

# Improving Hurricane Harvey Disaster Research Response Through Academic–Practice Partnerships

After Hurricane Harvey, researchers, media, and public health agencies collected data in Houston, Texas, to assess potential health effects and inform the public. To limit redundancy and ensure sampling coverage of impacted areas, research and practice partners used disaster research response (DR2) resources and relied on partnerships formed during a 2015 DR2 workshop in Houston. Improved coordination after the disaster can improve the effectiveness and efficiency of DR2 and enable the use of data to improve recovery and preparedness for future disasters. (*Am J Public Health*. 2019;109:1198–1201. doi:10.2105/AJPH.2019.305166)

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**S**cientifically sound and highly coordinated research should be conducted during disaster response to protect human health and improve community resilience to future disasters. The National Institutes of Health's Disaster Research Response Program (DR2) provides a framework for research related to public health emergencies.

## INTERVENTION

Conducting research in post-disaster settings requires academic–practice collaborations to address challenges associated with planning, coordination, and rapid execution.<sup>1,2</sup> To improve research in this setting, the National Institute of Environmental Health Sciences (NIEHS), in collaboration with the National Library of Medicine, developed the DR2. DR2 promotes timely and coordinated disaster research through publicly accessible data collection tools, multistakeholder exercises, a network of trained research responders, and integration with emergency preparedness, response, recovery, and mitigation activities and frameworks. Elements of DR2 include questionnaires, training materials, disaster research protocols pre-reviewed for human participants, subject matter experts, and a support infrastructure to facilitate research responses (<https://dr2.nlm.nih.gov>).

To support the use of these elements, NIEHS convened workshops where public health, emergency management, academic researchers, and community stakeholders explored how to improve data collection and critical health-related research in response to disasters in Los Angeles, California (2014); Houston, Texas (2015); and Boston, Massachusetts (2016). The Houston workshop, conducted 2.5 years before Hurricane Harvey, was developed in response to a report highlighting preparedness gaps of the Houston Ship Channel, a 50-mile human-made port linking Houston to the Gulf of Mexico. In the scenario, storm surge associated with a major hurricane damaged storage tanks and barges in the Houston Ship Channel, and floodwater containing chemicals and contaminated sediments was distributed into communities. Attendees included 80 representatives from federal, state, and local governments (e.g., fire,

police, and emergency management); public health and hospitals; academia; and industry. The workshop facilitated new collaborations among attendees, some that were used for DR2 activities after Hurricane Harvey.

## PLACE AND TIME

Hurricane Harvey made landfall as a Category 4 storm on August 26, 2017 near Rockport, Texas. The wettest tropical cyclone to affect the United States, Harvey's effects were widespread and resulted in flooding that the National Weather Service called “catastrophic, devastating, and deadly.”<sup>3</sup>

## PERSON

In Houston—a metropolitan area with 6.7 million residents and 16 superfund sites—flooding potentially exposed residents to chemicals and toxins as

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wastewater treatment facilities, petrochemical complexes, refineries, and municipal and industrial waste storage sites were flooded. The Harris County Flood District estimated that 70% of the county was flooded to at least 18 inches, with 1447 square kilometers inundated (Figure 1). Public safety officials rescued more than 10 000 residents from their homes; volunteers rescued thousands more.<sup>4</sup> Economic damages were estimated at \$180 billion.<sup>4</sup>

### PURPOSE

In the days after Hurricane Harvey, researchers, media, state and local agencies, and nonprofit organizations (1) conducted environmental and biological sampling, community health assessments, and surveys; (2) developed registries to track long-term health and housing;

and (3) supported access to health care and other services. Various stakeholders worked to improve coordination and research translation to the public. The Houston Health Department contacted academic and nonprofit groups to supplement internal capacity and worked to facilitate information sharing. The Houston Health Department also developed a geographic information systems-based online map to support the sharing of sampling locations and analytical results.

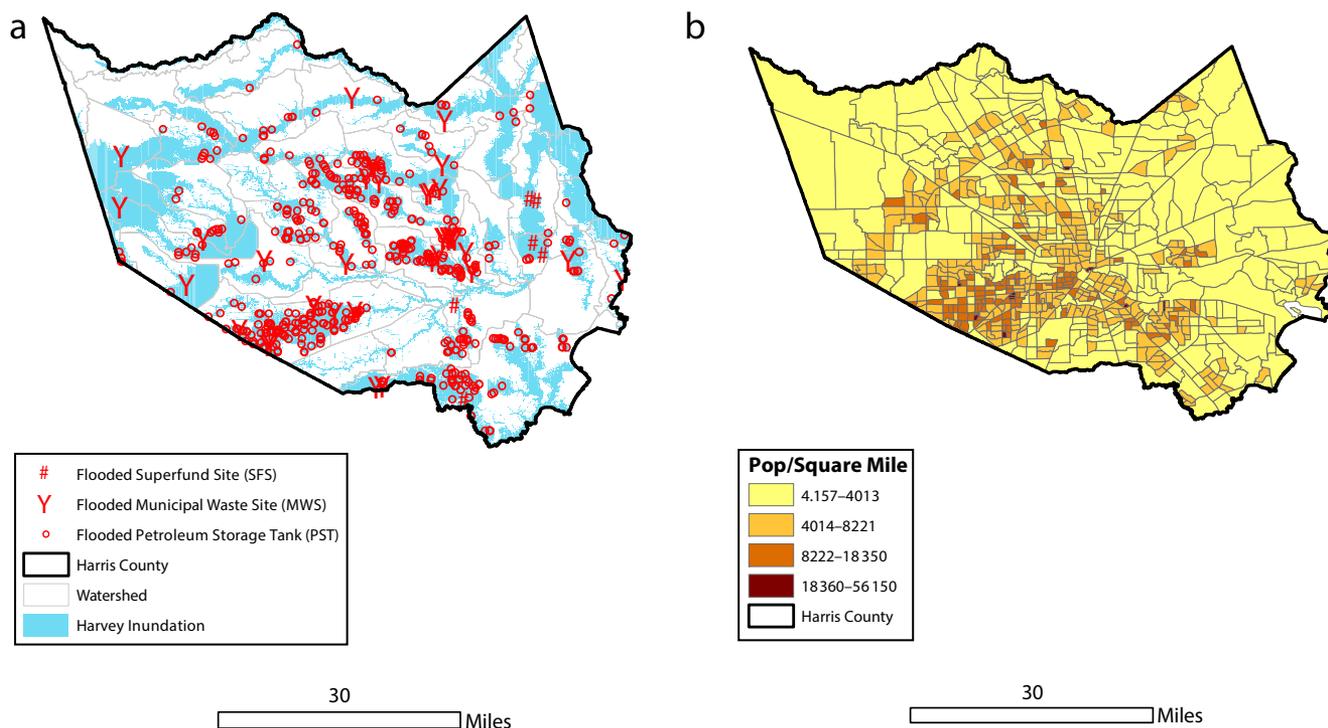
NIEHS senior scientists and DR2 program managers held weekly teleconferences among academic institutions, federal funding agencies, and non-governmental organizations, most of which attended the 2015 workshop (see the box on page 1200). Notes and spreadsheets summarizing data collection and research activities and plans, study locations, target populations,

organizations involved and collaborations, points-of-contact, and investigator needs were provided to teleconference participants by DR2 to create a common operational picture related to ongoing efforts, reduce overlap, share funding opportunities, and foster data collection and analysis efforts.

### IMPLEMENTATION

Thanks in part to the 2015 Houston DR2 workshop, research collaborations quickly formed across institutions, using expertise and ongoing activities to pursue questions concerning the health and environmental impacts of Hurricane Harvey. The DR2 program's resources, including questionnaires and data collection protocols, were used to support rapid implementation. The Houston Health

Department's geographic information systems mapping efforts aided efforts to avoid duplication, reduce participation burdens to residents and community partners suffering from flooding, and target areas with baseline data for data collection. Texas A&M researchers were able to revisit areas in the environmental justice neighborhood of Manchester, where samples had been collected before Hurricane Harvey on the basis of residents' predisaster concerns about environmental exposures.<sup>5</sup> Other researchers addressed research distrust by working with established partners in Pleasantville and Highlands. In areas not sampled before Hurricane Harvey, practice partners used online maps to identify areas of potential concern (e.g., such as flooded parks), enabling a targeted plan for longitudinal data collection and engagement of graduate students.



Source. Harris County Flood Control District and Federal Emergency Management Agency.

**FIGURE 1—Harris County and Houston, Texas, (a) Inundation of Toxic Sites by Hurricane Harvey and (b) Population: August–September 2017**

## HURRICANE HARVEY DISASTER RESEARCH RESPONSE (DR2) STAKEHOLDERS ATTENDING HOUSTON DR2 WORKSHOP AND PARTICIPATING IN POST-HARVEY DR2 TELECONFERENCES: TEXAS, SEPTEMBER 2017–MAY 2018

### ACADEMIC INSTITUTIONS

#### Texas

Texas A&M University  
 University of Houston  
 University of Texas Health Science Center at Houston  
 University of Texas Austin  
 University of Texas Medical Branch Galveston  
 Rice University  
 Baylor College of Medicine  
 Texas Southern University

#### Other

Oregon State University  
 Mt. Sinai School of Medicine  
 New York University  
 Stony Brook University  
 University of North Carolina at Chapel Hill  
 University of Colorado Boulder  
 University of Arizona  
 University of Michigan  
 Wayne State University  
 Virginia Tech  
 University of Washington

### FEDERAL AGENCIES

Centers for Disease Control and Prevention (CDC)  
 Department of Homeland Security (DHS)  
 National Institutes of Health (NIH)  
 National Institute of Standards and Technology (NIST)  
 National Science Foundation (NSF)

### STATE, COUNTY, LOCAL AGENCIES

Texas Department of State Health Services  
 Harris County Public Health  
 Houston Health Department

## EVALUATION

The Houston DR2 workshop, on the basis of a scenario similar to that of Hurricane Harvey, fostered coordination among local groups to conduct disaster research in affected communities and collect environmental, physical, and mental health data. A 2017 evaluation of the workshop completed before Hurricane Harvey indicated that participants had continued

efforts in developing collaborations, preparing data collection protocols, and planning for the next disaster.<sup>6</sup> DR2 activities bore out those results after Hurricane Harvey. For example, during the workshop, participants indicated that preapproved institutional review board documents would be helpful but a challenge for academic institutions to acquire. However, after Hurricane Harvey, Texas A&M,

Baylor College of Medicine, and the University of Texas Medical Branch worked together using protocols housed at one institution to collect multiple types of samples.

A 2016 workshop convened by the DR2's Special Considerations for institutional review board Review of Disaster and Emergency Related Public Health Research facilitated protocol development. More formal evaluations of DR2 activities related to Hurricane Harvey are under way; however, efforts to promote the development, implementation, and coordination of timely data collection across multiple stakeholders as part of DR2 workshops appear to have been successful. The DR2 network in Houston used pre-existing relationships, baseline data, and DR2 tools and protocols to quickly implement studies guided by local public health agencies to benefit the work of all involved. Federal agencies also helped with engagement and partnerships across the extramural funding community (e.g., NIEHS time-sensitive research opportunities).

## ADVERSE EFFECTS

Concerns related to DR2 include ethical considerations, such as minimizing risk and promoting benefits, informed consent, and protecting confidentiality.<sup>7</sup> Additional considerations involving timeliness of reporting results and addressing community concerns about health effects of environmental exposures remain an ongoing challenge that must be proactively addressed by inclusivity, transparency, and ongoing communications between researchers and communities.

## SUSTAINABILITY

Researchers and public health authorities need ongoing training and exercises to continue enhancing DR2 capabilities. Resources provided by DR2 (e.g., such as validated field methods and technical assistance) were deemed helpful and should continue to enhance capacities at state and local levels. Although strategies and methods may require modification in response to differing situations, ongoing DR2 efforts using validated data collection approaches and tools ensure that results can inform future preparedness, response, recovery, and mitigation efforts. On the basis of our experience after Hurricane Harvey, we hope to work with DR2 to develop new protocols for using geographic information systems-based tools to coordinate postdisaster data collection. These partnerships are critical in evaluating, revising, and sustaining DR2 and will (1) enhance existing geographic information system infrastructure for collection, warehousing, and visual display of DR2 data and (2) contribute to preparedness, response, recovery, and mitigation.

## PUBLIC HEALTH SIGNIFICANCE

Improving research after disasters is critical for contextualizing perishable data for the use of academic, practice, and community stakeholders. DR2 is critical to building capacity, mitigating health impacts, and supporting recovery. Primary benefits of the coordination of DR2 among collaborating institutions include research team safety, human participant protections, and the

efficient and effective use of limited resources. *AJPH*

### CONTRIBUTORS

J. A. Horney led the development of the initial draft of the article. All authors subsequently contributed to the critical editing of the article.

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### CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

### HUMAN PARTICIPANT PROTECTION

No protocol approval was necessary because no human participants were involved in this study.

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