



Perspective

Responding to Cholera in Post-Earthquake Haiti

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The earthquake that struck Haiti on January 12, 2010, decimated the already fragile country, leaving an estimated 250,000 people dead, 300,000 injured, and more than 1.3 million homeless. As

camp for internally displaced people sprang up throughout the ruined capital of Port-au-Prince, medical and humanitarian experts warned of the likelihood of epidemic disease outbreaks. Some organizations responding to the disaster measured their success by the absence of such outbreaks, though living conditions for the displaced have remained dangerous and inhumane. In August 2010, the U.S. Centers for Disease Control and Prevention (CDC) announced that a National Surveillance System that was set up after the earthquake had confirmed the conspicuous absence of highly transmissible disease in Haiti.

However, on October 20, more

than 55 miles from the nearest displaced-persons camp, 60 cases of acute, watery diarrhea were recorded at L'Hôpital de Saint Nicolas, a public hospital in the coastal city of Saint Marc, where Partners in Health has worked since 2008. Stool samples were sent to the national laboratory in Port-au-Prince for testing. The hospital alerted Ministry of Health representatives in the region and in the capital, as well as World Health Organization representatives managing the Health Cluster, a coordinating group formed after the earthquake. In the next 48 hours, L'Hôpital de Saint Nicolas received more than 1500 additional patients with acute diarrhea.

By October 21, preliminary results from the national laboratory confirmed our clinical impressions: though cholera had not been seen in Haiti in at least a century and may never have been recorded in laboratory-confirmed cases, it had somewhat unexpectedly emerged in a densely populated zone with little sanitary infrastructure and limited access to potable water. As the contours of the epidemic began to take shape, following the winding course of a large river in the Artibonite region, hospitals in central Haiti started recording rapidly increasing numbers of cases of acute diarrhea. Between October 20 and November 9, Partners in Health recorded 7159 cases of severe cholera. Among these patients, 161 died in seven of its hospitals in the Central and Artibonite regions.

In Port-au-Prince, sporadic cases were reported in the early

phase of the outbreak; most were deemed “imported cases.” On November 8, 48 hours after Hurricane Tomas caused flooding and worsening of living conditions in Parc Jean-Marie Vincent, one of the largest settlement camps, Partners in Health reported seven clinical cases of cholera within the camp. On the same day, Doctors without Borders reported seeing as many as 200 patients with cholera in nearby slums. By November 9, the Ministry of Health had reported 11,125 hospitalized patients and 724 confirmed deaths from cholera.

Although we responded as quickly as we could, we were hampered by the rapidity with which the epidemic spread, overwhelming our hospitals with hundreds of patients and stretching already thin resources, staff, and materials. Because there was minimal practical institutional knowledge about cholera in Haiti, we worked with other nongovernmental organizations to design treatment protocols and institute infection-control measures in affected hospitals. Our network of community health workers began distributing oral rehydration salts, water-purification systems, and water filters and instructing people about hygiene, hand washing, and decontamination of cadavers. Body bags were distributed to community leaders, and rehydration posts were set up throughout the countryside. A network of cholera treatment centers and stabilization centers was established in coordination with the Ministry of Health.

The cholera outbreak took most people by surprise. Unexpectedly, it was centered in rural Haiti and not in the displaced-person camps that are situated mainly in the greater Port-au-Prince area. But

history would suggest that an epidemic outbreak of waterborne disease was just waiting to strike rural Haiti. It is well known that Haiti has the worst water security in the hemisphere. In 2002, it ranked 147th out of 147 countries surveyed in the Water Poverty Index.¹ After the earthquake, more than 182,000 people moved from the capital to seek refuge with friends or family in the Artibonite and Central regions, increasing stress on small, overcrowded homes and communities that lacked access to latrines and clean water. In addition, in many areas of Haiti, the costs associated with procuring water from private companies and the lack of adequate distribution systems have rendered potable water even less accessible for those most at risk.

Waterborne pathogens and fecal-oral transmission are favored by the lack of sanitation in Haiti. Typhoid, intestinal parasitosis, and bacterial dysentery are common. Only 27% of the country benefits from basic sewerage, and 70% of Haitian households have either rudimentary toilets or none at all.² But the sudden appearance of cholera, a pathogen with no known nonhuman host, raises the question of how it was introduced to an island that has long been spared this disease. Speculations on this question have caused social and political friction within Haiti in recent weeks. Early in the epidemic, the CDC identified the cholera strain *Vibrio cholerae* O1, serotype Ogawa, biotype El Tor. Chin and colleagues (10.1056/NEJMoa1012928) report on DNA sequencing of two isolates from the recent outbreak, which showed that the cholera strain responsible for the Haitian epidemic orig-

inated in South Asia and was most likely introduced to Haiti by human activity. The implications of the appearance of this strain are worrisome: as compared with many cholera strains, it is associated with increased virulence, enhanced ability to survive in the environment and in a human host, and increased antibiotic resistance. These factors have substantial epidemiologic ramifications for the entire region and implications for optimal public health approaches to arresting the epidemic's spread.

As the infection makes its way to the capital city, there is debate about the likely attack rate inside displaced-person camps, as compared with the rate in surrounding communities. The latter often have worse access to water and sanitation than the former. But 521 of 1356 displaced-person camps listed by the United Nations camp-management cluster reportedly have no water or sanitation agency, and most are far from reaching the established guidelines for sanitation in humanitarian emergencies.³ The living conditions of most of Haiti's poor, whether they're living in camps or communities, are equally miserable in terms of the risk of diarrheal disease.

The reported numbers of cases and deaths, though shocking, represent only a fraction of the epidemic's true toll. We have seen scores of patients die at the gates of the hospital or within minutes after admission. Through our network of community health workers, we have learned of hundreds of patients who died at home or en route to the hospital. In the first 48 hours, the case fatality rate at our facilities was as high as 10%. Though it dropped to less than 2% in the ensuing days as

the health system was reinforced locally and patients began to present earlier in the course of disease, mortality will most likely climb as the disease spreads and Haiti's fragile health system falters.

This most recent crisis in Haiti has reinforced certain lessons regarding the provision of services to the poor. Complementary prevention and care should be the primary focus of the relief effort. Vaccination must be considered as an adjunct for controlling the epidemic, and antibiotics should be used in the treatment of all hospitalized patients. These endeavors should proceed in concert with much-needed improvements to sanitation

and accessibility of potable water. More generally, reliable partnerships are essential, especially if local partners are dependable and have practical experience and complementary assets. Long-term reinforcement of the public-sector health system is a wise investment, permitting provision of a basic minimum set of services that can be built upon in times of crisis. And community health workers who can be rapidly mobilized as educators, distributors of supplies, and first responders are a reliable backbone of health care. In Haiti, such workers can bring the time-sensitive lifesaving therapy of oral rehydration right to the patient's door.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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