

Deaths caused by Leptospirosis reported in Puerto Rico

Benjamin Mateus
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Three weeks since Hurricane Maria hit Puerto Rico, relief efforts have been woefully inadequate, as cries for rapid assistance and support continue to go unheeded. Hospitals are running low on medicine, while the number of patients being admitted keeps rising. Many medical personnel have not been able to return to work. Hospital generators, used to produce electricity, are low on fuel. More than 85 percent of the island remains without electricity, 45 percent lacks running water and only limited information from remote regions is available to assess the dire conditions plaguing the island's population.

According to the *New York Times*, the mayor of Canóvanas, a region in the northeast of the island, reported that several people in her city had died of Leptospirosis, a bacterial infection caught from the floodwaters. Puerto Rico usually sees about 20 to 30 cases a year, with possibly one death per year. Officials are extremely concerned about a spike in such waterborne infections.

The authorities are urging people to only drink bottled water, wear protective shoes and avoid handling potentially contaminated water or soil. Despite FEMA reporting the distribution of 7 million liters of water, there is a scarcity of clean water in rural communities, whose residents are resorting to washing and bathing in local rivers and springs. According to a story published in *Metro US*, in Comerío, a town in the mountainous interior, the floods destroyed the sanitation pipelines and took all the drinking water. In a town with 7,000 families, there are only two tank trucks that can distribute water to approximately 200 families per day.

As of last week, only four mobile hospitals had been set up and 10 Disaster Medical Assistance Teams have been sent in by the federal government. The USNS Comfort, a Navy hospital ship with 1,000 beds and 11 operating rooms, arrived more than a week ago, but they are still not seeing the number of patients they expected. According to the *Times*, the Puerto Rico Department of Health only sent 82 patients to the Comfort over a six-day period. Given the nearly complete failure of island's infrastructure, it is not surprising that authorities have limited capacity to mobilize

help for people in need of medical assistance and attention. Many of the local residents report they have yet to see FEMA.

Leptospirosis is a widespread and prevalent zoonotic disease occurring in some temperate but predominately tropical regions. The World Health Organization's Leptospirosis Burden Epidemiology Group has estimated 873,000 cases per annum, with 48,600 deaths.

The bacterium causing the disease is a spirochete of the genus *Leptospira*. The disease is synonymous with Weil's disease, Swineherd's disease, rice-field fever, waterborne fever, cane-cutter fever, swamp fever, etc., highlighting its connection with field work in wet environments. The spirochete can infect a variety of both wild and domestic animals, especially rodents, which are important reservoirs for maintaining the transmission in most settings.

Once the rodents are infected, they shed the organism in their urine, resulting in contamination of the water and soil. The bacteria can remain viable for days to months. Human infections occur through exposure to contaminated environmental sources via cuts, skin or mucosal abrasions, conjunctiva and possibly oral ingestion.

Leptospirosis has ceased being a notifiable disease nationally since 1995, with the exception of Hawaii. In the tropics, endemic infections are related to poverty, where lack of sanitation and poor housing conditions lead to infections. Occupational exposure such as subsistence farming and living in rodent-infested and flood-prone urban slums are the main causes of infection. Large outbreaks affecting thousands occur during the rainy seasons and flooding.

Observational studies from Salvador, Brazil, noted elevated antibodies of previous exposure among low-income and black populations, citing proximity to open sewers, accumulated refuse and rat sightings as risk factors. They also noted that an increase in 1 US dollar per capita of household income was associated with an 11 percent decrease in infection risk. In developed countries, sporadic outbreaks occur from participation in activities such as freshwater swimming for triathlons or recreational travels to

high endemic areas.

The clinical course of the disease is most often limited or mild, but can evolve into a severe and potentially fatal infection. With the transmission of the spirochete, there is a 2- to 26-day incubation period (usually about 10 days) before symptoms abruptly begin, which is on par with the recent reports. These include high fevers, rigors, muscle and joint pain and headaches. Conjunctival suffusion (redness of the eyes without the discharge seen in conjunctivitis) is a finding that occurs in about 55 percent of patients and should raise the suspicion of Leptospirosis.

Complications in a small subset of infected individuals include jaundice and renal failure, pulmonary hemorrhage, acute respiratory syndrome, inflammation of the eyes, neuropathy, inflammation of the heart and skeletal muscles. Renal failure may lead to electrolyte abnormalities requiring supportive care. These complications can carry a high mortality rate, even in hospitalized patients.

Antibiotics can help with mild to moderate infections. Patients with severe manifestations need hospitalization for supportive care and intravenous antibiotics. Prevention control follows the logical measures through avoiding stagnant water and animal farm water runoff, rodent control, and protection of food from animal contamination. In endemic areas, prophylaxis with the antibiotic doxycycline seems to reduce cases of Leptospirosis.

The immediate dramatic events of a hurricane garner much media attention: the news correspondent leaning into the gale force winds trying to describe the storm into his microphone while the wind howls; or residents of the devastated communities emerging from the shattered homes wading in chest-high water. However, the most concerning aspects of these catastrophes develop long after the storm has subsided. The public health infrastructure is often dismantled by the storm and delays the immediate care needed to prevent problems from injuries, exposure to hazards and drownings. Initial infections are mainly gastrointestinal and wound-related.

Flood waters are heavily contaminated by sewage waste and toxic chemicals. These can lead to issues such as severe and prolonged diarrhea. These conditions can be lethal for the very young and elderly. In Haiti after the 2010 earthquake, cholera introduced by UN aid workers became a serious epidemic. Small wounds can become readily infected, leading to sepsis.

Tetanus, for which a vaccine is readily available, can become a serious concern as puncture wounds are likely when wading in contaminated water and soil. Waterborne mosquito infections can spread viruses like Zika, dengue and West Nile disease. Orthopedic injuries are also more common in this phase of the recovery as people set to

rebuild their lives again.

These are only the more immediate physical impacts. Later, the anxiety and depression from those traumatized and displaced permeate into the community.

What is alarming in Puerto Rico is the discrepancy between optimistic official reports and the desperate urgency with which local officials are requesting assistance. Without establishing direct lines of communications throughout the region and triaging the appropriate services to these regions, matching resources with needs will remain a dire problem.

Suffering from such destructive processes can be reduced and communities made whole again. Such storms are predictable, and a network of islands and countries could prepare material, personnel, and finances to come to each other's aid and assistance.

Necessary internationally based emergency organizations could be assembled to respond to these devastations. The technological expertise is more than possible. An effective humanitarian response would entail the rapid deployment of the resources of the country to mitigating the disastrous consequence of the hurricane.

However, the subordination of the needs of those suffering from the effects of Hurricane Maria, and Harvey and Irma before it, to the capitalist market means that the relief effort is deplorably underfunded and bureaucratically mismanaged. President Trump's response—demanding that aid to the island be predicated on repayment of debt—is the most honest expression of the contempt on the part of US authorities for the plight of the Puerto Rican population.



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