

Children's Environmental Health: 2006 Report

Environment, Health, and a Focus on Children

The mission of the United States Environmental Protection Agency (EPA) is to protect human health and the environment. Recently, the World Health Organization estimated that as much as 24 percent of global disease is caused by avoidable environmental exposures, and that the environment significantly affects more than 80 percent of major diseases. More than 33 percent of disease in children under the age of five is caused by environmental exposures (WHO, 2006). EPA is taking action in response to the clear evidence that children face unique risks for these reasons:

- The neurological, immunological, respiratory, digestive and other body systems in children are still developing and are more easily harmed by environmental exposures;
- Children eat more food, drink more fluids, and breathe more air than adults in proportion to their body mass—their food, water, and air must therefore be especially safe;
- Children play and learn by crawling and placing hands and objects in their mouths—increasing their potential exposure to environmental contaminants. They do not understand risk until they get older and are more mature, again enhancing exposure potential;
- There are unique exposure pathways such as through the placenta and through breast milk;
- Children have a long life expectancy during which the consequences of exposures might become evident; and
- Children are limited in their capacity to communicate and urge action about their environmental health risks, so others must speak and act on their behalf.



A background image showing a group of children with backpacks walking past a yellow school bus. The bus has the number '9029' on its side. The scene is slightly blurred, suggesting motion.

This annual publication highlights a variety of efforts across EPA undertaken explicitly to improve the environments where children live, learn and play. We discuss recent projects to improve school environments, address indoor and outdoor air quality, and reduce exposures to chemicals and pesticides. We also highlight research, regulatory, and data development work, as well as efforts to protect children from overexposure to the sun, to train healthcare providers and to provide international leadership.

Protecting Children in Schools

In order to learn, children must have safe and healthy schools and they must be able to concentrate, free from environmentally-related conditions that may precede illness.

Asthma, lead poisoning, inadequate ventilation, moisture and mold problems, improper use of pesticides, and inadequate chemical management are all environmental issues in schools. EPA is taking an integrated and coordinated approach to improve the health, productivity and performance of 53 million children and 6 million staff in the nation's 120,000 public and private schools while saving energy, resources and money.

HealthySEAT: Efforts to help school administrators ensure that students and staff have safe and healthy environments in which to learn and work were accelerated in 2006 with the release of the Healthy School Environments Assessment Tool (HealthySEAT). The new HealthySEAT software developed by EPA allows school systems to establish and manage voluntary, comprehensive, environmental management systems for all of their school facility environmental health and safety issues. HealthySEAT is a free software tool that comes pre-loaded with approximately 400 assessment actions covering the major elements of all of EPA's regulatory and voluntary programs for schools, and many from other Federal agencies as well.

HealthySEAT is designed to be customized to reflect the school district's own issues and priorities, and to track the status of facility conditions and improvements school by school. Based on a model created by the Los Angeles Unified School District and developed in collaboration with several states and school districts across the country, HealthySEAT provides a truly integrated approach to protecting children's health in schools. For more information and to download HealthySEAT, visit www.epa.gov/schools/.

Indoor Air Quality: In 2006, EPA is recruiting 1,200 schools to implement indoor air quality management practices, bringing the total over ten years to 35,000 schools. These practices have reduced exposure to indoor pollutants and improved the indoor environment and health of approximately 18 million students, faculty, and staff. EPA's *Indoor Air Quality Tools for Schools Program (IAQ TFS)* has been supporting schools for over a decade with the goal to reduce exposures to indoor environmental contaminants in 35 percent of America's schools by 2012 through the promotion of voluntary adoption of IAQ management practices. Key elements of the program include outreach and education, training, technical tool development, and awards. Visit www.epa.gov/iaq/schools/.

Chemical Cleanout and Prevention Program: EPA continues to encourage safe chemical management and to help state, local, and tribal programs remove dangerous chemicals from schools. EPA encourages school districts and communities to promote a safer learning environment through use of its informational material and Web site with valuable resources for teachers, administrators, and community partners. Visit www.epa.gov/sc3/.

Chemical and Waste Management—the Lansing, Michigan Pilot: Throughout the United States, school districts struggle to find cost-effective and comprehensive solutions to their chemical and waste management challenges. EPA recently supported a revolutionary pilot to improve chemical and waste management in schools. Rather than placing additional burden on teachers and other school personnel, the school district's supply chain was transformed from product sellers to product service providers, using their expertise to comprehensively improve chemical and waste management without additional cost to the school district. General Motors, Chemical Strategies Partnership, Michigan Department of Environmental Quality, and EPA partnered to make this pilot a success. A step-by-step workbook based on the Lansing Public School District Pilot is being created to assist interested organizations. See www.epa.gov/epaoswer/hazwaste/minimize/cms.htm.

Reducing Lead in Drinking Water: EPA developed a suite of new tools and guidance documents to encourage schools and child care facilities to implement the 3T's (Training, Testing, Telling)—a voluntary lead in drinking water reduction program. Exposure to lead is a significant health concern, especially for young children and infants, whose growing bodies tend to absorb more lead than the average adult. EPA's objective is to provide school officials and child care providers with the tools they need to understand and address lead in drinking water in their facilities. Visit www.epa.gov/safewater/schools.

Clean School Bus USA: EPA launched its Clean School Bus USA program in 2003 to reduce children's exposure to diesel exhaust from school buses. When inhaled, pollutants in diesel exhaust may aggravate asthma and allergies or cause other serious health problems for children. At least 80 communities in 40 states have lowered pollution from their local school buses as a direct result of almost \$18 million in Clean School Bus grants. As a result, over 2 million children are riding cleaner school buses. Over 20,000 school buses have been involved in Clean School Bus projects and nearly 1000 tons of soot will be reduced at their conclusion. The benefits to children and communities are less exposure to particulate matter in diesel exhaust and fewer asthma episodes and emergency room visits. Visit www.epa.gov/cleanschoolbus/.

Energy Efficiency and Children's Health: EPA's ENERGY STAR program helps improve the school environment for our children by providing better lighting, reducing indoor and outdoor air contaminants, and regulating temperature and humidity to prevent mold and dust mites. School districts spend more than \$5 billion annually on energy. Typically, 30 percent of the energy used in a school is wasted. Energy efficiency reduces costs and provides a cleaner living environment. Of the 9,000 school buildings tested, more than 470 have earned the ENERGY STAR logo. Buildings that have earned the logo use about 40 percent less energy than average buildings. See www.energystar.gov/.

SunWise Program: Ultraviolet (UV) rays from the sun are classified as a human carcinogen. Serious health effects, including skin cancer, eye damage, cataracts, and immune system suppression can be caused by overexposure to the sun. SunWise teaches children and their caregivers how to protect themselves from overexposure to the sun, and has been shown to be effective at increasing sun safety knowledge and awareness in children ages 5 to 12. More than 14,000 schools and informal learning centers are signed up for the SunWise Program (up from 12,000 in 2005), making SunWise the most widely used public health education program in the country. Visit www.epa.gov/sunwise.

Integrated Pest Management (IPM): An IPM program employs common sense strategies to reduce sources of food, water and shelter for pests. IPM programs take advantage of all pest management strategies, including careful use of pesticides when necessary. Integrated pest management provides an opportunity to create a safer learning environment—to reduce children’s exposure to pesticides as well as eliminate pests. EPA is encouraging school officials to adopt IPM practices to reduce children’s exposure to pesticides. The IPM Institute of North America’s IPM STAR school certification program ensures IPM is practiced in schools. The Monroe Model, from Monroe County, Indiana, is known for its ability to engage staff at all levels in pest management and has been widely adopted. Both of the models are being demonstrated throughout many parts of the United States. These two models have positively affected more than 3 million students and staff in our nation’s schools. The measure of their success is the exposure reduction achieved. On average, schools show a 71 percent reduction in pesticide applications and a 78 percent reduction in pest complaints. See www.epa.gov/pesticides/ipm/.

Children and the Air They Breathe

Air pollution, whether indoors or out, affects the health of children in countries all over the world. While playing or at rest, children breathe more rapidly and inhale more pollutants per pound of body weight than adults. The airway passages in children are narrower than those in adults, and irritation caused by air pollution can result in proportionately greater airway obstruction (American Academy of Pediatrics Committee on Environmental Health, 2003). In addition to associations between air pollution and respiratory symptoms, asthma exacerbations, and asthma hospitalizations, recent studies also find links between air pollution and preterm birth, infant mortality, deficits in lung growth, and possibly, development of asthma (PEDIATRICS Vol. 114 No. 6).

Asthma: While health effects of exposure to polluted air vary by type of pollutants inhaled and the exposure level, a look at recent asthma research findings and statistics illustrates the importance of clean air for children. Research has shown that:

- Exposure to dust mites, molds, cockroaches, pet dander, and secondhand smoke trigger asthma attacks;
- Exposure to secondhand smoke can cause asthma in pre-school aged children;





- Exposure to dust mites can cause asthma;
- Ozone and particle pollution can cause asthma attacks;
- Exposure to particulate matter can reduce lung function;
- When ozone levels are high, more people with asthma have attacks that require a doctor's attention; and
- Ozone makes people more sensitive to asthma triggers such as pet dander, pollen, dust mites, and mold.

In the United States, 20 million people, including 6.1 million children, have asthma, which accounts for more than 14 million outpatient clinic visits and nearly 2 million emergency department visits each year. African Americans continue to have higher rates of asthma emergency department visits (380 percent higher), hospitalizations (225 percent higher), and deaths (200 percent higher) than Caucasians. Approximately 2 million Hispanics in the United States have asthma and Puerto Ricans are disproportionately affected. Asthma is the most common serious chronic disease of childhood, costing society annual expenditures for health and lost productivity estimated at \$16 billion. More information is available at www.epa.gov/asthma.

Controlling Asthma: EPA launched a new effort to support communities in delivering quality asthma care. The Communities in Action for Asthma Friendly Environments Network links community-based asthma programs committed to improving health outcomes and sharing knowledge, resources and tools. Network participants pursue strategies to achieve positive health outcomes, including cultivating strong program leaders, establishing sound community relationships, maximizing cooperative opportunities, providing integrated healthcare services, and implementing tailored environmental interventions. The network is supported through an interactive Web site which provides the platform for real-time education, communication, resource sharing, and recognition. See www.asthmacommunitynetwork.org.

Innovative Asthma Programs: EPA's National Environmental Leadership Award in Asthma Management recognizes health plans and healthcare providers who have demonstrated leadership in managing environmental triggers as part of a comprehensive asthma management program. Award winners serve as mentors and models for best practices in asthma care. This year EPA recognized two organizations:

IMPACT DC: With comprehensive asthma management for children, IMPACT DC, a program of the Children's Research Institute at Children's National Medical Center in Washington, D.C., reduces emergency room visits and decreases asthma severity. The program's unique approach uses the emergency department to identify and educate asthma patients, link them to primary care physicians or Medicaid managed care organizations, and follow them to ensure they receive effective long-term care. IMPACT DC's educational activities resulted in increased behaviors to reduce exposure to environmental triggers. The proportion of families using a mattress pad or pillow cover on a child's bed after receiving the program's asthma counseling was 75 percent compared with 23 percent in the control group.

Blue Cross of California, SSB: This managed care system demonstrates leading-edge approaches to asthma care by providing multi-lingual pharmacist consultations, home visits to assess environmental risks for high risk members, and incentives for physicians who follow the program's guidelines. As a result of its asthma education program, Blue Cross of California, SSB decreased hospitalizations by 60 percent and emergency room visits by 46 percent for continually-enrolled members. In addition, Blue Cross of California, SSB contributes to education and research efforts addressing air quality and its effect on asthma through a community-wide coalition it founded.

Emission Standards: In March, EPA announced proposed new emission standards to reduce toxic fumes and associated health risks from gasoline, vehicles, and gas containers. By 2030, these proposed Mobile Source Air Toxic regulations and fuel and vehicle standards should reduce toxic emissions from passenger vehicles to 80 percent below 1999 emissions. The proposed standards would take effect in 2011 for fuel requirements, 2010 for passenger vehicles, and 2009 for fuel containers. The proposal, supporting documentation, and information about submitting comments are online at www.epa.gov/otaq/toxics.htm#mobile.

Air Toxics and Dry Cleaners: On July 13th, EPA announced a new rule to reduce emissions of perchloroethylene (perc) from all dry cleaners, including a phase-out of the chemical in existing dry cleaners located in residential buildings. The rule prohibits the use of perc in any new co-residential dry cleaner. About 28,000 dry cleaners across the country, many in major cities such as New York and Washington D.C., use perc in the wash cycle to clean clothes. Of the total, 1,300 operate in residential buildings. Because apartments in these buildings are located very close to dry cleaners, residents' exposures and their estimated cancer risks can be much higher than for typical area source dry cleaners. Perc has been shown in animal studies to cause cancer. In addition, recent studies on residential exposures to

perchloroethylene have found neurological effects in residents living near dry cleaning facilities. Perc can cross the placenta and effects on developing nervous systems could pose a special concern for fetuses and young children. For more information, visit www.epa.gov/air/drycleaningrule.

Children and Secondhand Smoke: Exposure to secondhand smoke increases the risks of asthma episodes, middle ear, and lower respiratory tract infections, such as pneumonia and bronchitis. A recent EPA survey showed that approximately 20 percent of children with asthma are exposed to secondhand smoke in their homes. Asthma and secondhand smoke exposure rates are higher in low-income and low education households, with parents accounting for a majority of the exposure. By 2005, more than 120,000 parents and caregivers committed to keep smoke-free homes and cars for children by taking EPA's Smoke-free Home and Car Pledge. To take the Pledge and to find out more about how to protect children from secondhand smoke, visit www.epa.gov/smokefree.

Teaching Students about Air Pollution: *Air Pollution: What's the Solution?* is an online educational curriculum that uses real-time data to help students in grades 6 through 12 discover the science behind the causes and effects of outdoor air pollution. Students use scientific data and animated maps to monitor the presence of pollution and gain a better understanding of air pollution and the associated health effects. Visit www.k12science.org/curriculum/airproj/index.html.

EPA and the Weather Channel sponsored a twenty minute program to show how air quality can affect people and their health and to explain actions to reduce air pollution. The segment offers valuable information about the dangers of air pollution and stresses the effects it has on the environment and human health. The video is available free online at www.epa.gov/apti/broadcast.html in the section titled "Forecast Earth."

Protecting Children from Chemical Exposures

There are up to 80,000 chemicals registered for manufacture in the United States, and only a fraction of these have been tested for their effects on human health. Children are exposed to chemicals every day, as they are ubiquitous: in schools, child care centers, farms, fields, grocery stores, homes, lawns, and dry cleaners. Chemicals are also found in thousands of consumer products, including children's toys.

Toxicity and Exposure Assessment for Children's Health (TEACH): TEACH consolidates children's health and related developmental toxicology information from the scientific literature and improves access to that information through an interactive Web site. TEACH complements existing informational tools on health risks to children from exposure to chemicals in the environment. The TEACH Web site includes two main components: a searchable database and chemical summaries. The TEACH Database contains summaries of

research articles from peer-reviewed journals that pertain to early life and childhood exposure and health effects for the TEACH chemicals of concern. The TEACH Chemical Summaries highlight information from the TEACH Database and other federal resources in a standardized format for each TEACH chemical of concern. The site includes a database of research articles from peer-reviewed journals that pertain to early life and childhood exposure and health effects for each chemical. Eighteen chemicals or chemical groups are currently in TEACH, chosen because of their potential effects on children's health. They are: arsenic, benzo(a)pyrene, benzene, formaldehyde, manganese, alkyl mercury, elemental mercury, inorganic mercury, nitrates/nitrites, phthalates, polychlorinated biphenyls (PCBs), trichloroethylene (TCE), vinyl chloride, and five pesticides: atrazine, 2,4-dichlorophenoxyacetic acid (2,4-D), diethyltoluamide (DEET), dichlorvos, and pyrethroids (permethrin and resmethrin). Visit www.epa.gov/teach/.

2010/15 PFOA Stewardship: In January of 2006, EPA invited the eight fluoropolymer and telomer manufacturers to participate in a global stewardship program on PFOA and related chemicals. PFOA, also known as C8 or Ammonium Perfluorooctanoate (APFO), is used in the manufacturing process of fluoropolymers which impart desirable properties, including fire resistance and oil, stain, grease, and water repellency. They are used to provide non-stick surfaces on cookware and waterproof, breathable membranes for clothing. PFOA is persistent in the environment. It has been detected in low levels in wildlife and humans, and animal studies have indicated developmental and other effects of concern. Companies were asked to commit to reducing PFOA from emissions and product content by 95 percent no later than 2010, and to work toward eliminating PFOA from emissions and product content no later than 2015. Eight companies made commitments to participate in this program: Arkema, Asahi, Ciba, Clariant, Daikin, DuPont, 3M/Dyneon, and Solvay Solexis. For more information, see www.epa.gov/oppt/pfoa/.





Polybrominated Diphenyl Ethers (PBDEs):

EPA released a PBDE project plan to summarize relevant information on this group of brominated flame retardant chemicals. EPA is working with all parties to ensure that fire safety, environmental concerns, and public health are all considered for these chemicals, which are widely used in a variety of manufactured products. Concerns about liver toxicity, thyroid toxicity, developmental toxicity and developmental neurotoxicity are particularly important for children. The plan outlines EPA's overall approach to activities for these chemicals, which includes pentabromodiphenyl ether (pentaBDE), octabromodiphenyl ether (octaBDE), and decabromodiphenyl ether (decaBDE). Visit www.epa.gov/oppt/pbde/.

Integrated Pest Management in Public

Housing: Over 2.5 million people live in public housing, and many are families with young children. Controlling common pests like cockroaches and rodents is an enduring challenge for low-income families. Research has shown that cockroaches and rodents are common asthma triggers for children living in urban environments. In collaboration with the National Centers for Disease Control

and Prevention, the Department of Housing and Urban Development, and the National Center for Healthy Housing, EPA is providing integrated pest management training for public health and housing officials as well as for residents of subsidized housing to control pests and minimize exposure to pesticides. EPA is also sponsoring two projects with the Providence Housing Authority and the Housing Authority of the District of Columbia in an effort to transform pest management practices and evaluate health outcomes for residents.

Hispanic Outreach and Pesticide Safety: EPA reached out to over 3 million Latinos through national and local TV, radio, and print to promote pesticide safety for Spanish-speaking farmworker families during National Poison Prevention Week. During the campaign, the Agency made special efforts to convey the need to protect children of farmworkers from exposure to pesticide residues where they live and play. An estimated 84 percent of the farmworker labor force is Spanish-speaking and many rely on Spanish language media for their health information.

Lead-Based Paint: EPA proposed new requirements for contractors and construction professionals when working in homes that contain lead-based paint. The goal of these requirements is to reduce lead exposure to children. EPA is proposing that contractors be trained in the use of lead-safe work practices, renovators and firms be certified, providers of renovation training be accredited, and renovators follow protective work practice standards. For more information visit www.epa.gov/lead/pubs/renovation.htm.

Children and Toxics: A report by the Commission for Environmental Cooperation (CEC) profiles children's health and the relative risk of industrial chemicals. Using pollution data from Canada and the United States, the report highlights our need to better understand exposures to industrial chemicals as well as chemicals used in residential and school settings, and the association of these chemicals with potential health effects in children. This report is available on the CEC Web site www.cec.org/pubs_.

Indicators of Children's Environmental Health

To guide and improve environmental, health, and development policy in the United States and throughout the world, EPA has spearheaded efforts to fill information and data gaps on environmental conditions and health outcomes in children.

America's Children and the Environment:

This series of reports on measures helps track and understand the potential impacts of environmental contaminants on children's health and, ultimately help to identify and evaluate ways to minimize environmental impacts on children. The reports bring together quantitative information from a variety of sources to show trends in levels of environmental contaminants in air, water, food, and soil; concentrations of contaminants measured in the bodies of children and women; and highlight childhood illnesses that may be influenced by exposure to environmental contaminants. In 2006, new data are available at www.epa.gov/envirohealth/children.

Global Indicators: EPA launched a partnership to develop global indicators for children's environmental health at the World Summit on Sustainable Development in 2002. The partnership is working to increase understanding and improve the quality of information about the linkages between environmental conditions and human health outcomes and will enable us to measure progress toward improving environments for children. The partnership includes governments, non-governmental organizations, and international organizations and is managed by the World Health Organization. Progress on indicator development is being made in Europe, Africa, the Middle East, and in North America. Visit www.who.int/ceh/.

North American Indicators: Thirteen children's environmental health indicators for Mexico, the United States, and Canada were developed under the auspices of the Commission for Environmental Cooperation in partnership with the International Joint Commission, the Pan-American Health Organization, the World Health Organization, and the governments of the three countries. Indicators cover asthma and respiratory disease, exposure to lead and other toxic substances, and waterborne diseases. See results and data at www.cec.org/pubs.



Promoting Pediatric Environmental Health Expertise

Environmental health is currently an insignificant part of health professional education. Yet the public relies on doctors and nurses for their health information, including that related to environmental exposures.

Healthcare providers receive little or no training about the health problems related to the environment, yet they are recognized by the public as the most authoritative source of health information. In response, EPA has undertaken a variety of efforts to provide recognized centers of children's environmental health expertise, promote learning about the environmental causes of diseases in the healthcare community, and to create training materials for healthcare providers. EPA is better able to safeguard human health when healthcare providers are able to address pediatric environmental health concerns.

Pediatric Environmental Health Specialty Units (PEHSU): EPA and the Agency for Toxic Substances and Disease Registry support a program that enables experts to educate other healthcare providers, consult on diagnosis and treatment of environmentally-related illness, and educate the public about children's environmental health. The program has been recognized by other countries and international organizations as effective and worth emulating. See www.aoc.org/pehsu.

Katrina Response: Recent hurricanes along the Gulf Coast and flooding in New Orleans presented environmental and health problems for the entire population, and EPA worked with the PEHSUs to address the unique needs and vulnerabilities of children. For example:

- children get dehydrated more quickly than adults;
- children suffer the effects of unclean drinking water before adults; and
- children with asthma may be affected by pollutants in flooded homes and outdoor air.

See www.epa.gov/katrina/faqs.htm#13 for information addressing:

- how to provide clean water to children in disaster-affected areas;
- how to clean up after a flood in a manner that is protective of children;
- what to do with toys that were in flood waters;
- how to protect children from exposure to mold; and
- whether to allow older children to help in clean up work.

PEHSU Research: The investigators of the MidAmerica Pediatric Environmental Health Specialty Unit are doing a pilot study to assess the effect of exposure to diesel bus emissions in the schoolyard on pediatric respiratory health. This is an observational risk assessment study to test two hypotheses: 1) There is a direct relationship between concentration of particulate matter and severity of respiratory symptoms experienced by students exposed to school bus emissions; and 2) The amount of particulate matter that children breathe at school is partially determined by the combined action of three variables: a) the number of buses that service the school; b) whether the buses leave their motors running while parked at the school; and c) whether the students stand in the vicinity of the buses during drop-off and pick-up times.

Capacity Building for Health Professionals

EPA awarded seven grants (totaling \$1,042,152) to help increase the number of physicians, nurses and public health workers able to address the broad spectrum of children's environmental health issues, whether in their private practices, in the institutions where they work, in academia, or in their communities.

Canadian Institute of Child Health (Institut Canadien de la sante infantile) is training as many as 37,000 healthcare professionals in Canada, Argentina, Uruguay, Paraguay, and Chile to recognize, assess and initiate protocols to prevent environmentally-related diseases in children. Master Trainers have been identified in four South American countries and Canada for the August 2006 workshops in Buenos Aires and Canada. Visit www.cich.ca/projects/epa/Index.htm.

University of Massachusetts Lowell focuses on health professionals who serve low-income, immigrant/refugee, and minority children in small cities and rural areas in New England. This population is generally underserved by children's environmental health capacity building efforts although it suffers disproportionately from the impacts of environmental contaminants. Workshops for nurses and other public health professionals are being conducted in all six New England states.

National Center for Healthy Housing is delivering training to public health nurses in residential environmental health and safety hazards. Substandard housing is a key determinant of health and has been linked to childhood lead poisoning, asthma and respiratory disease, and unintentional injuries. Training is being offered through NCHH's National Healthy Homes Training Center and Network, a national training program funded by the CDC, HUD, and EPA. The training is delivered through a network of five university partners. Visit www.centerforhealthyhousing.org.

Greater Boston Physicians for Social Responsibility (GBPSR) is coordinating the Pediatric Environmental Health Toolkit Training Program in five states (Massachusetts, California, Minnesota, Oregon, and Washington) adapting their new clinical tool, the Pediatric Environmental Health Toolkit as the core curriculum. The program is directly training 250 health professionals who care for children and an additional 1250 providers through peer training. Training programs are conducted in collaboration with PSR chapters, local American Academy of Pediatrics chapters, and medical schools with whom GBPSR previously conducted their *In Harm's Way Continuing Medical Education* courses. The Toolkit was developed by GBPSR and the San Francisco Bay Area chapters of Physicians for Social Responsibility in partnership with the Pediatric Environmental Health Specialty Unit at the University of California, San Francisco, and a team of pediatricians from around the country. Recently, the American Academy of Pediatrics endorsed the Toolkit. See www.igc.org/psr.



Northeastern Ohio Universities - College of Medicine (NEUCOM) is offering post-graduate training in pediatric environmental health to pediatricians in five countries in Central and Eastern Europe (Romania, Hungary, Poland, Slovakia, and Croatia). Lectures and didactic exercises are delivered via the internet using two-way synchronous audio with graphics to be followed by a final workshop in Bratislava, Slovakia.

International Pediatric Association is launching a virtual International Pediatric Environmental Health Leadership Institute that could train up to 500,000 pediatricians about children's environmental health and improve their capacities for leadership in the recognition, diagnosis, prevention, and management of pediatric diseases linked to the environment. Eighty-eight participants from African countries attended the first workshop in Nairobi, Kenya including 60 medical professionals from 21 African countries. An outcome of the Nairobi workshop was a statement on children's environmental health. The second workshop will be in Cochin, India. IPA will evaluate the training by certifying pediatricians in environmental health through written and oral exams.

National Environmental Education and Training Foundation is creating children's environmental health faculty champions at medical and nursing schools throughout the country. Twenty-eight faculty champions selected from academic centers will take a leadership role in integrating children's environmental health into their institutions in a sustainable fashion, lend expertise and support in their institutions and surrounding communities, teach courses, integrate competencies into curriculum, and serve as a model for how to integrate environmental health into health professional education. The faculty champions will train an additional 300 plus health professionals at academic institutions who can incorporate children's environmental health into their teachings and clinical practices. The training tools will also be disseminated through these cosponsors: American Academy of Pediatrics, Ambulatory Pediatric Association, American Association of Colleges of Nursing, Association of Academic Health Centers, and the National Association of Pediatric Nurse Practitioners.

Studying Environmental Exposures and Children's Health

Scientists, environmental and health managers, healthcare professionals, and policy makers need to know more about environmental factors and whether they are harmful, harmless or helpful to children's health and development. Studies conducted with adults often have unknown application for characterizing risk to children. Recent research has contributed greatly to our understanding of how environmental exposures early in life may lead to childhood diseases or diseases later in life.

Research Findings: EPA and the National Institute for Environmental Health Sciences support eleven Centers for Children's Environmental Health and Disease Prevention Research. The Centers use community-based participatory research to understand and prevent children's exposure to environmental hazards. The research centers are developing innovative ways to investigate the role of environmental stressors in important childhood disorders such as asthma, autism, and learning disabilities and finding effective strategies to reduce the risks from these exposures. Highlights include:

Air Pollution Exposure and Respiratory Health

- Disadvantaged asthmatic children in urban areas appear to be at an increased risk for higher residential allergen and elevated air pollution exposure. This combination of asthma triggers in the home appears to contribute to a disparity in asthma burden between inner city and non-inner city children. (Breyse et al., 2005. Indoor exposure to air

pollutants and allergens in the homes of asthmatic children in inner-city Baltimore. *Environmental Research* 98: 167–176)

- Children two years or younger living adjacent to major roadways have an increased risk of developing asthma. This is particularly the case for children *without* family history of asthma. This “roadside effect” was more pronounced in girls. (McConnell et al., 2006. Traffic, Susceptibility, and Childhood Asthma. *Environmental Health Perspectives*. 114:766–772)
- Early life exposures to traffic-related pollutants in urban environments appear to affect the immune system by increasing allergic responses, leading to respiratory symptoms in children as young as two years old. (Al-alem et al., 2006. Association of mouse, cockroach and dust mite IgE levels at age 2 with traffic-related exposure and respiratory symptoms in an inner-city birth cohort. *Journal of Allergy Clinical Immunology* 117(2): Supplement 1, S178)

- Genetic variations in immune response to air pollutants may offer protection or confer susceptibility to the incidence of asthma. Some of these genetic differences appear to vary significantly between ethnic groups, potentially contributing to health disparities. (Yu-Fen et al., 2006. Association of Tumor Necrosis Factor G-308A with Childhood Asthma and Wheezing. *American Journal of Respiratory and Critical Care Medicine* 173: 970–976 and Donohue et al., 2006. Ethnic Differences in Frequencies of Single Nucleotide Polymorphisms from Glutathione S-Transferase (GST) and IL13. *Journal of Allergy Clinical Immunology* 117(2): Supplement 1, S162)

Pesticide Exposure and Genetic Susceptibility to Effects

- Newborns in farmworker communities exposed to several organophosphate pesticides (OPs) display broad variability in sensitivity to OPs due to variations in a particular gene called PON1. This gene produces enzymes which metabolize many OPs but these enzymes vary in both serum levels and detoxification efficiencies depending on the version of the gene. This is far greater variability than previously predicted. (Furlong et al., 2005. Role of Paraoxonase (PON1) Status in Pesticide Sensitivity: Genetic and Temporal Determinants. *Neurotoxicology* 26: 651-659 and Furlong et al., 2006. PON1 status of farmworker mothers and children as a predictor of organophosphate sensitivity. *Pharmacogenetics & Genomics*. 16(3):183–190)
- Toddlers in farmworking communities gather twice the amount of multiple pesticide residues on their clothing compared to crawlers. This disparity in pesticide loading was consistent with urine samples collected from the children in the study. (Bradman et al., 2006. Pesticides and their metabolites in the homes and urine of farmworker children living in the Salinas Valley, CA. *Journal of Exposure Sciences and Environmental Epidemiology* (*In press*))
- Prenatal exposures to pesticides were ubiquitous in one urban cohort of pregnant women whose exposure to chlorpyrifos



and diazinon was associated with adverse birth outcomes, however, researchers found that the recent EPA ban on these two residential pesticides reduced exposure within their study population and improved public health by significantly increasing healthy births within a year of the regulation. (Whyatt et al., 2004. Prenatal insecticide exposures, birth weight and length among an urban minority cohort. *Environmental Health Perspectives* 112: 1125–32)

Complex Chemical Exposure and Neurodevelopment Outcomes

- Prenatal exposure to environmental tobacco smoke and postpartum social stresses experienced by mothers act separately and synergistically on cognitive development at age two. (Rauh et al., 2004. Developmental effects of exposure to environmental tobacco smoke and material hardship among inner-city children. *Neurotoxicology and Teratology* 26: 373–85)
- High prenatal exposure to air pollutants is associated with three times greater risk of cognitive development delay at age three. (Perera et al., 2006. Effect of prenatal exposure to airborne polycyclic aromatic hydrocarbons on neurodevelopment in the first three years of life among inner-city children. *Environmental Health Perspectives* (*In press*))

Each of the Centers supports a Community Outreach and Translation Core to take basic research findings into intervention and prevention methods, enhancing awareness among communities, healthcare professionals, and policy makers.. For example, the University of Washington has developed a partnership with their Pediatric Environmental Health Specialty Unit to conduct continuing education courses for healthcare professionals who work with children and parents. The Columbia Center applied its research findings to an integrated pest management intervention in New York City low-income public housing, convincing city officials to replace traditional extermination methods in public housing with less toxic techniques.



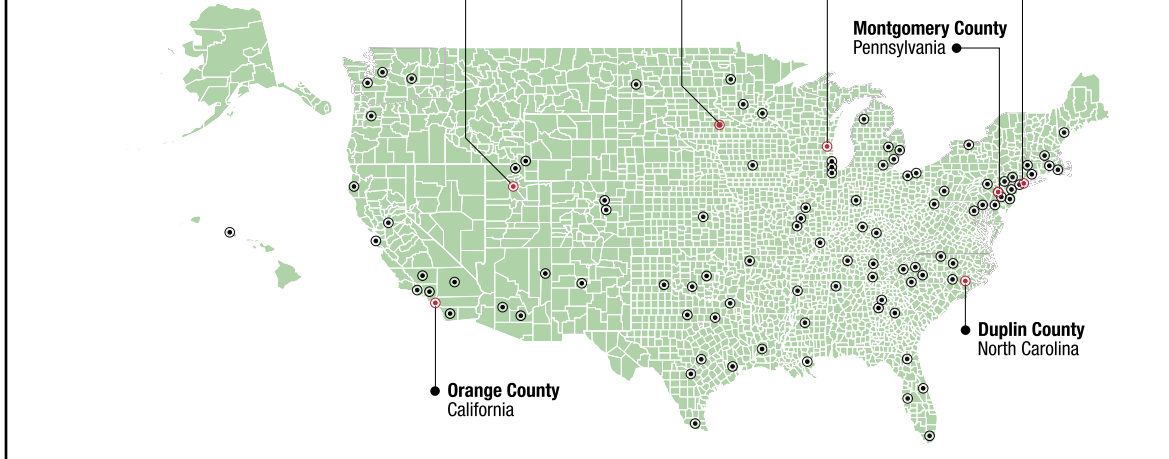
The EPA/NIEHS Children's Environmental Health Centers were featured in the October, 2005 issue of *Environmental Health Perspectives*. The issue contains a mini-monograph of seven collaborative "lessons learned" papers from the Centers. See www.ehponline.org/docs/2005/113-10/toc.

National Children's Study: The National Children's Study, mandated by Congress in 2000, plans to follow 100,000 children from before birth to age 21. By working with pregnant women and couples, the Study will gather data about how environmental factors alone, or interacting with genetic factors, affect childhood health. Examining a wide range of environmental factors—from air, water, and dust to what children eat and how often they see a doctor—will help scientists develop prevention strategies and cures for a wide range of childhood diseases. By collecting data nationwide—before diseases arise—this study can test unproven theories and generate hypotheses that would inform spin-off studies for years to come.

This interagency effort, led by the National Institute of Child Health and Human Development in collaboration with EPA, the Centers for Disease Control and Prevention, and the National Institute of Health Sciences, announced the first Vanguard Centers to launch and carry out the study in late 2005.

National Children's Study Locations

Vanguard locations labeled



The Vanguard Centers are:

- University of California, Irvine with Children's Hospital of Orange County for Orange County, California
- Mt. Sinai School of Medicine with Columbia University Mailman School of Public Health, New York City Dept. of Health and Mental Hygiene, University of Medicine and Dentistry of New Jersey, and Columbia University Dept. of Obstetrics and Gynecology for New York City (Queens), New York
- University of North Carolina-Chapel Hill with Battelle Memorial Institute, and Duke University for Duplin County, North Carolina
- Children's Hospital of Philadelphia and Drexel University School of Public Health with University of Pennsylvania for Montgomery County, Pennsylvania
- University of Utah for Salt Lake County, Utah
- University of Wisconsin-Madison and Medical College of Wisconsin with National Opinion Research Center, Marquette University, UW-Milwaukee Center for Urban Initiatives Research, UW Marine and Freshwater Biomedical Sciences Center/Institute for Environmental Health, and Children's Service Center of Wisconsin for Waukesha County, Wisconsin
- South Dakota State University with Children's Medical Center of Cincinnati and the University of Cincinnati for Brookings County, South Dakota and Lincoln, Pipestone, and Yellow Medicine Counties, Minnesota



studying other types of cancer as well as other rare childhood diseases. More information is available at www.nationalchildrensstudy.gov/about/organization/program_office/iig/index.cfm.

Age Groups for Children's Exposure

Assessment: *Guidance on Selecting Age Groups for Monitoring and Assessing Childhood Exposures to Environmental Contaminants* helps researchers assess childhood exposure to environmental contaminants and the resultant potential dose. A consistent set of childhood age groups, supported by an underlying scientific understanding of differences in behavior and physiology that may affect exposures and internal dose in children, improves EPA's exposure and risk assessments for children and assists the Agency in implementing various regulatory initiatives. These age groups will guide future analyses of exposure factors data and new research and data collection efforts. Documents and additional information are available at <http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=146583>.

The National Children's Study is developing the Study Protocol, a roadmap to guide researchers' sampling, recruitment, and data collection activities. EPA is planning a pilot study to test the feasibility of household-based recruitment in North Carolina. Visit www.nationalchildrensstudy.gov.

International Research Activities: To encourage a wider exchange of information on children's environmental research in other countries, an International Interest Group has attracted investigators worldwide who are currently working on or are interested in establishing longitudinal cohort studies. The International Interest Group complements the National Children's Study and seeks to facilitate communication and sharing of ideas. More information is available at www.nationalchildrensstudy.gov/about/organization/program_office/iig/index.cfm.

International Cancer Research: Around the world, several large infant/child prospective studies have been launched to examine environmental and biological determinants of common diseases. A workshop in September, 2005 established an International Childhood Cancer Cohort Consortium—a global alliance of longitudinal studies of children to enable investigations of the role of various environmental exposures in the etiology of childhood cancer. Because of its longitudinal design and large sample size, it will be easier to see associations considered statistically meaningful. Initially, this effort may provide valuable insights about the causes of childhood leukemia, and later may be helpful for

Exposure Factors for Children: The 2002 interim final report on the *Child-Specific Exposure Factors Handbook* is being updated. The document provides a summary of the available and up-to-date statistical data on factors to use when assessing childhood exposures. These include: drinking water consumption; soil ingestion; inhalation rates; dermal factors such as skin area and soil adherence factors; consumption of fruits and vegetables, fish, meats, dairy products, homegrown foods, and breast milk; activity patterns; body weight; use of consumer products; and life expectancy. Documents and additional information are available at <http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=55145>.

Children's Health Risk Assessment: The draft *Framework for Assessing Health Risks of Environmental Exposure to Children* outlines the EPA risk assessment process with a focus on childhood exposures, identifies sources for more detailed information on life stage-specific considerations, and includes web links to on-line publications. The document emphasizes the need to take into account the potential exposures to environmental agents during preconception and all stages of development and focuses on the relevant adverse health outcomes

that may occur during childhood or later in life as a result of such exposures. Visit <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=150263>.

A complementary document by the World Health Organization's International Programme on Chemical Safety, *Principles for Evaluating Health Risks in Children Associated with Exposure to Chemicals*, was supported by EPA and other organizations. See www.who.int/ipcs/features/ehc/en/index.html.

Life Stage Pharmacokinetics: Age-related physiological changes in the body may cause differences in the way the body handles chemical exposures. Models can be used to predict internal doses by taking into account the rate of absorption, distribution among target organs and tissues, metabolism, and elimination from the body. A draft report of *Approaches for the Application of Physiologically Based Pharmacokinetic (PBPK) Models and Supporting Data in Risk Assessment* addresses the application and evaluation of these PBPK models for risk assessment applications. The draft document and additional information are available at http://cfpub.epa.gov/si/osp_sciencedisplay.cfm?dirEntryID=135427. A final report is expected in November, 2006.

Research Protections for Children: A rule announced in January banned all third-party intentional dosing research on pesticides involving children and pregnant women intended for submission to EPA. EPA will neither conduct nor support any intentional dosing studies that involve pregnant women or children for all substances EPA regulates. Visit www.epa.gov/fedrgstr/EPA-GENERAL/2006/February/Day-06/g1045.htm.

Children's Inhalation Dosimetry and Health Effects for Risk Assessment Workshop: EPA hosted this workshop to review existing and emerging information on children's inhalation dosimetry, health effects, and risk assessment, and to explore and discuss new approaches for children's inhalation risk assessment practice. Physiological and behavioral factors distinguish children from adults in many ways that affect inhalation dosimetry and assessment of health effects upon exposure to environmental agents. Epidemiology studies suggest that children may be

more sensitive than adults to a variety of criteria air pollutants and air toxics, yet this information has been incorporated in risk assessment to only a limited extent. The workshop explored key areas of children's inhalation dosimetry, as well as the use of biomarkers of exposure and mode-of-action information to address children's health outcomes in risk assessment. The summary of the workshop is planned for publication in a peer-reviewed journal.

Protecting All the Children of the World

Each year, more than three million children under age five die due to environmentally-related causes, often from the effects of a basic lack of clean air to breathe and clean water to drink. Morbidity from chronic overexposure to harmful chemicals and pesticides compromises the normal growth and development and ability to learn for millions more children each year.





Lead Phase-out in Africa: The Partnership for Clean Fuels and Vehicles was launched by EPA, the United Nations Environment Programme, and dozens of other partners more than three years ago at the World Summit on Sustainable Development. In 2002, leaded gasoline was used in all but one country in Sub-Saharan Africa. By January of 2006, with the assistance of the Partnership and the World Bank, all 49 Sub-Saharan African countries had stopped refining and importing leaded gasoline. When the remaining supply is exhausted, Sub-Saharan Africa will have eliminated the use of leaded gasoline. This action to reduce exposure to lead affects millions of people and is particularly important to Africa's children, who represent 44 percent of the population. The partnership aims to realize a global phase-out of leaded gas by the end of 2008. Learn more at www.unep.org/pcfv.

Central Asia and Children's Environmental

Health: In April of 2005 and June, 2006, scientists and policy makers attended the Children's Environmental Health Conference for Central Asia, held outside of Almaty, Kazakhstan with support from EPA. The focus of the conference was on children's environmental health issues in Central Asia, with participants from Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Armenia, Azerbaijan, Russia, Turkey, Palestine, Pakistan, Jordan, the United States, Canada, Italy and Japan. As a result, participants formed a nonprofit organization to discuss and find solutions to their common children's environmental health problems. Their Web site is www.cehca-2005.org/.

Global Protections from Mercury: EPA is

leading the implementation of four partnerships to reduce global mercury use and emissions in artisanal and small-scale gold mining, chlor-alkali manufacturing, coal combustion, and in consumer products containing mercury. Mercury released in these sectors affects children disproportionately, as mercury is a powerful neurotoxin. Many children work with their families to mine and refine gold, and are directly exposed to mercury and mercury vapors. In addition, artisanal gold mining may release up to 1000 tons per year of mercury globally. A large portion of these releases are atmospheric, affecting children through deposition in areas far from the release site. EPA is working with other countries to reduce mercury exposures in artisanal gold mining, and is developing public information materials for global distribution. Visit www.chem.unep.ch/mercury/partnerships/.

Children's Environmental Health Awards

Developing a new generation of pediatricians with environmental health expertise; studying the effect of on-road emissions in asthmatic children to prevent the health impacts of air pollution; and starting a "green cleaning" program to reduce exposures to environmental hazards in schools. These programs are 3 of 14 that were recognized by the EPA at the second Children's Environmental Health Excellence Awards ceremony in April 2006.

Children's Environmental Health Champion:

The 2006 Children's Environmental Health Champion Award was presented to Dr. Philip J. Landrigan—a pioneer and leader in the field of children's environmental health who is recognized for his many accomplishments, including his work with the Center for Children's Health and the Environment, and the Pediatric Environmental Health Specialty Unit at Mt. Sinai.

The 2006 Excellence Award Winners are:

- Ambulatory Pediatric Association (APA), Fellowship Program in Pediatric Environmental Health, Bronx, NY
- The Ashkin Group, LLC, Bloomington, IN
- Coalition for a Smoke-Free Valley (The Coalition is part of the Community Health Department of Lehigh Valley Hospital and Health Network), Keep Us Healthy Collaborative, Allentown, PA
- Community Asthma Prevention Program (CAPP), Community Asthma Prevention Program of Philadelphia, Philadelphia, PA

- Department of Development, Cuyahoga County, Cuyahoga Lead Hazard Reduction Program, Cleveland, OH
- Emory University School of Medicine, EVA (Emisiones Vehiculares y Asthma) or Vehicular Emissions and Asthma, Atlanta, GA
- Get the Lead Out! Collaborative, Grand Rapids, MI
- Loyola University Chicago Civitas Child Law Center, Lead Safe Chicago, Chicago, IL
- National Center for Healthy Housing (NCHH) Enterprise Community Partners, The Home-Based Child Care Lead Safety Program, Columbia, MD
- National Environmental Education & Training Foundation (NEETF), Integrating Environmental Health into Pediatric Healthcare, Washington, D.C.
- Oregon Environmental Council, Providing Caregivers Tools to Protect Children's Health, Portland, OR
- The University of Georgia College of Family and Consumer Sciences, Georgia Radon Education Program, Athens, GA
- University of Medicine and Dentistry of New Jersey (UMDNJ) - School of Public Health, Center for School and Community Health Education, ToxRAP™ Education Program (Toxicology, Risk Assessment, and Pollution), Piscataway, NJ
- West Virginia Division of Tobacco Prevention, West Virginia Clean Indoor Air Program, Charleston, WV

The Children's Environmental Health Awards are designed to recognize ongoing and sustainable dedication to, and notable leadership in, protecting children from environmental health risks at the local, regional, national and international level. Twenty-nine additional organizations received Recognition Awards for their demonstrated commitment to protecting children from environmental health risks. To view a list of the Excellence and Recognition Award recipients and learn more about their programs, go to www.epa.gov/children.



EPA's Mission to Protect Children

In 1995, EPA made it a priority to explicitly and consistently take into account environmental health risks to infants and children in all studies and public health standards set for the United States.

The President's Executive Order on Environmental Health Risks and Safety Risks to Children requires all federal agencies to address health and safety risks to children, coordinate research priorities on children's health, and ensure that their standards take into account special risks to children.

EPA established the Office of Children's Health Protection to catalyze, support, and facilitate Agency efforts to protect children's health from environmental risks. The mission of the Office is to make the protection of children's health a fundamental goal of public health and environmental protection. Protecting children where they live, learn, and play is essential to ensuring that our environment is safe and healthy, now and for future generations. In 2006, the Office of Children's Health Protection was reorganized and became the Child and Aging Health Protection Division.

For more information, visit EPA's Child and Aging Health Protection Division at:
www.epa.gov/children



Child and Aging
Health Protection Division

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