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Surprising New Research Links Infant Mortality to Crashing Bat Populations

Without bats to eat insects, farmers turned to more pesticides, a study found. That appears to have increased infant deaths.

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By Catrin Einhorn

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The connections are commonsense but the conclusion is shocking.

Bats eat insects. When a fatal disease hit bats, farmers used more pesticides to protect crops. And that, according to a new study, led to an increase in infant mortality.

According to the research, published Thursday in the journal Science, farmers in affected U.S. counties increased their use of insecticides by 31 percent when bat populations declined. In those places, infant mortality rose by an estimated 8 percent.

“It’s a seminal piece,” said Carmen Messerlian, a reproductive epidemiologist at Harvard who was not involved with the research. “I actually think it’s groundbreaking.”

The new study tested various alternatives to see if something else could have driven the increase: Unemployment or drug overdoses, for example. Nothing else was found to cause it.

Dr. Messerlian, who studies how the environment affects fertility, pregnancy and child health, said a growing body of research is showing health effects from toxic chemicals in our environment, even if scientists can't put their fingers on the causal links.

"If we were to reduce the population-level exposure today, we would save lives," she said. "It's as easy as that."

The new study is the latest to find dire consequences for humans when ecosystems are thrown out of balance. Recent research by the same author, Eyal Frank, an environmental economist at the University of Chicago, found that a die-off of vultures in India had led to half a million excess human deaths as rotting livestock carcasses polluted water and spurred an increase in feral dogs, spreading waterborne diseases and rabies.

"We often pay a lot of attention to global extinctions, where species completely disappear," Dr. Frank said. "But we start experiencing loss and damages well before that."

To come up with his findings, Dr. Frank analyzed county-level data on the detection of white-nose syndrome in bats, pesticide use by farmers and a variety of health indicators, including infant mortality. Two environmental economists who were not involved with Dr. Frank's study, Jason Shogren of the University of Wyoming and Eli Fenichel of Yale, praised the methodology and the efforts Dr. Frank made to seek a different explanation for the uptick in both insecticides and infant mortality.

"He uses simple statistical methods to the most cutting edge techniques, and the takeaway is the same," Dr. Fenichel said. "Fungal disease killed bats, bats stopped eating enough insects, farmers applied more pesticide to maximize profit and keep food plentiful and cheap, the extra pesticide use led to more babies dying. It is a sobering result."

Dr. Frank estimated the number of infant deaths at 1,334 throughout 245 counties affected by white-nose syndrome from 2006 to 2017.

Three species of bats in North America have been decimated by white-nose syndrome, a disease caused by a fungus that attacks the animals during hibernation. Researchers first discovered sick and dying bats with white fuzz on their noses, ears and wings in the Northeast in the mid-2000s. The fungus can live on clothes, shoes and gear, which is how scientists believe it arrived in North America, probably from Europe. Since then, bats with white-nose syndrome have been confirmed in 40 states and nine Canadian provinces. Researchers are working to find ways to help bats survive the disease.

More broadly, 52 percent of bat species in North America are at risk of severe declines over the next 15 years from a variety of causes, including habitat loss, climate change and collisions with wind turbines, said Winifred Frick, chief scientist at Bat Conservation International, a nonprofit group.

Biologists have long known that the animals provide an important ecosystem service by controlling pest insects. But they've been underappreciated by the public, Dr. Frick said.

"We just take these services for granted because they're happening without our ability to quantify them, usually," she said.

Ecosystems are complicated things, interwoven with connections that scientists only partially understand, so biodiversity is exceedingly difficult to quantify in all kinds of ways. But economists are trying.

Dr. Frank does so by searching for natural experiments. He found this one while procrastinating, he said. After downloading some data from the United States Geological Survey, he wasn't in the mood to start analyzing it. Instead, he started poking around to see what other information was on the website and came across an article about bats and white-nose syndrome. From his training in ecology, he knew bats were important for insect control and pollination. As an economist, he knew he had stumbled upon something rare.

“Reading how this disease is spreading from county to county, decimating bat populations, made my economist senses go, ‘Oh, this is probably the best natural experiment you can have,’” Dr. Frank recalled. “It’s the closest we’re going to get to just going out there into the wild and randomly manipulating bat population levels to see what happens at a large, meaningful spatial scale.”

An earlier estimate put the agricultural value of bats in the billions per year, and another study found that land rental rates dropped in counties hit by white-nose syndrome.

Catrin Einhorn covers biodiversity, climate and the environment for The Times. More about Catrin Einhorn

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