

The Environment and Disease: Tracking the Health Connection

Is there a connection between environmental contaminants and disease? That's what residents of two geographically distant and dissimilar towns—Brick Township, New Jersey and Fallon, Nevada—are trying desperately to find out.

In the shore community of Brick Township, residents began noting a high incidence of children with autism—36 of 7,000-plus kids between ages 3 and 10—and in April of last year, the state Health Department asked the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry, both arms of the U.S. Health and Human Services Department, to investigate whether there was an autism “cluster” and if so, whether it could be linked to chemicals in the environment.

After examining incidence rates and taking environmental samples—from the town drinking water supply and landfill as well as the local river—the agencies found little to console worried parents. CDC, for example, said that while autism rates in Brick Township were much higher than previously calculated national rates, there wasn't enough information to determine whether that can be called a cluster, while the agency found nothing it deemed a health risk.

In the small agricultural town of Fallon, meanwhile, 13 children have been diagnosed with acute lymphocytic leukemia over the last four years—more than 30 times higher than the projected rate for the region—and experts expect even more cases to surface. (The first of the youngsters died on June 3.) The situation has perplexed resi-

dents searching for a cause. Among the suspects: a leak in the jet fuel pipeline at the nearby naval air base, radiation, viruses, pesticides and arsenic in drinking water, though unlike radiation, arsenic has not been found to cause leukemia on its own, if at all.

Assemblywoman Marcia de Braga, who represents the Fallon area, had sought a \$500,000 appropriation to aid in identifying a cause of the cluster and providing an accurate accounting to residents. According to DeBraga, a parent who had lost a child earlier to leukemia told her, “When my boy died I thought it was because God wanted him. Now, I'm not so sure.” But on June 5, the Legislature adjourned without making the money available. “I'm pretty upset, because some less-pressing causes got funded,” de Braga said in a post-adjournment interview. “If there's a findable cause, we want to find it sooner than [2003],” when the next regular legislative session convenes. Congress may come through with some financial help and in the meantime, de Braga said she's looking into “a couple of other sources” to tap for support for a study.

In April, Nevada Sen. Harry Reid, then the ranking minority member of the Environment and Public Works Committee, and New York Sen. Hillary Rodham Clinton held a field hearing on the Fallon situation to determine what the federal government can do to help. What they heard was that neither the federal government nor Nevada—nor most other states, for that matter—systematically track and monitor developmental disabilities or chronic diseases like leukemia.

Indeed, the Pew Environmental Health

Commission, based at the Johns Hopkins University School of Public Health, has made a case for a nationwide network to track the occurrence of conditions like asthma and cancer and developmental disabilities along with environmental factors, to better inform research and policy decisions. Without such a network, the commission maintains, the country “will remain unable to mount effective prevention efforts” to combat chronic diseases, birth defects and neurological disorders such as Alzheimer's and Parkinson's.

SOME OF THE SUSPECTS

Thanks to federal laws, including the Safe Drinking Water Act and Clean Air Act and statutes to eliminate lead in paint and gasoline, many environmental health indicators have improved over the last 30 years. Still, the public cannot be certain whether there's a link between exposure to chemicals in food, drinking water and air and rising rates of chronic diseases and developmental disabilities.

But some scientists and medical professionals suggest that environmental chemicals may be putting people at risk. “Every day people are exposed to untested chemicals,” said Phil Landrigan, M.D., director of the Center for Children's Health and the Environment at the Mt. Sinai School of Medicine. At the same time, “less than half of the 3,500 high-production volume chemicals have been tested at all for their toxicity,” he noted, “and less than 25 percent have been tested for their toxic effects on childhood development.”

Lynn Goldman, a former official at the federal Environmental Protection Agency (EPA) who's now a professor at the Johns Hopkins University School of Public Health, agreed. “What we found at EPA is that more than half of the chemicals in consumer products don't even have basic information about hazards,” said Goldman, and “by and large haven't been tested.”

Pesticides are a major source of controversy, given that tons of them are sprayed on crops and used in households to control weeds and garden pests each year. In a 1999 study, U.S. Geological Survey research found that many of the nation's lakes, streams and ground water sources, which are often used for drinking water, have detectable levels of pesticides in them. Which are most troublesome? “The ones I'm most worried about today are the persistent organic pollutants—PCBs, dioxin

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CONTRIBUTING STAFF

Glen Andersen, Louise Bauer, Janis Borton, Ann Dietrich, Doug Farquhar, Kristine Goodwin, Tracey Hooker, Martha King, Leslie Teach Robbins, Lisa Speissegger, Laura Tobler, Stephanie Wasserman

1560 Broadway, Suite 700
Denver, CO 80202

Fax: 303-863-8003

email: tracey.hooker@ncsl.org or martha.king@ncsl.org

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and others—that have become widespread in the environment and have the potential to cause learning disabilities in children,” Landrigan said. “I’ve become a strong supporter of efforts to restrict the manufacture and use of those chemicals.” Part of the problem, he said, is that the chemicals persist in the environment for years and tend to build up in living tissue, a characteristic called bioaccumulation. Because of that, EPA has warned people against eating certain species of Great Lakes fish that are likely to contain unhealthy levels of PCBs—chemicals that were banned in the 1970s but that linger in the environment and bioaccumulate.

Then, there’s mercury, another pollutant that tends to bioaccumulate and that has found its way from incinerators and coal-burning power plants into essentially every water body on earth. In a 2000 report, the National Academy of Sciences concluded that every year, 60,000 American children may be born with neurological damage that can be traced to unsafe levels of mercury. In response, both EPA and the Food and Drug Administration have warned pregnant women and small children to avoid certain types of seafood, this time because of the risk of mercury contamination. “We have a long way to go before management of mercury reaches... a realistic public health standard,” Goldman observed.

MAKING THE CONNECTION

Medical advances in eliminating infectious diseases like smallpox and polio have dramatically improved the health and lifespan of the average American over the last century. At the same time, diseases like asthma and testicular cancer in young men and developmental disabilities like attention deficit hyperactivity disorder are on the rise, and scientists and public health officials say environmental factors likely play a role.

“Our concerns have to do with birth defects and developmental disabilities, some of which have known environmental causes,” said Goldman, “but for most, we don’t have a good

understanding what the causes might be.” For cancer, neurological diseases and the like, there’s growing evidence that they begin *in utero* or early childhood. There’s also a suggestion that certain types of damage to the brain early on may not cause problems until later in life, impairing the body’s ability to cope with the normal aging processes and resulting in diseases like Alzheimer’s.

So is there a link between disease and pollutants in the environment? “Unequivocally yes, and lead is probably the best example,” said Tom Sinks, associate director for science in CDC’s National Center for Environmental Health. Large numbers of children, and on into adulthood, have suffered behavioral problems and I.Q. deficits from being poisoned by lead in their environment, he posited. In addition, air pollution, including ozone, has been proven to cause and exacerbate respiratory disease. As for other environmental contaminants, including pesticides, however, “I don’t think we have a good handle on their effects,” he said. (See story on page one for a report on lead poisoning.)

But some say the link is being overplayed. “In a relative sense, there is an overemphasis on chemical risks,” said Sandra Tirey, director of the public health team at the American Chemistry Council. Tirey offered the following as an example: “If you aren’t putting a bicycle helmet on your child but you’re worrying about pesticide residues, you probably aren’t [in] good balance.” In addition, there’s general agreement that the health benefits of eating vegetables far outweigh the risks posed by pesticide traces found in them.

FINDING ANSWERS

“In public health we’re often challenged to explain to communities [like Fallon] why they have high rates of certain diseases when the basic information about the diseases and the exposures has not yet been gathered,” Goldman observed. Concerned about the shortfall of information, government agencies and private associations have begun the search for some of the answers.

✦ EPA, for example, is changing its approach to risk assessment from a chemical-by-chemical basis to one that attempts to add risks from exposures to many chemicals together. (The 1996 Food Quality Protection Act, which requires reassessment of pesticides for safety, particularly for children, is one of the first laws to adopt the cumulative risk approach.) In addition, the agency is working on new tests examining hormone-disrupting chemicals and developmental disabilities.

✦ In March, CDC, using new technology that enables scientists to measure pollutant levels in humans directly, released a report on Human Exposure to Environmental Chemicals, providing first-ever information on exposure to 27 chemicals. Over the next four years, it will expand the base to 100 chemicals.

✦ In cooperation with EPA, the American Chemistry Council, is working with member-companies to get missing health data for 2,000 of the 3,500 high-production volume chemicals.

States are also actively trying to address the problem by creating better tracking programs that can help determine the links between environment and disease. In **Indiana**, for example, Sen. Beverly Gard is drafting legislation to track chronic disease as it relates to the environment. “We want to establish a state registry to identify pockets of health problems and see if there’s any tie to any specific environmental conditions in those areas,” Gard said. “With the newer technology that’s available, our ability to collect data and relate [them] to possible effects is much better than it used to be.”

Likewise in **California**, Sen. Martha Escutia has introduced a bill that would create a statewide tracking system on conditions like asthma, neurological disorders, birth defects and “cancers of unknown origin.” The aim, she said, is to provide communities with reliable information about chronic diseases as they relate to the environment as “a basic tool of prevention.” ✦ *GA*

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RESEARCH & EDITORIAL STAFF

Dick Merritt Forum Director
Linda Demkovich Editor
Anna Spencer Assistant Editor
Contributors: Laura Biesiadecki, Carrie Farmer, Donna Folkemer, Wendy Fox-Grage, Shelly Gehshan, Tim Henderson, Holly Kenny, Kala Ladenheim, Anna Scanlon, Tara Straw

EDITORIAL INQUIRIES

Linda Demkovich, Managing Editor
Tel: 202-624-5400 • Fax: 202-737-1069
email: linda.demkovich@ncsl.org

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NCSL, 1560 Broadway, #700, Denver, CO 80202
Tel: 303-830-2200 • Fax: 303-863-8003

Though it's been in business only since Jan. 1, the Trust for America's Health has become a strong voice for a national health tracking network to monitor chronic disease trends and the link to environmental pollutants. Serving as its executive director is Shelley Hearne, who had held the same title with the Pew Environmental Health Commission, which closed its doors in December. Hearne, who has a doctoral degree in environmental health sciences, also sits on the American Public Health Association's executive board and on two Environmental Protection Agency advisory committees—one on Children's Health Protection, the other on the Clean Air Act. In an interview, she discussed the need for a coordinated system to track the environmental links.

Q: To what extent is the public being exposed to untested chemicals in the environment?

A: A report released recently by the Centers for Disease Control and Prevention gave a first-time national profile of 27 chemical substances and the extent to which Americans are exposed to them. But the reality is that there are 75,000 chemicals on the market today, and the potential for human exposure is substantial. The bottom line is that we know very little about what people are exposed to and what the health effects of those substances might be, and that gets at the heart of the need for a nationwide health tracking network.

Q: Is there any evidence that the exposures are causing disease?

A: We know that environmental factors, from pollution to viral infections, play a role in the causation of many diseases, and [our knowledge about the extent of that role] is continuing to develop. A recent *New England Journal of Medicine* study on twins, for instance—one of the most comprehensive epidemiologic studies on the relationship between the environment and cancer—found that genes play a minor role and that the environment [may be] responsible for as much as 90 percent of cancer development. Also, asthma has escalated over the past 15-20 years to epidemic proportions, and while we know little about the underlying causes, we do know that environmental factors, from pollen, mold and [ambient] tobacco smoke to ambient air pollutants, including ozone and particulate matter, can trigger an attack.

Q: There's considerable uncertainty about public health risks posed by exposure to chemicals. What are the best ways to resolve the doubts?

HEALTH TALK

HEARNE: DISEASE AND THE ENVIRONMENT

A: There is no uncertainty that environment plays a significant role in health, but we need stronger science to make smarter decisions. As public health professionals, we want prevention to be our leading approach to protecting the population. If we had better information about where in the country health problems are occurring, we could focus our investigation to uncover underlying causes and effects and be able to intervene early and prevent the disease outbreaks, the clusters, in the first place.

Q: Could health tracking avoid or solve disease cluster cases, like the autism cluster in Brick Township, New Jersey?

A: The reality is that in almost every cluster we see, and Brick Township is exemplary, it's the parents and community leaders—be it churches or local physicians—that recognize the problem, and it often takes them a long time to convince the decision makers—politicians and health officers—of the problem because so often, the data are not being collected. So how can we tell if you have an abnormal event when we don't know what's normal? In Brick Township, it took the health department, with [help from federal agencies], several years to put together a baseline on which to do the analysis. Recent reports have said there is a significant cluster event occurring. Now we have to figure out why, [which will take years].

If this had been an infectious disease outbreak, health officials would have rapidly caught it, because that's how we won the battle in the 1800s against various plagues—cholera, typhoid, yellow fever. We set up a system to track the health of citizens. When it saw a problem, it sent out investigators to help the folks who were sick, but fundamentally it was all about preventing it from happening again. We live 30 years longer now and 25 of those years are attributable to fundamental public health practices: good sanitation systems, safe foods, clean drinking water, clean air.

Today, 7 of 10 deaths in the U.S. are attributable to chronic disease, and 75 percent of them are preventable. So what are the lessons from the war with infectious disease? Track, respond, prevent. But with chronic diseases, we don't even track. It's hard to respond and prevent when you don't do the basics.

Q: How do we balance risks with costs?

A: The cost of tracking is minimal. What the Pew Environmental Health Commission envisions as a comprehensive, nationwide health tracking network would cost about \$275 million a year to implement fully. To put that in perspective, that's the equivalent of building 150 miles of highway. This is a fundamental health defense need, a basic infrastructure the country needs to be healthy and vital. The biggest challenge is that people just assume that we're taking care of this, that of course we're tracking. It's not about money. It's about making a commitment [that should have been made] 15 years ago.

And when you say balance costs with risk, what's the risk? The risk is that we'll continue to [run up] these extraordinary expenditures—about \$325 billion dollars annually—on chronic diseases, and the numbers are going up astronomically. How do you control health care costs? Not through this big experiment to manage health care. The cheapest way is to prevent disease in the first place.

There are a lot of success stories sitting out there, waiting for us. Take the finding that lack of folic acid in the diet is a significant contributor to the risk of deadly neural tube defects. There was a cluster of neural tube defects along the Texas-Mexico border. The town was horrified, but the Texas Health Department said, "We're not sure what's happening because we don't track birth defects." Notice the parallel with Brick Township. In the end, Texas put together an extensive birth defects registry, one of the best in the country, and the subsequent investigation was a key precursor to discovering the link between folic acid and neural tube defects. And today, we've got comprehensive programs encouraging expectant mothers to supplement their diets with folic acid, with huge expected savings in reducing horrifying and deadly birth defects.

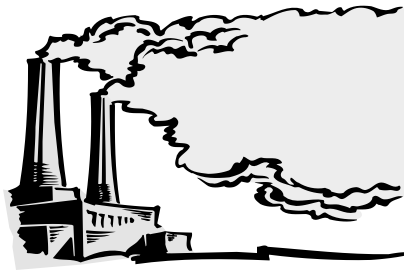
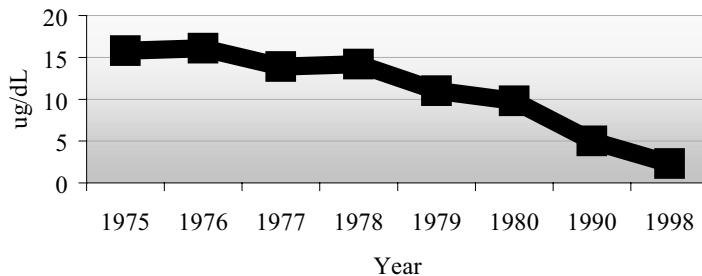
Q: What role can state legislators play?

A: They can help revitalize the ability of public health departments to be the vigilant watchdogs of our communities' health and to respond and prevent chronic disease threats. A few states are already putting forward legislation encouraging tracking and strengthening health department capacity, and I anticipate that we'll see legislation soon at the federal level. But it can't be done without strong, able partners in the states. That's where public health happens. That's where the rubber meets the road. ✦ GA

Health and the Environment

The Hazards of Lead

Trends in Average Blood Lead Levels



Fast Facts on Environmental Health Hazards:

- ✦ In 1990, American industry emitted more than 2.4 billion pounds of toxic pollutants into the atmosphere.
- ✦ In 1991, 98 areas, with 140 million residents, exceeded the Environmental Protection Agency's recommended level for ozone; in addition, 76 areas were above recommended levels for carbon monoxide and 50 for sulfur dioxide.
- ✦ An estimated 50,000 to 120,000 premature deaths annually are associated with exposure to toxic pollutants.
- ✦ Principal water pollutants include nutrients, siltation, metals and pathogens.
- ✦ 46 percent of lakes are in good condition, 9 percent are good but threatened, 45 percent are impaired;
- ✦ 1.2 billion pounds of pesticides are used annually in the U.S.

Source: Environmental Protection Agency

Fast Facts on Chronic and Developmental Conditions:

- ✦ Chronic diseases such as asthma, cancer, Parkinson's, Alzheimer's and diabetes are responsible for seven of every ten deaths in the U.S., at a cost of \$325 billion/year.
- ✦ The number of Americans with asthma rose 75 percent between 1990 and 1984; among children under four, the disease has increased by 160 percent.
- ✦ The incidence of neurological diseases (e.g., multiple sclerosis, Parkinson's), grew by 20 percent between 1986 and 1995, while the incidence of learning disabilities rose by 50 percent.
- ✦ An estimated 3.8 million school-age children in the U.S. are diagnosed with either attention deficit disorder or attention deficit hyperactivity disorder.
- ✦ Autism—a neurological disorder affecting the functioning of the brain—has been estimated to occur in as many as 1 in 500 individuals, typically manifesting itself in the first three years of life; it is four times more prevalent in boys than girls.

Sources: Trust for America's Health; National Center for Environmental Health; Autism Society of America

A Look at the Causes of Developmental Disabilities

