

SCIENTIFIC AMERICAN™

Exotic Diseases from Warmer Climates Gain Foothold in U.S. Climate change is helping make the U.S. more hospitable for diseases ranging from Chagas to dengue fever

By [Umair Irfan](#) and [ClimateWire](#) | June 4, 2012



UNHEALTHY IMMIGRANT: Mosquitoes that play host to exotic tropical diseases are expanding north as climate change warms average temperatures. Image: James Gathany, CDC

Diseases once thought to be **rare or exotic in the United States** are gaining a presence and getting new attention from medical researchers who are probing **how immigration, limited access to care and the impacts of climate change** are **influencing their spread**.

Illnesses like schistosomiasis, Chagas disease and dengue are endemic in warmer, wetter and poorer areas of the world, often closer to the equator. According to the World Health Organization, almost 1 billion people are afflicted with more than one tropical disease.

Caused by bacteria, parasites and viruses, these diseases are spread through bites, excrement and dirty water stemming from substandard housing and sanitation. Consequently, the United States has been largely isolated from them.

But Americans are traveling more, and as tropical vacationers return home, they may unwittingly bring back dangerous souvenirs. Immigrants from endemic regions are also bringing in these diseases, some of which can lie dormant for years. All the while, the **flies, ticks and mosquitoes that spread these illnesses** are **moving north as rising temperatures make new areas more welcoming**.

In 2009, dengue emerged in south Florida and infected more than 60 people, the **first outbreak since 1934**, according to the Centers for Disease Control and Prevention (CDC). Dengue is caused by **four closely related viruses spread by mosquitoes**. It results in joint and muscle pain, severe headaches and bleeding.

The outbreak was first detected in a Rochester, N.Y., woman who traveled to Key West, Fla., for one week, with several Key West residents subsequently reporting infections. The infection rate rose to 5 percent, which CDC said indicated "a serious risk of transmission."

According to the Monroe County Health Department, there hasn't been a confirmed dengue case in the Florida Keys since November 2010. "We keep the public aware that they need to be dumping standing water and wearing mosquito repellent," explained Chris Tittle, public information officer at the health department. The outbreak may have been linked to travel from Latin America and the Caribbean, where the disease's incidence has risen fourfold over the past 30 years. In 2010, Puerto Rico faced the largest dengue epidemic in its history.

However, not every outbreak is imported, and future epidemics may come from within. "There's a substantial but hidden burden of tropical disease in the United States, particularly among people in poverty," said Peter Hotez, founding dean of the National School of Tropical Medicine, the first such school in the United States, at Baylor College of Medicine in Texas. Diseases like leishmaniasis often are not tracked rigorously in this country and are classified as neglected, unlike vector-borne illnesses like Lyme disease that are monitored.

Little data or public awareness

Since there is a dearth of data, it is hard to distinguish to what extent neglected tropical diseases are actually endemic in the United States or are brought by travelers and immigrants. It is also hard to tell if the number of infections is rising or if people are just noticing them more.

"In most cases, we don't know. We're just really getting our arms around how pervasive the disease is," said Hotez, who is studying these diseases in communities along the Gulf Coast. "People jump to the conclusion that it must be immigration coming up from Mexico or Central America, but we don't think that's the case."

Hotez believes some of these diseases may be spreading indigenously, though other infections do have stronger links to immigration. For example, **Chagas disease is a parasitic infection caused by *Trypanosoma cruzi*, a single-celled parasite.** It causes swelling at the infection site and, if left untreated, **develops into a chronic illness that can be asymptomatic or unfelt in most people and can cause digestive, heart and nervous system failures in others.**

The **disease is spread by triatomines, also called kissing bugs for their tendency to bite on the lips to suck blood.** They are often found in cracks and holes in walls and foundations in decrepit homes. Susan Montgomery of the parasitic diseases branch of CDC said this disease is not new to the United States. "It's been here for a long, long time," she said. "The vector bugs have been here probably for centuries."

She also said this illness is not spreading here the way it does in Latin America because the vectors are different, though their ranges are influenced by climate. "There is no evidence that [Chagas] is an increased problem at this point. **We don't live in the kind of housing that would put us in contact with triatomine bugs,**" Montgomery said. **"Our triatomine bugs live in the brush, they live in the woods.** They are not adapted to live in people's homes."

Arriving with illegal immigrants

Changes in Chagas' prevalence are therefore related to infected people migrating to the United States. "The concentration of positive blood donors is in areas with larger concentrations of immigrant populations," Montgomery said. Cases emerge occasionally in Texas and Oklahoma, but triatomines do not seem to be spreading any farther.

However, as the economy improves, immigration may become a greater disease pipeline. "A lot of people don't come here through the so-called legal channels," said Marian McDonald, associate director for health disparities at the National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) at CDC. "Changes in the global economy have really sort of propelled immigration to the United States, and that doesn't seem like it would change anytime soon."

Since undocumented immigrants are difficult to track, officials have a hard time measuring and treating infected individuals, especially for diseases like Chagas that can remain dormant for years. "Overall, the problem for the population that is vulnerable is that they may not have any idea that they are at risk or that they may have been exposed to it," McDonald said. Legal immigrants from endemic regions are treated for these diseases when they enter the United States.

Poverty is another compounding factor. Undocumented immigrants tend to live in areas with poor quality housing, intermittent garbage pickup and impure water, creating havens for infections. These illnesses can also hamper economic development. "They actually are a cause of poverty because they interfere with child growth and development and pregnancy outcomes," said Hotez, noting that these complications can follow someone for life.

Another disease, Chikungunya, may also set up shop in the United States. The disease's name means **"that which bends up"** in the Makonde language in East Africa, since the **afflicted are often contorted from joint pains.** The **disease spreads through mosquitoes,** particularly the **Asian tiger mosquito,** an invasive species that is expanding from the southeastern United States and may reach as far north as New York.

Laura Harrington, an associate professor of entomology at Cornell University, expects this **disease to become a bigger issue in the future.** "It's not a matter of if, it's a matter of when," she said. The **disease, which has no cure or vaccine,** has been seen in travelers returning to the United States from endemic regions in 2006 and may find a new home here, since many infected don't show any signs. "The danger of Chikungunya virus being introduced into the Americas is increasingly real," said a 2011 CDC report.

Help isn't on the way -- yet

Volatile weather and warming temperatures also influence neglected tropical diseases and their vectors. "Anything that impacts climate is likely to have a significant impact on disease incidence," said C. Ben Beard, associate director for climate change at NCEZID.

Exactly how remains a bit fuzzy, but researchers have observed some trends. "Certainly, if you take a disease like dengue or West Nile virus, warmer temperatures allow the mosquito to replicate faster," he explained. "The virus replication rate in the mosquito is also increased, and then you shorten the period from when the mosquito becomes infected and when they're able to transmit."

In addition, Beard notes that the **annual first frost tends to kill off mosquitoes, ticks and flies, but warmer temperatures are delaying frosts and pushing the frost line farther north.** That creates the **potential for year-round disease transmission in some parts of the country.** "It's likely we'll see northward expansion of some of the diseases already here," he said.

Increased hurricanes, drought and torrential rainfall in endemic areas **may push diseases into new regions** as local economies and livelihoods are devastated. "We wish we had a crystal ball, but we don't. It's hard to know exactly what [the disease scenario] will look like," he said.

Researchers say they need more and better information. The "Neglected Infections of Impoverished Americans Act" (H.R. 528) offers some hope; it would require the secretary of the Health and Human Services Department to submit an annual report to Congress about these diseases. The bill, sponsored by Rep. Hank Johnson (D-Ga.) has passed the House twice but only passed committee this year, according to Andy Phelan, communications director for Johnson.

"Rep. Johnson's legislation is a good first step in fighting these diseases by raising awareness," said Phelan, in an email. "These are infections that we can treat, but we don't have a good grasp on what impact these diseases are having on poor communities throughout the nation."

Baylor's Hotez agreed. "We need to expand our data collection," he said, noting that the private sector does not have a strong incentive to address these diseases because they mainly affect the very poor. McDonald from NCEZID said outreach and education are also critical. "For a lot of people, just getting them to think about some of these things when they have extremely urgent daily survival tasks is difficult," she said.

Reprinted from Climatewire with permission from Environment & Energy Publishing, LLC. www.eenews.net, 202-628-6500