Environmental Threats to Children’s Health: A Challenge for Pediatrics: 2000 Ambulatory Pediatric Association (APA) Presidential Address

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ABBREVIATIONS. APA, Ambulatory Pediatric Association; PCBs, polychlorinated biphenyls; EPA, US Environmental and Protection Agency; GM, General Motors.

Public health accomplishments have dramatically improved children’s lives. Sanitation programs, vaccines, better nutrition, surveillance and monitoring of disease, and the development of antibiotics have led to extraordinary reductions in infant and child mortality. Ambulatory pediatricians have contributed, through research, teaching, and advocacy, and especially through the delivery of improved medical care to this dramatic trend. Despite these advances, children are in trouble:

- According to the Centers for Disease Control and Prevention, the number of children with asthma in the United States has more than doubled in the past 15 years, and presently nearly 5 million children <18 years old have asthma. Asthma accounts for 1 in every 6 pediatric emergency department visits nationwide, >10 million missed school days per year, and 100 million days of restricted activities. In the Bronx, 1 in every 12 children has asthma.
- Childhood cancer is increasing at a rate between 1% and 2% per year.
- The rate of infants born with low birth weight has been rising steadily since the mid-1980s despite prevention efforts. The rate of infants born with a serious heart defect has risen 2.5 times and those with a urinary tract obstruction >1.5 times in states with tracking systems. Fewer than 30% of birth defects have known causes.
- Motor vehicles continue to kill more children >1 year old than any thing else, and homicides involving children increased by 67% from 1978 to 1991.
- Approximately 17% of US children have 1 or more developmental disabilities, and attention deficit hyperactivity disorder may affect >2 million children. Every 4 hours a child or youth under 20 years old commits suicide, and behavioral and psychiatric problems are increasing rapidly.
- Initiation of smoking has increased among teens. If 20 million of our 70 million children continue smoking as adults, 5 million will die of smoking-related diseases.
- Twenty-two percent of children are overweight, and 11% are obese.

Evidence is accumulating that disruption of the natural environment plays an important role in these new morbidities, directly or in combination with other factors such as nutrition, access to care, maternal health status, and genetic factors. The environment may account for 25% to 40% of the global burden of disease. Moreover, although children <5 years old make up only 12% of the world’s population, it is estimated that approximately 43% of the total burden of disease attributable to environmental factors falls on them.

There are many examples of environmental disruptions that affect children’s health. Although the prevalence of asthma is increasing nationwide, prevalence and morbidity are highest among poor urban children. Allergists have commented on the dramatic increase in human allergic airway disease in the past 200 years that has paralleled the use of fossil fuels. In New York City, where coal is still used to heat many schools and there are more diesel buses than in any city in the United States, the highest rates of pediatric asthma are in Harlem. Six of the 7 diesel bus terminals in Manhattan are located in Harlem, and 3000 diesel buses are garaged there. Diesel engines are difficult to start, so they are left running while the buses are in the garage with their exhaust vented to the outside. Five of the 6 diesel bus terminals in Harlem are located immediately adjacent to schools and the sixth is within a block of a housing project.

In 1997, the Centers for Disease Control and Prevention estimated that 1 of every 20 US children suffers from subclinical lead poisoning. Needleman has documented that elevated lead levels are associated with decreased mean verbal IQ scores, persistent reading difficulties, decreased high school graduation rates, and increased risk for violent behavior in adolescence and adulthood. The risk for lead exposure in children is primarily...
determined by environmental conditions in the child’s home, and the most common sources of lead exposure for children are lead-based paint and lead in dust. Approximately 83% of privately owned housing units and 86% of public housing built before 1980 contains some lead-based paint. Not surprisingly, lead poisoning is predominantly a problem of the urban poor.

In addition to lead, children are exposed to many other neurotoxic substances. Solvents, pesticides, and polychlorinated biphenyls (PCBs) are among the best known. In the United States, nearly 900 pesticide active ingredients registered with the Environmental Protection Agency (EPA) are mixed with other chemicals to produce >20 000 pesticide products used as insecticides, herbicides, rodenticides, and fungicides. The pesticide residues in their urine.37

Over the past decade, data from the Food and Drug Administration show that in any given year, between 33% and 39% of the food supply contains pesticide residues.28 In 1999 Consumer Reports found that foods commonly consumed by infants and children contain dangerous levels of pesticides.29 There is growing evidence that organophosphates are toxic to the developing brain and nervous system at very low levels of exposure. One carcinogenic pesticide was taken off the market in 1974, but it is still found in farming soil in such high levels that there is a 77% chance that a child will get too much in a single serving of winter squash. In fact, each day, 1 out of 20 US children <6 years old ingests an unsafe dose of organophosphate insecticide.30

Pesticides are big business. Four and one half billion pounds of pesticides, costing $11.3 billion, are used in the United States each year, and the EPA has estimated that US consumers spend nearly $2 billion annually for 74 million pounds of pesticides for home and garden use.31 In New York State, a survey found that pesticide use was substantially higher in New York City than in upstate agricultural areas. Eighty-seven percent of New York City schools apply pesticides regularly.32 In California, 93% of 46 school districts report using 73 different pesticides. Seventy percent use pesticides classified as known, probable, or possible human carcinogens, and 54% use pesticides that the EPA calls acutely toxic to the nervous system.33 Residents often buy especially toxic pesticides to use in their homes in an attempt to eradicate cockroaches. Indoor carpets, dust, and furniture are sources of exposure to pesticides, especially by crawling infants and toddlers.34 Children are 6.5 times more likely to develop leukemia if their families use pesticides at home.35,36 To estimate the extent of pesticide exposure nationwide, urine samples were collected from 1000 adults as part of the 1988–1994 NHANES III and analyzed for the breakdown products of about 30 pesticides. More than half of the participants had at least 6 of the pesticide residues in their urine.37

Pesticides, along with PCBs and other compounds also serve as endocrine disrupters, able to exert adverse health effects through their ability to disrupt estrogen function and other signaling compounds such as thyroid hormone. Exposure to these compounds has had dramatic effects on wildlife and may be responsible in part for the doubling in the incidence of hypospadius in the United States39 as well as for the marked reduction in the age of onset of puberty in US girls noted by Herman-Giddens et al.40

Combined with increased use of pesticides, intense population pressure for development around reservoirs and in watershed areas, increased use of organic compounds, gasoline and road salt, and uncontrolled disposal of these products has threatened the quality of our drinking water. EPA data shows that overall in the United States only 64% of nearly 694 000 surveyed river miles have good water quality.41 Tests have shown that 50% of the drinking water wells in Eastern Long Island are contaminated with pesticides,42 and the New York Times published a report that the levels of arsenic in northern New Jersey aquifers give residents who drink tap water a 1 in 100 chance of getting cancer.43

Increased rates of television viewing combined with parental reports that they are afraid to let their children go outside to play, and the lack of natural play areas in urban and even suburban areas may contribute to lower rates of exercise and the alarming rise in obesity among children.44 Moreover, qualitative evidence suggests that play in natural settings stimulates children’s powers of quiet observation, and fosters creativity and more harmonious play.45,46 Could the lack of opportunities for play in natural areas be 1 factor related to increased rates of behavioral problems and aggression?

Despite growing evidence that assaults on the environment are threatening children's health, pediatricians, who are children’s greatest advocates, have generally remained quiet. There are several reasons for this. First, physicians are not trained to respond to environmental issues in meaningful ways. The medical model doesn’t fit well. Physicians are trained to treat individual patients who present for care with specific signs and symptoms. Environmental health problems typically are cumulative and subtle, and in fact the effects may be seen long after the exposure has occurred as with PCBs and other endocrine disrupters. The association between the exposure and the outcome is not so clear in environmental health.

Second, little attention is paid to environmental health in medical school and even less in residency. In 1998–1999, the average number of hours devoted to epidemiology, public health, or even biostatistics in the preclinical years according to the American Association of Medical Colleges was 1.9% of the total preclinical course time.47 Recently, Ben Gitterman and Jimmie Roberts surveyed pediatric residency programs and found that although most programs reported that they include training in pediatric environmental health, over half teach only exposure to lead and tobacco smoke and smoking cessation. Less than one-third said they could identify a resource person in pediatric
environmental health, and <10% had specific field and community experiences in pediatric environmental health for their residents. (B. Gitterman, personal communication, 2000).

Third, as teachers of pediatricians-in-training, we have moved out into the community to give our trainees experience with the types of clinical problems they will encounter during their careers, and we have developed new and highly successful methods for faculty development in community settings. Although our successes in the office as teachers, clinicians, and researchers have reinforced these behaviors, we give our trainees little opportunity to observe us as advocates.

Most importantly, the structure of the health care delivery system blocks our attention to the environment. In 1974, the Bureau of Health Professions used a new definition of primary care developed by Drs Joel Alpert and Evan Charney to develop the Title VIII program. Primary care was considered to have 4 components, the first of which is that primary care services are delivered when the patient first seeks medical care. I am suggesting that, in fact, good primary care must begin long before this; we must pay attention to the environment into which the child is born. If we are serious about establishing links between healthy children and healthy environments, we need to get out of our clinics, offices, and hospitals, and into the communities where our children live.

To address this new threat to children’s health, we as generalist pediatricians, need to adapt more of a public health approach. Pediatrics as a discipline separate from obstetrics and gynecology developed in response to the high infant and childhood mortality from infectious diseases. Among all the great early pediatricians, there was a close association between practice and public health. Abraham Jacobi, MD (1830–1919) is credited with the establishment of pediatrics as an independent branch of medicine in the United States. We may remember him best for being the first to instruct from the bedside in an American medical institution, but at the same time he crusaded for social and political reform. Physicians were gaining in stature in the community in Jacobi’s time, but were not so divorced from the communities in which they practiced as they are today. Jacobi walked through the streets of New York City and could see first-hand the consequences of poverty for his young patients.

Even earlier, one of the best known public health actions was taken by an anesthesiologist, Dr John Snow. In the mid-1800s, he investigated the relationship between cases of cholera and the water supply to London homes by private companies. He clearly documented that polluted drinking water was the cause of the transmission of cholera. His theory met with considerable resistance, but he was so convinced that he had the handle removed from the Broad Street water pump, and the outbreak soon ended.

Our members have always understood that the application of medical knowledge goes on in a social and political setting, and there are numerous examples of effective interventions our members have undertaken that reflect this awareness. At this meeting we are honoring Dr Margaret Heagarty, in part, for her work to improve the safety of Harlem playgrounds. She and her colleague, Dr Barbara Barlow, a pediatric surgeon, combined investigation with advocacy that led to the passage of legislation requiring bars on windows in apartments occupied by children. After the law took effect, there was a 96% decrease in accidental falls through windows in New York City.

If we seriously believe that there is a link between healthy environments and healthy children, we will need to strengthen our advocacy efforts. Efforts to protect the environment immediately threaten profits and jobs; wealthy businessmen have unlimited access to Congress, and challenging jobs does not fare well with local politicians. These political realities will make our work even harder, but we cannot leave this arena to politicians to watch over. There is example after example of instances of environmental damage closely tied to risks to children’s health when this happens. Let me share 2 such examples with you.

In 1923, after the failure of the copper-cooled engine in which General Motors (GM) had invested 4 costly years of development, its proponent, Charles Kettering, who, later with his boss Alfred Sloan, would build the famous Memorial Sloan-Kettering Hospital in New York, realized that with the patents they held, GM could make millions if tetraethyl lead became the additive used to reduce engine knocking. Although numerous reports of deaths attributable to lead exposure had been published, GM persuaded the US Bureau of Mines to withhold a report on the dangers of tetraethyl lead until GM had a chance to review the data. Millions of US children were affected by this public health failure. According to the World Bank, 1.7 billion people in developing urban areas are at risk of lead poisoning, 90% of which is attributable to leaded gasoline supplied in large part by the same companies that had put lead in the gasoline they sold in the United States until its phase-out was completed in 1986.

In the mid-1990s, Administrator Carol Browner of the US EPA, with the advice of Dr Philip Landrigan, proposed the Food Quality Protection Act (Pub L. No. 104-170). This legislation included a requirement to test pesticides specifically for their effects on children, something that had never been done before. The bill was unanimously passed by both houses of Congress. Recently, Richard Pombo (R-California) introduced a bill (H. R. 1592, April 28, 1999) aimed at forcing the EPA to slow down its pesticide reassessment and allow more time for farmers and pesticide manufacturers to make their case. With the strong possibility that pesticides damage children’s health, shouldn’t we develop mechanisms to study and formulate a response to bills such as this?

Some will say we shouldn’t get involved in politics, but if environmental degradation is responsi-
ble for any of the new morbidity facing children, we have no choice, because the decisions that will affect children’s health are being made in that arena. Others will say we won’t make much difference, but if each of us takes some action, it will add up. We need to continue to encourage health-promoting behaviors by the families we care for, but that is no longer enough. Pediatricians can have an important voice, especially when they are talking about children’s health.

What can we do to increase awareness of environmental issues among our trainees?

1. We must work to expand the amount of time spent in medical school on this topic. It would be best to have a separate required module because environmental health doesn’t fit well into the medical model. Acute poisonings by toxins and how to take an environmental history can be addressed in problem-based learning situations, but the real goal of understanding the consequences of environmental degradation in their social and political contexts cannot be accomplished through our traditional learning methods.

2. We must develop opportunities for medical students and housestaff to get out into the community. Environmental degradation is, unfortunately, much easier to find in the very communities served by most of our teaching hospitals and medical schools. Have students and housestaff undertake a geoenvironmental survey of the areas their patients come from. These surveys should include location of brownfields, environmental hazards, schools, hospitals, housing projects, as well as residential density and relevant health data. Once these maps have been created, they can serve as tools for communicating with community residents and policymakers, and they can serve as a basis for exposure studies of all types. Have students and housestaff assess the use of pesticides by school districts, in housing projects, and in apartment buildings.

3. Departments of pediatrics could link with community groups interested in children’s health and serve as their research arm, providing data on various environmental exposures. Such an association can provide ideas to fuel research efforts and would fulfill the Residency Review Committee’s requirement that residents be given opportunities to participate in advocacy experiences.

One example of an opportunity that can get students and housestaff out into the community is an elective on border medicine given by the University of Texas at San Antonio. Students collect water samples from the Rio Grande River, which serves as a source of drinking water for many farmworker communities, survey the environmental hazards in migrant farmworker camps, and provide health care to the families living there.

Community-based activities take effort. They require a dedicated mentor to organize and maintain the experience as well as cooperation with other departments or divisions with expertise in environmental health.

The APA has responded swiftly to our need for more knowledge in this area. After a call for abstracts on environmental health, for the first time ever at this meeting you might have seen a section of posters labeled “Environmental Health” that was not simply about smoking and smoking cessation. The board unanimously approved seeking funding for a national fellowship in pediatric environmental health to be sponsored by our organization. One of our members, Ruth Etzel, MD, PhD, has generously contributed a column on environmental health issues to the newsletter this year.

As our knowledge grows in this area, we need to develop our advocacy efforts. There is no other issue facing children’s health that is so political except perhaps for health insurance. Should the public policy committee make a healthy environment for children one of its action items? Can we encourage the Public Policy Council to add environmental issues to their legislative report? Should we develop a method to alert members to pending legislation on environmental issues so that we can take action individually or as an organization. Let us return to Abraham Jacobi for guidance. In 1904, he said, “It is not enough . . . to work at the individual bedside and in the hospital. In the near or dim future, the pediatrician is to sit in and control school boards, health departments, and legislatures. . . . [A] seat for the physician in the councils of the republic is what the people have a right to demand.”54

In the year 2000, as we celebrate the 40th anniversary of the APA, we can be proud of our many accomplishments. To safeguard and further improve children’s health, however, as researchers we must work in collaboration with our colleagues in other disciplines to better understand the threats to children’s health from environmental degradation. As pediatric educators, we need to encourage medical students and house officers to think about these things as well. And finally, we must link advocacy to our growing knowledge of the relationship between the environment and children’s health. We must be willing to advocate when the science shows that it is more likely than not that a particular exposure or activity results in a bad outcome, and not insist that it be proved beyond a shadow of a doubt. This is an ambitious undertaking, but if we wait, it may be too late.

REFERENCES

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