

ENVIRONMENTAL INJUSTICE: CHILDREN'S HEALTH DISPARITIES AND THE ROLE OF THE ENVIRONMENT

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"The test of our progress is not whether we add to the abundance of those who have much. It is whether we provide enough to those who have little."

—Franklin Delano Roosevelt, 32nd President of the United States

THE STATE OF CHILDREN'S HEALTH

Children are our most precious natural resource. Ensuring the optimal health of this generation and future generations of children is not a choice we have—it is a human rights mandate. The Children's Environmental Health Network, a multidisciplinary group that includes some of the world's most well-respected environmental scientists, has declared, "Healthy children grow into healthy adults. The health of our children is one of the most important investments that we can make and should be among our top priorities."¹ Yet today, we are witnessing a public health crisis of historical proportions that threatens the well-being of children across the world. Everywhere, there are a growing number of children suffering from environmentally related diseases. The following snapshot of the state of our children's health portrays a very disturbing picture of how our failure to make children's health a priority is producing disastrous consequences.

1. Cancer continues to be the leading cause of death by disease in children. The age-adjusted annual incidence of cancer in children increased from 129 to 166 cases per million children between 1975 and 2002.²
2. One in eight babies is born prematurely, an increase of nearly 31% since 1981. A lack of prenatal care and poor nutrition may account for 40% of premature births in developed countries. Preterm birth contributes to more than one third of all infant deaths and

costs the United States more than \$26 billion per year.³

3. Asthma is the most prevalent chronic disease affecting American children, leading to 15 million missed days of school per year. From 1980 to 2004, the percentage of children with asthma has more than doubled, from 3.6% to 8.5%.⁴
4. One in three adolescents are overweight or at risk of becoming overweight. One in six youths aged 6 to 19 years are overweight, a 45% increase in the past 10 years alone.⁵
5. Type 2 diabetes rates, directly related to the obesity epidemic, are rapidly increasing in US youth. Of those children newly diagnosed with diabetes, the percentage with type 2 has risen from less than 5% to nearly 50% in a 10-year period. This disease disproportionately affects American Indian, African American, Mexican American, and Pacific Islander youth.⁶
6. Neurodevelopmental disorders affect one in six American children today,⁷ with autism and attention-deficit/hyperactivity disorder reported at all-time high rates. Autism spectrum disorders are most recently estimated at 1 in 150 children (4:1 boys:girls), a 20-fold increase since the 1980s.⁸ Most recent national surveys estimate that approximately 1 in 12 children (2.5:1, boys:girls) have been diagnosed with attention-deficit/hyperactivity disorder.⁹
7. Children and adolescents are suffering from mental health disorders at alarming rates. Nearly 20% of young adolescents report symptoms of depression, with even higher rates in Native American youth.¹⁰ Suicide is the third leading cause of death in youth aged 10 to 19,¹¹ and suicide rates in Native American adolescents are three times greater than the national average.¹²

ENVIRONMENTAL INJUSTICE

Environmental justice is defined by the U.S. Environmental Protection Agency as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."¹³ Injustice is done when there exist health disparities based on these same factors. Children, for a variety of reasons, are particularly vulnerable to changes in their environment.¹⁴ Consumption of environmental chemicals is magnified as children routinely consume more food and water and breathe more air than adults. Children also play close to the ground and continuously engage in hand-to-mouth behavior, exposing themselves to a vast array of toxins. Infants are exposed as well to toxins in utero and ex-utero based on parental exposures. For example, before taking their first breath, babies are exposed to large amounts of pesticides, placing them at a higher risk for health disorders. In July 2005, the Environmental Working Group released the findings of a landmark study that revealed an average of 200 industrial chemicals and pollutants in babies' umbilical cord blood. The study identified 287 chemicals in the cord blood of 10 children, 180 of which cause cancer in animals and humans; 208 of these chemicals are known to cause birth defects or abnormal development in animals, and as many as 217 are recognized to be toxic to the developing brain and nervous system.¹⁵ Once born, babies are exposed to a variety of secondhand environmental exposures that greatly influence health. Breast milk, long considered to be the ideal source of nutrition for newborns, may actually expose babies to increased levels of a variety of toxins, including flame retardants (polybrominated diphenyl ethers [PDBEs]).¹⁶ If new parents smoke, their

child is more likely to develop a variety of physical and behavioral problems, including asthma and neurodevelopmental disorders.^{17,18} Newborns, as well, differ in their ability to excrete toxins compared with adults, due to developmental differences in respiratory, digestive, and urinary system physiology.¹⁹ In fact, given their increased burden of exposure and altered ability to excrete toxins, one could argue that children, as a group, are victims of environmental injustice. The environment, in the most holistic sense, includes physical factors such as the air we breathe, the food we eat, and the water we drink, as well as sociological and psychological factors such as violence and stress. Children exist not in isolation but within families and communities.

Although the United States is widely considered the richest nation in the world, approximately 13 million children in the United States (1 in 6) live in families with incomes below the federal poverty level.²⁰ These rates are on the rise, and they are higher in young children (under age 6) and in African American, Latino American, and Native American children. These most “vulnerable of the vulnerable” are disproportionately subjected to a wide range of environmental threats, leading to increasing susceptibility to adverse health outcomes. If one defines optimal health in the truest integrative sense, it is the wellness in mind, body, and spirit; children in poverty are at increasingly greater risk of missing this goal than their counterparts. As Dr Philip Landrigan, chair of the Department of Community and Preventive Medicine at Mount Sinai School of Medicine, has noted, “Many of the children who are most heavily exposed in our society to environmental toxins are the same children who are poor, the same children who have either no access or inadequate access to medical care. The notion that there exist disparities in the level of protection from environmental health hazards among children and adults of different races, ethnicities, and socioeconomic backgrounds is called environmental injustice.”²¹ A 2007 study by the United Nations through UNICEF, titled “Child Poverty in Perspective: An Overview of Child Well-Being in Rich Countries—A Comprehensive Assessment of the Lives and Well-Being of Children and Adolescents in the Economically Advanced Nations,”

found that 20 other affluent countries outranked the United States on the subject of the welfare of its children.²² The United States, considered by many to possess the world’s top healthcare system, ranked at the bottom of this United Nations’ survey. How could this be? In an interview with National Public Radio, one of the study’s authors, Jonathan Bradshaw, lamented, “We’ve failed to invest in child health, in child education, in child care. . . It’s the result of neglect, which other countries have not done . . . they’ve just spent more on their children, despite the fact they’re not as rich as we are.”²³

SPECIFIC EXAMPLES

Cornell College of Human Ecology psychologist Gary Evans notes, “Low-income children are disproportionately exposed to a daunting array of adverse social and physical environmental conditions. The fact that so many environmental risk factors cluster in the environment of low-income children exacerbates their effects and most likely have debilitating long-term effects on the physical, socio-emotional and cognitive development of children.”²⁴ Families living in socioeconomically deprived areas are inordinately exposed to environmentally precarious and crowded surroundings. Deteriorating and poorly constructed urban and rural housing can be a breeding ground for a multitude of chronic diseases and neurological disorders.²⁵ Children in inner cities have been shown to have higher cumulative amounts of carcinogenic and neurotoxic chemicals in their bloodstreams.²⁶ The following are specific examples of how environmental factors are in large part responsible for the litany of children’s health concerns noted above.

Cancer

One of the greatest increases in children’s cancer rates has been seen in adolescents. The annual incidence of cancer in teens aged 15 to 19 increased from 183.0 per million in 1975 to 1979 to 203.8 per million in 1990 to 1995.²⁷ The largest increase in adolescent cancers was in the gonadal tumor category, specifically testicular and ovarian germ cell tumors. We have long suspected that increased exposure to endocrine-disrupting chemicals such as polychlorinated biphenyls (PCBs) may be responsible for the rise in gonadal tumor

cases. Polychlorinated biphenyls are mixtures of 209 chemical compounds, which, although no longer manufactured in the United States, were used in the past in flame-resistant materials, electrical insulators, heating coils, caulking compounds, and various other related materials. They are chemically stable and remain in the environment for long periods of time. Sources of exposure to PCBs can come from direct use of PCB-containing products and leaching from landfills often found close to or under low-income neighborhoods. Indeed, we do have evidence of the impact of PCBs on gonadal development in boys. Male genital abnormalities on the rise, including hypospadias, undescended testis, poor semen quality, and testicular cancer, are seen as part of an underlying testicular dysgenesis syndrome, conclusively linked to PCB exposure.²⁸ The PCB exposure may also occur vertically, across generations. It has been demonstrated that men born to mothers with higher blood concentrations of PCBs are four times more likely to develop testicular cancer than controls.²⁹

Prematurity

Poor birth outcomes, including infant mortality, low birth weight and prematurity, are more frequent in populations living in poverty.^{30,31} There are many environmental factors that influence these birth outcomes, but recent research has focused on air pollution as a contributing factor. It has been shown that women living in US counties with greater air pollution, including ozone and carbon monoxide, are more likely to deliver babies prematurely.^{32,33} Many of these babies come from families with genetic predisposition toward allergic disorders, and then they are exposed in utero to higher levels of ambient air pollution. They are born too early, weighing too little. Their lungs are immature and they often cannot eat and digest breast milk due to gastrointestinal immaturity; they are nutritionally deficient as a result. They eventually go home to indoor and outdoor environments, pushing them further down the road toward chronic respiratory problems. Exposed to crowded living conditions, ripe with cockroach dander and tobacco smoke,³⁴ and living in neighborhoods with excessive outdoor air pollution, many of these children are doomed to a

lifetime of asthma-related emergency room visits.

Asthma

As noted, national asthma rates have surged to new highs in recent years. There are communities though, like New York City's Harlem, where rates exceed by far even these troubling numbers. According to one study coordinated by Harlem Hospital Center and Harlem Children's Zone, asthma is now diagnosed in one in four children in this region.³⁵

Low-income populations and children living in inner cities experience disproportionately higher morbidity and mortality due to asthma, as well. A laundry list of air pollution contaminants are thought to be responsible for the trend, including ozone.³⁶⁻³⁸ According to the last survey of the U.S. Environmental Protection Agency in 2004, approximately 41% of children lived in counties in which the eight-hour ozone standard was exceeded on at least one day per year.³⁹ Of course, there are many other factors associated with asthma in youth living in poverty. The Head-off Environmental Asthma in Louisiana study in New Orleans is looking at mold and other allergen exposure as one trigger for a surge in children's asthma diagnoses following the devastation of hurricane Katrina.⁴⁰

Obesity

The tremendous rise in obesity in today's children and adolescents is reported in all racial groups and socioeconomic spheres. Still, certain populations—African Americans, Native Americans, and Latino Americans, report higher rates of obesity than matched community controls.⁴¹ Much of this increased risk is due to a complex interplay of genetic factors and environmental triggers. Poor quality nutrition plays a role, as does reduced access to fitness opportunities. Related health disorders, type II diabetes and metabolic syndrome, have also been reported at startlingly higher rates in these same at-risk populations, leaving adolescents with poor health profiles reminiscent of elderly relatives. Hypertension, hyperlipidemia, and insulin resistance, all hallmarks of metabolic syndrome, are now developing at younger and younger ages.⁴² What will these children feel like in years to come, what health resources will they consume, and at what

cost to them and to society? To know that all of these outcomes are theoretically preventable is perhaps the greatest shame.

Neurodevelopment

The complexities of child development are profound. Our understanding of brain function remains in its infancy as we strive to develop better objective tools to measure neurologic differences and the physiological factors responsible for them. As autism spectrum disorders and attention-deficit/hyperactivity disorder continue to be reported at epidemic rates, we are searching for environmental factors that may be contributing to the alarming rise in neurodevelopmental disorders. As Drs Philip Landrigan and Philippe Grandjean point out, "The combined evidence suggests that neurodevelopmental disorders caused by industrial chemicals has created a silent pandemic in modern society."⁴³ It is not likely to be one single pollutant that influences the development of attention-deficit/hyperactivity disorder or autism in this way, but a toxic cocktail of small, persistent amounts of contaminants (in air, land, food, water, industrial, and pharmaceutical products) that affects a child in such a way that he develops clinically obvious neurodevelopmental symptoms. Several of these toxins have been identified, including the heavy metals lead and mercury, pesticides, and PCBs.⁴⁴ Both lead and mercury have been well-documented to disproportionately affect poor youth.^{45,46} Less well described are the effects of pesticides and PCBs on the neurodevelopment of children living in poverty, both in urban and rural settings. One example is the documented adverse effect of chlorpyrifos, a now banned pesticide, on the development of New York City children.⁴⁷ Another is the negative effect of PCBs on the cognitive functioning of Akwesasne Mohawk adolescents.⁴⁸ The exposures in these case are most likely multi-generational. Polychlorinated biphenyls amass in the fatty tissues of animals and bioaccumulate through the aquatic food chain. Poor families often depend on fishing to provide a low-cost source of food. In many areas, fish is the primary diet for many low-income and Native American communities. The food meant to be a source of nourishment can actually be contaminated with toxic PCBs that seeped into rivers and streams. Fish can also contain high levels of mercury. The combination of mercury air pollution and a regular diet of fish caught in

polluted streams can add substantial PCB and mercury exposure to children growing up in poverty. For pregnant women, both PCBs and mercury found in fish can cross the placenta and affect the fetus.

The evidence presented here demonstrates the huge impact of the environment on children's health. These examples, furthermore, represent only a small percentage of the numerous concerning findings being published with alarming regularity. An unpredictable and explosive mix of genetic susceptibility and environmental exposure often leads to disparate health woes for those children at highest risk. The concept of genetic susceptibility, as well, is under scrutiny. With new research elucidating the mechanisms of epigenetic phenomena,⁴⁹ it is likely that environmental factors are causing disease both via direct exposure and by altering DNA *de novo*, thereby increasing the effect of exposure at the same time—a double-edged sword, if you will. Dr Kenneth Olden, former director of the National Institute of Environmental Health Sciences, notes that "certain disadvantaged ethnic groups may have a higher incidence of certain susceptible genes that render them more vulnerable to adverse effects of the environments they inhabit" and that "much of the nation's disease burden could likely be reduced through better environmental protection practices, especially in low-income and minority communities."⁵⁰

CONCLUSION

Children cannot protect themselves nor can they clean up an environment our society has created. Independently, they have no political or economic voice. It is our responsibility to insure that their environment is safe. A compassionate and successful society will invest its assets in the good health of its children—all of its children. Addressing these environmental inequities will require a substantial resource shift and a commitment from government, industry, and citizens. A paradigm shift directing our focus toward preventing disease is urgently needed. We must adopt a new way of looking at children's health and cannot delay in addressing the environmental inequalities that are robbing our society of its future. If prevention is the key, then the precautionary principle serves as a guide for how we might frame the

solution. The concept of the precautionary principle is very simple in theory and quite difficult in practice: one must act to prevent human harm rather than seek to remove toxins from use only after they have been proven to be harmful. Environmentalist Carolyn Raffensperger incorporates this philosophy as a core pillar of what she terms *ecological medicine*, which is, as she notes, “a true integrative medicine, addressing the root causes of illness and creating the conditions for health.”⁵¹ Integrative medicine, in fact, is one paradigm of care that addresses all of the concerns raised in this discussion of environmental health disparities. Integrative medicine practitioners value prevention greatly, and they are ever mindful of the impact of the environment on health as well as of the impact of human living on the environment. Integrative pediatricians, specifically, emphasize family centered and culturally effective care, focusing on the whole child with the idea that children are not islands unto themselves but exist within the context of family and community.

The American Academy of Pediatrics has developed a model, the medical home, which provides a holistic care framework for children. The medical home is “not a building, house, or hospital, but rather an approach to providing comprehensive primary care.”⁵² It is defined as primary care that is accessible, continuous, comprehensive, family centered, coordinated, compassionate, and culturally effective. These are all principles supported by a holistic, integrative approach to children’s wellness. The medical home model was developed initially to provide optimal care for children with special healthcare needs. It is our belief that the case has been made here that all children, none more so than those living in poverty, are in need of this kind of special care.

Without understanding the consequences, poor families are forced to confront multiple overwhelming environmental inequities. It is difficult to calculate the long-term health outcome for children who live in poverty and remain particularly vulnerable to chemical toxins. Contributing risk factors include maternal exposures to toxins during pregnancy, older substandard housing that often contains asbestos, mercury and lead-based paint, use of insecticides, poor nutrition, inability to afford medications, and limited or no health insurance coverage, resulting in less access to

healthcare. These disparities impact the physical and psychological development of children, resulting in irreversible health problems. The disparities separating impoverished communities will continue to deliver disastrous health outcomes for millions of children as long as the status quo remains acceptable. As author and children’s rights advocate Pearl S. Buck warned, “If our American way of life fails the child, it fails us all.”⁵³

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