sources of toxic waste through pollution prevention.

Endocrine Effects of Prenatal Exposure to PCBs, Dioxin, and Other Xenobiotics

Moderator

Theo Colborn, PhD, Senior Scientist, World Wildlife Fund

Panelists

Linda Birnbaum, PhD, Director, Environmental Toxicology Division, Health Effects Research Lab, US EPA

Leon Guo, MD, Dept. of Industrial Health, National Cheng Kung Univ. Medical College, Taiwan

John McLachlan, PhD, Director, Division of Intramural Research, NIEHS

Polychlorinated biphenyls (PCBs) and other chlorinated compounds-DDT and other chemically-related pesticides still in use-have been linked to disruptions of the endocrine system, responsible for the production of sex hormones. Evidence from studies of wildlife affected by industrial emissions and spills of these chemicals into the surrounding ecosystem shows serious population declines and impaired reproduction in these species. Human equivalents appear as lowered sperm counts and increasing rates of testicular cancer in men, undescended testicles in adolescent males, and endometriosis in young women. Breast cancer and immune system disorders have also been linked to exposure to these chemicals.

This workshop was devoted to reviewing the effects of these specific compounds on the developing endocrine system. Panelists explored the mechanisms of the effects on the endocrine system and transgenerational effects of in-utero exposures as well as implications for future research policy.

Recommendations were not developed, however workshop participants developed these points for further debate:

For laboratory researchers

Assess the full range of hormone systems and develop screenings for such a range. Apply these screenings to chemical interactions (including multiple-chemical interactions). Assess effects of interactions on different organ systems. Develop non-invasive sampling methods and exposure markers. Integrate molecular and organ system data.

For epidemiologists

Investigate effects of high exposure to toxic substances in humans and wildlife through "natural experiments". Bank samples of tissues collected from highly exposed sub-groups. Improve surveillance of hormone-related cancer outcomes.

For policy makers

Identify sources of contamination in food supply and other exposure pathways to assess economic and policy implications of curtailing the use of chemicals that disrupt endocrine system function (per analysis by the National Academy of Sciences).

When setting tolerance levels in food and threshold levels for intervention for toxic substances, establish a priority list for the application and incorporation of other toxicological data, including substances that disrupt hormones.

Incorporate results of research on how chemicals disrupt endocrine system function into national policy-making arenas.

From Science to Soundbite: Understanding and Improving Communication Between Science and the Media

Moderator

Ned Groth, PhD, Director, Technical Policy & Public Service, Consumer's Union

Panelists

Elinor Blake, MSW, Health Program Specialist, Environmental Health Investigations Branch, California Dept. of Health Services

David Carpenter, MD, Dean, School of Public Health, Univ. at Albany, SUNY; Host, National Public Radio

Janet Raloff, Senior Editor for Environment/Policy, Science News

Participants in this workshop learned how scientists can help bridge the gap between scientific data and the public's perception of risk. Panelists addressed the different dimensions of public outrage over environmental hazards and how the public can help or hinder the scientist's role in explaining how such hazards affect human health.

Panelists also discussed the factors that contribute to scientists' efficacy in explaining scientific

data through the media and to different audiences. Media representatives on the panel discussed their role in deciding how scientists' messages are relayed to the public at large.

Recommendations

For the scientific community

Foster community and participatory research.

Be able to quantify economic impact of risks to children.

Do not oversimplify research findings; respect the intelligence of the audience, and involve the public in discussions; but speak in language appropriate to the audience.

Be clear and precise on the message. Prepare delivery of research before talking to media. Prepare a "take-home" message on findings.

Target message to community by using different media channels (e.g. non-English-language, community-oriented newspapers).

Receive training on communication to learn about techniques for using the media to communicate research findings and for being a media source.

Attend more conferences on how to communicate issues on children and the environment to the media.

Stay on the record when discussing findings with the media. Complain to media if story is inaccurate or if quoted out of context; but be fair in criticism.

For the media

Include perspectives of all communities affected by the issue.

Realize the limits of sources consulted.

Make sure quotes are accurate.

For policy makers

Support funding for environmental science curricula in grades K-12.

Don't expect scientists to make decisions for policy makers, but request that scientists make relevant interpretations of data.

For consumers and community members

Assemble information and disseminate it to members of the community.

Empower and involve children in environmental issues.

Neurotoxicology- Learning and Behavioral Consequences of Prenatal Environmental Exposures

Moderator

Martin Philbert, PhD, Assistant Professor, Dept. of Neurotoxicology, Rutgers Univ.

Panelists

Steven Gilbert, PhD, Research Associate Professor, Dept. of Environmental Health, Univ. of Washington

J. Rount Reigart, MD, Professor of Pediatrics, Medical Univ. of South Carolina

Hugh Tilson, PhD, US EPA, Director, Neurotoxicology Division, Health Effects Research Lab, US EPA

Panelists focused on fetal exposure to methylmercury and its effects on physiological and cognitive development in the fetus and at different stages of the child's life. Those attending the workshop learned about methylmercury, high concentrations of which are found in areas with coal-fired power plants and incinerators. Native Americans who subsist on locally caught fish, and low-income neighborhoods near incinerators, are particularly vulnerable to methylmercury exposure.

High levels of exposure to this metal, which passes through the placenta and concentrates in the fetus, have been found to result in severe neurodevelopmental problems in children, including behavioral disorders, learning impairment, delayed motor development, and sensory defects.

Panelists discussed the problem of determining "safe" levels of exposure to methylmercury and developed a series of recommendations addressing policy and research issues.

Recommendations

Encourage legislation that regulates chemicals in the environment. Such legislation should include consideration of neuro-developmental effects and should aim at protecting the most sensitive groups (i.e. pregnant women, fetuses, newborns, and children). Such legislation should also include funding methods to pay for research and regulatory processes (e.g. the "polluter pays" principle).

Develop pro-active outreach to child advocacy groups in order to develop policy and legislation.

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Improve risk communication to populations at risk by forging links between universities and local health departments, between health departments and affected communities, and between universities and communities.

Develop systemic and new approaches for the screening of environmental exposures, developmental disabilities in clinical settings, and for potential neuro-developmental toxicants.

Promote accessibility of child-based data that includes information on neuro-developmental outcomes and toxicants.

Policy should follow science rather than the public's perception of risk.

Science should not be a barrier to timely policy.

Fetuses and newborns should be considered vulnerable hosts. Policy should be goal-directed and consistent, and should ensure the safety of all populations, including the most sensitive groups.

Pesticides-The National Academy of Sciences Report: How Can the Recommendations Be Implemented?

Moderator

Jim Aidala, Associate Assistant Administrator, Office of Prevention, Pesticides, and Toxic Substances, US Environmental Protection Agency (EPA)

Panelists

Jay Feldman, Executive Director, National Coalition Against the Misuse of Pesticides

Marcia vanGemert, PhD, Toxicology Program, US EPA

Richard Jackson, MD, MPH, Chief, Division of Communicable Disease Control, California Dept. of Health Services

John McCarthy, PhD, Vice President of Global Scientific and Regulatory Affairs, National Agricultural Chemical Association

How have recommendations from the National Research Council's June 1993 report on Pesticides and the Diets of Infants and Children been implemented? Those attending this workshop heard presentations from panelists representing government, industry, and advocacy, who discussed progress toward meeting the report's recommendations and future actions.

In the presentation from the advocacy perspective, participants were alerted to the rising cancer rates in children and their possible link to continued exposure to pesticide residues on

foods. The presentation from the Environmental Protection Agency highlighted the various ways the agency is addressing the NAS report, especially in the areas of toxicology, risk assessment, food and water consumption, and residue chemistry. The industry presentation focused on NACA's response to the NAS report-which recommendations they agreed with and which they found questionable.

Participants also learned about the difficulty the NAS report's contributors encountered with data. Among the issues arising in this presentation were: the lack of monitoring cases of illness among workers and consumers exposed to pesticides, possibly changing the default ten-fold safety factor for risk assessments, and the possible expansion of toxicity computer modeling in the future.

Recommendations

Require industry to quantify risks to children and make information available to the public. Disseminate the Environmental Protection Agency's information to the public. Encourage "Right to Know" for pesticides. Find threshold for phase-outs of chemicals; where uncertain, support non-exposure.

Develop a national strategy to: follow up on incomplete studies (e.g. hazard assessment on children), and promote monitoring and surveillance of human populations. Focus on human and animal studies.

Encourage international approaches to pediatric environmental health. Adopt the most stringent standard.

Fit benchmark dose to endpoints (clarify model for data set used). Clearly state assumptions of model; use conservative assumptions when there is uncertainty.

Target farmworkers' children when regulating phase-out of chemicals.

The Role of the Environment in Birth Defects and Developmental Delay

Moderator

Jim Hanson, MD, President, Teratology Society

Panelists

John Harris, MD, Chief, California Birth Defects Monitoring Program

Godfrey P. Oakley, Jr., MD, MPH, Director, Division of Birth Defects and Developmental Disabilities Branch, CDC

Lowell Sever, PhD, Senior Scientist, Battelle Pacific Northwest Labs

Are birth defects and developmental delay attributable to environmental causes? Previous

scientific studies have suggested that neural tube defects in newborns are attributable to fetal exposures to environmental agents, such as organic solvents, pesticides, heavy metals, and ionizing radiation.

This workshop discussed these particular birth defects, such as folic acid preventable spina-bifida and anencephaly, as well as poverty-associated mental retardation. The role of epidemiologic research in finding environmentally caused birth defects among specific population groups was also discussed.

Participants developed recommendations aimed at increasing research efforts in identifying environmental factors attributed to these particular birth defects. Recommendations also urged support for the Birth Defect Prevention Act of 1994 and suggested ways to improve folic-acid supplementation to lessen the likelihood of such neural tube birth defects in population groups especially susceptible to associated environmental hazards.

Recommendations

Support the Birth Defect Prevention Act of 1994.

Organize a national interagency workgroup to coordinate laboratory science and human clinical and epidemiological (population-based) research with strong public participation.

Develop an aggressive national program to eradicate preventable neural tube defects stemming from folic acid deficiencies (with strong media component, federal agency support, and funding).

Remove barriers to folic acid supplementation. In particular, vitamins should be removed from the list of proscribed items in food stamps.

Develop appropriate population-based methods for assessing adverse developmental outcomes, ranging from spontaneous abortion to functional deficits (not limited to structural defects).

Develop prevention and intervention programs for fetal alcohol syndrome and fetal alcohol effects.

Address transborder regulation, liability, and health issues, such as those addressed in the debate over the North American Free Trade Agreement. Address, in particular, the occupational and environmental hazards posed by the expansion of the maquiladora (foreign-owned border factory) industry.

Educate professionals and professional groups (e.g. AAP, ACOG) about causes and prevention of adverse developmental outcomes.

The Role of the Environment in Childhood Cancer

Moderator

Rick Kreutzer, MD, Public Health Medical Officer, Environmental Health Investigations Branch, California Dept. of Health Services

Panelists

David Rall, MD, PhD, Assistant Surgeon General (retired)

Sheila Zahm, ScD, Epidemiologist, Environmental Epidemiology Branch, National Cancer Institute

Lauren Zeise, PhD, Chief, Reproductive & Cancer Hazard Assessment Section, California EPA

Each year in the U.S., an estimated 8,000 children—from newborns up to age 14—are diagnosed with cancer. Panelists in this workshop discussed the few well-established environmental causes of childhood cancer, such as radiation, chemotherapeutic agents, and diethylstilbestrol (DES). Workshop participants heard presentations on other agents suspected in playing a role in the development of childhood cancer, such as electromagnetic fields, pesticides, and environmental tobacco smoke.

As the participants also learned, the evidence isolating these agents as proven carcinogens is still inconclusive; moreover, some of these agents contribute to cancers that develop many years after exposure during childhood. Panelists also discussed the special vulnerability of children to possible environmental carcinogens. Participants in this workshop also learned of the difficulty in using animal studies to predict cancer in children exposed to carcinogens.

Recommendations again underscored the need for prevention programs to mitigate children's exposure to known and suspected carcinogens.

Recommendations

Create and fund comprehensive pediatric environmental health centers, whose elements would include basic and applied science, epidemiology, medicine, policy, community participation, law, urban planning, and education.

Recognize the need to develop prevention programs for knowable hazards (i.e. UV light and tobacco, especially second-hand smoke). For example, babies should have warning labels saying "Do not expose to UV light or second-hand smoke."

Industry and regulatory agencies should recognize the need for disclosure in household products and pesticide ingredients.

Shift the burden of proof to industry in demonstrating the safety of their products, including the disclosure of identified carcinogens in these products and the assessment of their risk.

Develop an Environmental Bill of Rights for Children; make current laws more protective for children.

In the absence of information, legislators and regulatory officials should take a public health approach in drafting relevant laws and policies. Such an approach would assume that vulnerable populations need more protection, especially regarding children's exposures.

The Role of Nutrition in Mitigating Environmental Insults

Moderator

Harvey Karp, MD, Assistant Professor, UCLA School of Medicine

Panelists

Howard Hu, MD, MPH, DS, Associate Professor, Harvard School of Public Health

Kathryn Mahaffey, PhD, Acting Chief, Chemical Mixtures Assessment Branch, Environmental Criteria Assessment Office, EPA

Babasaheb Sonawane, PhD, Chief, Reproductive and Developmental Toxicology Branch, US EPA

Can nutritional supplements and anti-oxidants mitigate the adverse health effects of exposures to toxic substances in the environment? This was the central question addressed in this workshop, which explored the role of nutrition in mitigating environmental insults to children and its associated policy implications.

Panelists provided an overview of toxic contaminants in human milk, including halogenated organic compounds and metals. Participants agreed that more research should be devoted to identifying breast milk contaminants and to developing better, more appropriate risk-assessment methods for infants that account for their food consumption, nutritional patterns, etc.

Panelists also discussed nutrition as a public health strategy to reduce adverse effects of high blood lead levels, focusing on nutritional components that reduce the body's absorption of lead (e.g. adequate levels of calcium and iron). Participants developed recommendations around the strategies of nutritional supplements and optimal diet recommendations, in addition to prevention efforts by state and local health departments.

Ethical issues concerning the role of nutrition in mitigating health consequences of toxic exposures were also discussed. Participants agreed that efforts at preventing environmental hazards should be the primary method in reducing such hazards, and that nutritional approaches should supplement these efforts at prevention.

Recommendations

Support optimal nutrition for whole population (survey, identify, and replicate successful programs).

Develop database of various social groups' food consumption (i.e. SES).

Study how consumers decide what foods to buy.

Support nutritional education in medical, public health, primary, and secondary schools.

Study the protective effects of anti-oxidants among populations at risk from environmental stressors (i.e. ozone).

Encourage farmers and USDA to promote low or no pesticide use.

Support FDA in the scrutiny of health department claims.

Review Recommended Daily Allowances (RDAs) to see if these are optimal for various new environmental stressors.

Environmental Justice Caucus Recommendations

The following environmental justice representatives met during the symposium to discuss research and policy issues, and to develop recommendations:

Robert Bullard, PhD, Professor, Center for Afro-American Studies, UCLA

Luke Cole, JD, Staff Attorney, Center on Race, Poverty & the Environment, California Rural Legal Assistance

Raymond "Rico" Gonzales, Eco Rap

Running-Grass, Executive Director, Three Circles Center for Multicultural Environmental Education

Henry Holmes, Associate Director, Urban Habitat Program

Janet A. Phoenix, MD, Manager of Public Health Programs, National Safety Council

Beverly H. Wright, PhD, Associate Director, Xavier Univ., Deep South Center for Environmental Justice

Recommendations:

Policy

In setting minimum standards for environmental health research, policy and practice, standards should be protective of the most vulnerable subsets of sensitive populations.

There needs to be legislative strategies which address the state and federal levels.

The potential for conflict in resource allocation must be addressed.

Research

There should be a focus on developing new paradigms and models of research. There need to be changes not only on the focus of research, but on how the research is conducted.

There needs to be explicit implementation/action plans for completed research.

There is a need to redefine "interdisciplinary" to represent something other than many different types of scientists (e.g. community people, agency officials and scientists, environmentalists, and other public advocates must be involved).

Community Interactions

Researchers from outside of the community should explain limitations in the research up front, and not create false expectations.

The community should be involved in designing the research and protocol.

Research must be culturally, linguistically, and educationally appropriate-post-college language is not appropriate.

There is a need to transfer information and expertise from academics and government to communities. There needs to be a focus on early education.

There is a need to institutionalize this expertise and education on the community level.

Research should be more action-oriented and less academic.

Leadership

Use historically Black colleges and universities and minority institutions which are often in the very communities which are most heavily affected.

Address a lack of people of color in the administration of minority institutions.

Involve students, professors, and professionals of color in identifying, defining, and addressing the problems.

Conference Organization

Planning committee and conference implementation needs to be more inclusive-participation needs to be expanded. Participation should be open, equitable, and diverse.

Work groups should include grassroots voices in more than token capacity.

To influence dialogue about fundamental issues, the conference should be structured to facilitate discussion at the beginning, not at the end of the conference.

The recommendations from this symposium should be tied to those from the NIEHS conference which preceded it. Their outcomes need to be coordinated.