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# REMAPPING DEBATE

Asking "Why" and "Why Not"

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## While you were worrying about rising sea levels...

**Original Reporting** | By David Noriega | Environment, Health

Sept. 25, 2013 — The future consequences of climate change in Florida have often been envisioned in terms of rising sea levels and erratic weather: flooded coastal cities, violent hurricanes, critical infrastructure made to malfunction by invading seawater.

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But an ongoing outbreak of dengue fever in Martin and St. Lucie counties, on the state’s Atlantic coast, may provide early warning of an under-appreciated threat: as Florida’s environment becomes more conducive to the spread of mosquitoes, the state’s residents could be at greater risk for contracting a variety of diseases.

As with every other aspect of climate change, increased incidence of disease could carry potentially huge economic consequences. Remapping Debate focused its inquiries on a seldom-discussed but critical one: we asked what increasing outbreaks of illness would mean for real estate markets. The economists and other experts we interviewed agreed that property values would almost certainly suffer because fears of illness would deflate demand for Florida real estate.

The state’s trajectory need not be one of gloom and doom. But the rise of a climate-facilitated mosquito threat, Remapping Debate found, means that the decisions Florida makes about the strength of its public health and other health care infrastructure will become ever more important to whether the threat can be effectively met.

Some worry, however, that the current response is not encouraging: “We’re arguably regressing at a time when we need to be reacting to what may very well be a public health crisis,” said Democratic State Representative Mark S. Pafford.

## The outbreaks so far

The *Aedes aegypti* mosquito, the most common carrier of dengue, breeds in small containers of water. After it rains, anything from a discarded bottle cap to a garden bromeliad can become a cradle for dozens of larvae. And since the current outbreak of dengue began five weeks ago in Martin County, some 40 miles north of Palm Beach, rain has come unseasonably heavy and late.

“We generally don’t get the kind of rain we’re getting right now in September,” said Gene Lemire, manager of mosquito control for Martin County. September is usually a slow month for mosquito control, but not this year. “I’ve got all kinds of water on the ground, so I’ve got all kinds of breeding sites,” Lemire said. To make matters worse, the air is still warm. “As long as you’ve got moisture coinciding with warm weather, you have mosquito breeding.”

The Martin County dengue outbreak, which so far has infected 20 people, is the second in Florida since an outbreak in Key West in 2009, which was the first time dengue was found in Florida in nearly 60 years.

## Prospects for the future

While any climate scientist would caution against making inferences on long-term climate patterns based on individual weather events, those we interviewed confirmed that Martin County’s protracted rainy season nevertheless matches up with a likely future: longer and wetter summers with shorter and milder winters mean less opportunity for mosquitoes to die off as the weather grows cooler and drier, which in turn translates to an increased risk of exposure to vectors — organisms that carry disease, in this case mosquitoes.

### How does dengue feel?

Dengue is colloquially known as “breakbone fever” for the excruciating joint and muscle pain it causes. It can also lead to sudden-onset fever, headaches, and a rash.

Dengue has four strains, or serotypes, with different symptoms of varying intensity. This complicates the question of immunity. If people get infected with one strain of dengue, they will likely be immune to further infections from that strain. But if they are then infected with a different strain, the possibility of severe or fatal illness — with symptoms like intense fever, internal bleeding, and shock — increases.

“So, if you have multiple serotypes of dengue virus circulating in any area, it’s an extreme problem,” said Nathan Burkett-Cadena, a researcher at the University of South Florida.

This unusual interaction has stymied the development of effective vaccine: immunizing people to a particular strain of dengue only makes them more vulnerable should they contract another, and a vaccine covering all four strains has yet to be invented.

The types of mosquitoes that could proliferate and spread around Florida are also vectors for different kinds of encephalitis, or swelling of the brain. Typical symptoms include fever, malaise, and joint and muscle pain. Many cases are fatal. Some of these diseases, like Eastern equine encephalitis and St. Louis encephalitis, are already present in Florida. Others, like Venezuelan equine encephalitis, are present in countries further south and, scientists warn, may spread northward.

“Vector abundance is extremely important in all calculations of risk of infection,” said Nathan Burkett-Cadena, a mosquito biologist at the University of South Florida. “I would say milder winters are definitely going to result in larger mosquito populations subsequent summer, and that’s going to drive transmission of vector-borne diseases.”

Milder winters may also affect the territorial range of vectors — how far north different kinds of mosquitoes are able to survive.

Currently in southern Florida, “we have about a dozen species of mosquitoes that are not found farther north than the Everglades,” said Burkett-Cadena. “Many of these species are vectors of human pathogens.”

As winters grow milder further north, more of the Florida peninsula will become hospitable to these disease-carrying mosquitoes, Burkett-Cadena added.

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## Choosing to be prepared or unprepared?

Historically, one consistently important factor in the spread of illnesses is the way human activity has interacted with the disease landscape – from the elimination of wetlands for agriculture several hundred years ago to the building of public health infrastructures in the modern age. The former destroyed breeding habitats for mosquitoes on a massive scale, functionally getting rid of entire species. The latter developed systems to monitor, fend off, and treat disease, ranging from simple measures like window screens to intricate systems for controlling mosquito populations, to hospitals ready to identify and react to disease outbreaks.

Whether public health and other health care infrastructure is adequately funded will prove, scientists say, to be a critical determinant of how the consequences of a changing natural environment affect residents of the state.

Kevin Lafferty is a research ecologist with the U.S. Geological Survey who has cautioned that, rather than leading to blanket increases in disease, climate change may cause the incidence of some disease to decrease in some places. But Lafferty, too, thinks that public health readiness is ignored at society’s peril: “There are obviously going to be direct relationships between how we choose to invest in public health and the risk of infectious disease,” Lafferty said.

Independent of the complicated factors that Lafferty believes determine changes in the baseline risk of disease, he is certain on one point: across the board, risk will be worse than it otherwise would be in the absence of adequate investment in public health.

## A real estate nightmare

Increased health problems are serious enough. But those problems have typically gone hand in glove with depressed real estate markets.

In 1997, the population of Churchill County in Nevada began to see an abnormal rate of pediatric leukemia. Lucas Davis, now an economics professor at the University of California, Berkeley studied the county and found that the health risk led to a significant decline in housing prices.

Davis and other experts interviewed by Remapping Debate agreed that a scenario in which communities in Florida become associated with disease outbreaks is analogous to other instances in which public health concerns, like proximity to toxic waste sites or power plants, put a dent in local real estate markets.

Davis noted that, for this to take place, individual outbreaks would need to be seen as part of a longer-term pattern. “If something really changes and all of a sudden some threshold is passed, and that really changes the risk in a community, then you could see an immediate, substantial impact” on housing values, he said.

Still, the threat of disease need not be incontrovertible to deliver a blow. Davis recounted how, in cancer clusters he’s studied, officials from the Center for Disease Control (CDC) would hold meetings to assure the population that the disease rates were a statistical anomaly and not an actual risk. Yet people remained skeptical.

“I think a reasonable thing the CDC gets asked at these meetings is, ‘Well, would you move your family to this community?’” Davis said. “The evidence does not have to be 100 percent verifiable for it to have impacts on perceptions and thus housing values.”

### “Continuing uncertainties”

Kevin Lafferty, a research ecologist with the U.S. Geological Survey, has done research showing that the impact of climate change on disease will not be linear: some diseases may increase in some areas while others decrease elsewhere.

Other scientists Remapping Debate interviewed agreed that the course of change cannot be predicted with precision, as several intricately related factors — biological, climactic, and social — will be in play. For example, there might be changes in the behavior and age structure of mosquito populations or local rainfall patterns that deviate from larger climate trends.

Nevertheless, most of the scientists we spoke with who are familiar with the Florida environment stated that the problem of mosquitoes and the diseases they carry was likely to intensify. Furthermore, even those who were more skeptical acknowledged the critical importance of maintaining the state’s ability to track mosquito populations and disease levels, and to respond robustly to any changes.

## “It’s going to be about perceptions”

The key lies in people’s “demand functions” — the various factors that go into their assessment of how desirable a given location is as a place to live. One factor that could prove especially significant in Florida relates to the second-home market. If an increase in disease causes those seeking escape from wintertime cold to think twice about coming to Florida, they could easily substitute other destinations, thus causing a steep drop in Florida’s market for second homes.

“It’s going to be about people’s perceptions,” said Katherine Kiel, chair of the Department of Economics at the College of the Holy Cross in Massachusetts. “How risky is it for me to move there? What other options do I have?’ If I’m pretty much indifferent between going to Florida and Arizona, and suddenly Florida has this other negative externality, I’m going to Arizona.”

### Other climate-influenced diseases

Mosquito-borne diseases are not the only ones likely to be affected by climate change — other illnesses may already be showing signs of increasing as the weather warms. J. Glenn Morris, Jr., director of the Emerging Pathogens Institute at the University of Florida, said warming seas may have already helped the proliferation of food-borne illnesses, such as those caused by *vibrio*, bacteria found in raw or undercooked shellfish, particularly oysters. The most notorious *vibrio* illness is cholera.

“During cold months *vibrios* disappear entirely from the water column. But as the water column begins to warm up, they undergo blooms,” Morris said. “Even slight increases in water temperature may increase the number of *vibrios* in the aquatic environment, and this in turn may increase the frequency of *vibrio*-associated illness.”

*Vibrio*-related illnesses have been on the rise in the United States in recent years according to data from the Center for Disease Control. This, Morris said, “comes back to the whole idea that this may be a climate change–related observation.”

Another food-borne illness that may already be spreading with climate change is ciguatera, which is normally contracted by eating tropical reef fish contaminated with a toxin that originates in certain kinds of algae.

“This algae growth and toxin production is temperature-dependent,” Morris said. “And there are concerns that these microorganisms might be moving further and further up the Florida coast, again because the water temperatures are more permissive.”

At the same time, the toxic algae find better homes as a result of another consequence of climate change: damaged coral reefs. “Climate change, with increase hurricanes, causes increased reef damage, which opens up ecological niches for this toxic algae to come in,” Morris said.

What might this mean for the people of Florida? The diseases caused by *vibrio* are usually manifested as gastroenteritis, meaning diarrhea, vomiting, and abdominal cramping. Ciguatera causes nausea and diarrhea and can also lead to more serious, long-term neurological disorders, such as numbness, vertigo, and hallucinations.

As Robert Repetto, a senior fellow at the International Institute of Sustainable Development who has studied the economic effects of climate change in Florida, put it: “Why would Mrs. Nicholson want to go to Florida in the winter and get dengue? She probably wouldn’t.”

Beyond the dent in housing prices, a blow to the desirability of Florida communities would have broader economic consequences. Fewer snowbirds, Kiel pointed out, means fewer people patronizing grocery stores and gas stations and movie theaters. Lower property values, Davis said, lead to lower property taxes and a decrease in state revenue.

The latter is critical for Florida. Pafford, the democratic state representative from Palm Beach County, pointed out that the state’s tax system is built largely on property and sales taxes. Events related to climate change that weaken either or both revenue sources would hinder the state’s ability to provide public services in any circumstances, let alone respond quickly and effectively to crises.

“The very revenue streams we [would] depend on under these scenarios might be affected,” Pafford said. “The results could be devastating for Florida.”

## **The state of public health infrastructure today**

Normally, Gene Lemire’s staff deals not only with mosquitoes throughout Martin County but also with controlling aquatic weeds and African bees. Since the outbreak, the entire staff has been working on mosquito control exclusively. All seven staff members — even Lemire, the unit’s director — have made the rounds from backyard to backyard, looking for mosquito breeding grounds and spraying them with pesticides. “We’ve been stretched the whole time,” Lemire said. “We’ve done well because we pretty much ignored the rest and concentrated on where we think it’s most important, because of the outbreak.”

Shortly after the election of Governor Rick Scott in 2010, mosquito control saw the portion of its budget provided by the state cut nearly in half. This was a small part of a larger assault on health-related spending pushed by Scott and a Republican-controlled state legislature in which members from the GOP’s Tea Party wing wield significant influence. The same year, under the banner of the need for budget cutting, Florida’s Department of Health saw its funding cut by nearly \$125 million, a 4.6 percent decline resulting in the loss of some 260 positions.

“When you drop your number of personnel, you have less ability to monitor and track what’s going on,” said J. Glenn Morris, Jr., director of the Emerging Pathogens Institute at the University of Florida. This means “the personnel you do have are spending their time putting out fires.”

This year, after an extensive lobbying effort, the Florida Mosquito Control Association, a nonprofit organization, managed to get the legislature to return county mosquito control budgets to previous levels. But the battle Lemire’s team is fighting in Martin County suggests that even this re-stabilization may be insufficient in the event of more or larger outbreaks.

“Most people [in mosquito control] within the state of Florida have been saying, ‘Well, we’re due for an outbreak,’” Lemire said. “And at some point something’s going to happen, and we won’t be budgeted for it. We won’t have the people, we won’t have the resources to deal with it.”

## **Glass half full or half empty?**

Cary Pigman, a Republican state representative from a rural district in central Florida, acknowledged that changes in climate create the potential for increased risk of disease spread. He also acknowledged that financial problems in recent years have led to budget cuts. “It’s been far more than just belt-tightening,” Pigman said.

However, Pigman, who is also an emergency medical physician, is confident that Florida’s doctors will be prepared to handle any increase in mosquito-borne and other diseases. “This comes down to just increased awareness on the part of physicians that these diseases will become more likely,” he said.

Hence the principal job of the Department of Health, according to Pigman, is being being capable of monitoring disease levels and communicating risk potential to medical professionals, “so that providers know what to be looking for.”

Moreover, Pigman believes an improving economy will ameliorate the effects of recent cuts. “As the economy improves and state revenues improve, I think you’ll see some of that funding come back,” he said.

The Florida Department of Health also told Remapping Debate that it was confident that, should there be an increased risk of disease transmission, it would be capable of dealing with the situation. But the Department of Health did not respond to our inquiry as to *how* it would be able to keep up in the face of reduced budgets, other than to state that it “continues to build partnerships in the private and public sectors at the local, state, and federal level to make sure we are prepared for these events.”

Some environmental and public health professionals do think the situation in Florida has begun to right itself since the early years of Scott’s tenure. Anamarie Garces, executive director of the public health nonprofit Urban Health Partnerships, points to the fact that the Department of Health recently obtained a federal grant, funded and designed by the CDC, devoted to studying the possible health consequences of climate change.

Garces also points to concerted efforts to address climate change and all of its possible effects on a local level, such as the Southeastern Florida Regional Compact on Climate Change, an alliance between four counties to develop preparedness, adaptation, and mitigation plans. Nevertheless, even to the optimistic, these efforts do not represent a solution. “I think there’s a lot left to do,” Garces said.

Others are more pessimistic and focus on the larger trend of disinvestment from public health and climate change preparedness. “I think the Florida Health Department, in its time, was regarded as one of the best health departments in the country,” said Morris, the director of the Emerging Pathogens Institute at the University of Florida. “The reality, however, is that, with the current governor, there has been a dramatic cutback in the health department budget.”

“I am concerned about the ability of the state of Florida to deal with more general public health issues,” Morris added. “My concern is the political judgment where, in an effort to cut taxes, the health department has had its ability [curtailed] to react to public health issues including, potentially, climate change.”

Pafford, the state representative from Palm Beach County, characterized Florida’s current legislature as unwilling to confront the realities of a changing climate. This, he said, is true even of pressing issues that the state is already experiencing, like sea level rise, and therefore especially true of more complex and distant challenges like increased disease risk. As to those, he said, “we’re not reacting at all.”

*This content originally appeared at <http://www.remappingdebate.org/node/2059>*

## UNRESPONSIVE POLICYMAKERS

In an effort to gauge the views of policymakers on the health and economic impacts of climate change in Florida, Remapping Debate reached out to 21 sitting state senators and representatives.

We focused on legislators in relevant committees, such as Matt Hudson, chair of the House Health Care Appropriations Subcommittee, and Joe Negron, chair of the Senate Appropriations Committee.

Remapping Debate asked policymakers whether they acknowledged the disease and other health risks of climate change, as well as the attendant economic perils to the housing market, and what, if any, was the state’s responsibility in preparing for and responding to these threats.

Leaving aside those who cited scheduling issues and other conflicts, 15 either affirmatively declined to comment or simply did not respond. Hudson and Negron were among those who did not respond to repeated telephone and email inquiries.