

Building Public Health Resilience to Severe Weather in a Changing Climate

Workshop Report
March 28-29, 2019 | San Juan, Puerto Rico



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Workshop Overview

Variations in weather and climate routinely affect public health by increasing the risk of disease transmission, damaging infrastructure that impacts access to health care, and degrading air quality, among others. Although the interrelated nature of climate variability and change and public health well known, weather and climate science has not been integrated into public health decision-making to the fullest possible extent. With advances in climate and weather forecasting, monitoring and the availability of data, as well as a heightened awareness of impacts of climate on public health, there are new opportunities to create useful informational resources. The purpose of the workshop was to begin to identify those opportunities where weather and climate information intersect public health concerns (Figure 1). Finding the tractable and useful opportunities requires engaging the public health experts.

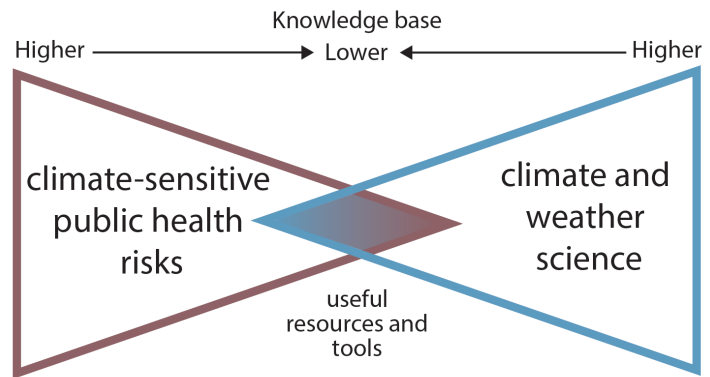


Figure 1. IRAP project is focused identifying opportunities for weather and climate science to be brought to bear on public health decision-making and developing useful information resources or tools.

We convened a 1.5-day workshop between March 28 and 29 in San Juan. A total of 19 participants from civic organizations, academia, federal and state agencies, and 10 members of the research team attended. Participants brought diverse expertise and work in fields related to infectious disease, respiratory illnesses, cancer, and weather and climate services.

The goals of the workshop were to: (1) identify climate-sensitive public health concerns that are of high priority; (2) identify the weather and climate impacts on these concerns; and (3) determine opportunities for weather and climate information to inform public health decision-making.

On the first day, the workshop began with two presentations by the research team on preliminary public health and climate assessments, followed by small group discussions identifying main public health concerns, climate risks, and contextual factors that influence the risks. On day two, plenary group discussions focused on three main climate-sensitive public health concerns: respiratory illnesses, vector-borne diseases, and chronic illnesses.

Summary of Climate and Public Health Assessments

To help create a common understanding among the diverse audience, the team presented preliminary findings from assessments of public health and a climate conditions in Puerto Rico. Group discussions then built on this knowledge.



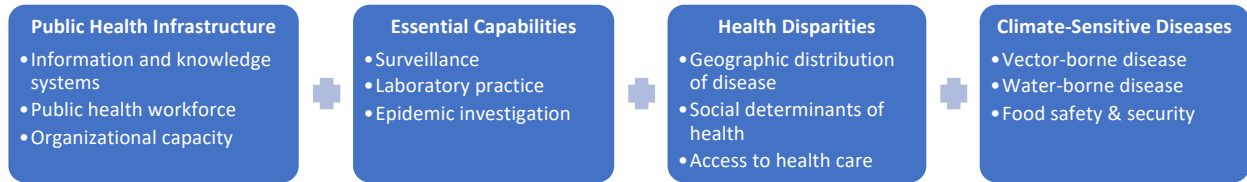


Figure 2. The four environmental assessment domains

The public health assessment provided an overview of Puerto Rico’s public health infrastructure, essential capabilities for surveillance and laboratory practice, historic burden of health disparities, and climate-sensitive diseases (*Figure 2*).

Preliminary findings from this scan were presented to the participants on the first day of the workshop by the research team. The scan highlighted key challenges for public health infrastructure, such as a lack of critical care health facilities, shortage of physicians, and aging population. Findings also note that surveillance and reporting is uneven among the key public health concerns. Puerto Rico has regular surveillance of vector-borne diseases (e.g., dengue, chikungunya, Zika), tuberculosis, HIV/AIDS, and other diseases. In December 2018, the National Electronic Disease Surveillance System Base System was implemented in Puerto Rico as a surveillance system for all disease programs. Puerto Rico also has one Level 2 Laboratory Response Network chemical laboratory, which detects exposure to various toxic chemical agents.

Health and social disparities are significant in Puerto Rico, with rural and mountainous regions experiencing more constrained access to health care services and poorer health outcomes. The high rates of poverty, disability and populations that are aging in Puerto Rico also have implications for disaster preparedness and response. The environmental scan concluded with an examination of the cumulative and interactive effects of Hurricane Maria on health outcomes and disparities.

The climate assessment presented monthly and seasonal rainfall and surface temperatures for San Juan to demonstrate annual and seasonal variability within the context of public health. Monthly rainfall and surface temperature time series were placed into context of climate change scenarios when the new normal of the future is expected to resemble the extreme values from today. Both the climate and public health assessments show that temperature and precipitation patterns impact outbreaks of diseases like leptospirosis, dengue, chikungunya, and Zika. High temperatures in San Juan and Bayamón have also been linked to increases in mortality, particularly from cardiovascular disease and stroke. Additionally, Puerto Rico experiences high rates of asthma, which are exacerbated by aeroallergens (e.g. mold, pollen) and potentially African Dust Events.



Group Discussion Highlights

During the first day of the workshop participants identified the key public health concerns influenced by weather and climate, as well as the weather and climate factors that impact those concerns (*Figure 3*). These included respiratory diseases (e.g., asthma, COPD), heat stress-related diseases (e.g., cardiovascular disease), vector-borne diseases (e.g., dengue, Zika), and mental health. Cancer, influenza, and rabies were also discussed. While cancer is not directly caused by weather or climate conditions, cancer patients are among the most vulnerable groups to climate hazards. Depressed immune system of cancer patients makes them susceptible to any climate stressors that exacerbate their health conditions.

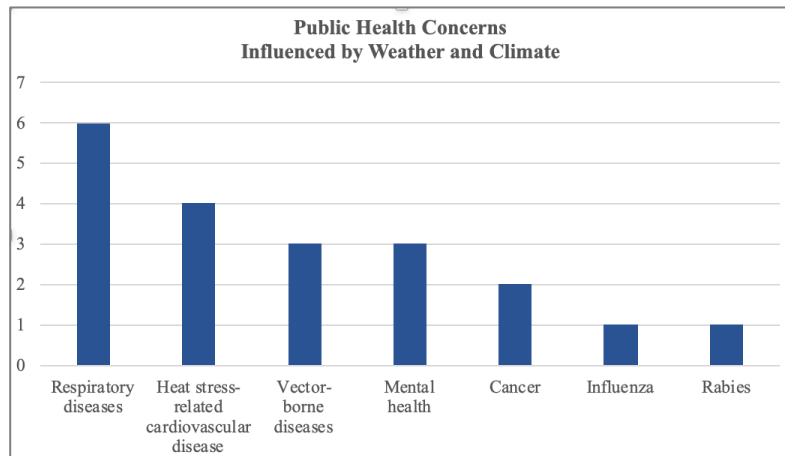


Figure 3. Key public health concerns influenced by weather and climate identified on the first day of the workshop.

The key weather and climate factors discussed included heat, hurricanes, drought, precipitation, and the El Niño–Southern Oscillation (ENSO). Participants described the increased demand on the health care system and increased disease prevalence as a result of these climate stressors. Participants also discussed the role of weather events in disrupting screening, diagnostics, reporting, treatment, and re-evaluation. For heat-related diseases, group discussions showed relationships between climate stressors, amplifying or mitigating circumstances, and consequences. Although not fully explored in this workshop, a mitigating action to heat-disease was identified (*Figure 4*).

Many participants referred to recent experiences with Hurricane Maria, including the loss of electricity and disruption of telecommunication services in Puerto Rico. Other influential factors discussed included the shortage of physicians, constrained access to health care services, electrical grid infrastructure challenges, issues with the maintenance of storm-water management systems, lack of critical care health facilities, social determinants of health, and heat tolerance in the local population.

On the second day of the workshop, participants continued to explore climate-sensitive health concerns. Participants re-visited the issues around respiratory disease and vector-borne diseases and also examined chronic disease and the public health system in greater detail. Discussions of



Public Health Concern: Heat-related disease			
Climate Stressors	Consequence, Implications and Impacts	Amplifying or Mitigating Factors	Actions to Reduce Impact
Increase in atmospheric temperature	Loss of electricity	Shortage of physicians	Alternative energy
Drought	Disruption of screening, diagnostics, and reporting	Compromised immune system	
Seasonal climate events like El Nino	Disruption of treatment and reevaluation	Lack of critical care health facilities	
Hurricane	Increased demand on health system	Heat intolerance	
	Disruption of telecommunication services	Social determinants	
	Increase in deaths and premature deaths	Electrical grid infrastructure	
	Damage to infrastructure		
	Increases in cases of CVD, Cancer		

Figure 4. Exploration of the conditions that create, amplify, and reduce the impacts of heat-related diseases.

asthma triggers highlighted the threats of mold and fungal spores in the rainy season and the threat of dust in the dry season. These triggers were reportedly influenced by larger climate phenomenon, including El Niño-Southern Oscillation (ENSO) and African Dust Events. Vector-borne disease discussions centered primarily on dengue outbreaks. Participants highlighted that the combination of precipitation, temperature, breeding sites, mosquito population, virus serotype, and the population's immunology determine the occurrences of outbreaks. Discussions on chronic disease focused on cancer, diabetes, cardiovascular disease, and renal diseases, as well as issues of comorbidity and access to medication during emergencies. Lastly, participants discussed general issues of well-being, mental health, and quality of life amidst extreme climate events. Participants described the limited resources and high demand for public health services during a crisis, emphasizing the need to improve the mobilization of resources to manage extreme events and disease outbreaks.

Emerging Opportunities

Participants began to identify opportunities for collaboration between the public health and the weather and climate communities. Participants expressed a need for better access to tailored information for decision-making in public health. It was determined that disease surveillance and warning systems need to be supported with climate information, for example, by establishing climate thresholds for disease transmission and outbreaks.

In reflecting on the discussions, the following ideas could lead to new collaborations and opportunities for climate information to be brought to bear on public health concerns.



- The identification of useful climate-related decision support tools and best practices for integrating climate science in public health decision-making, drawing on examples from Puerto Rico and other countries, could serve as a useful guide. As one workshop participant summarized, other places are having similar conversations and implementing activities. This awareness could help advance knowledge and actions in Puerto Rico.
- Convene workshops or a seminar series to facilitate a multidisciplinary public health and climate-risk dialogue. This could strengthen and build new networks. Closer connections between the health practitioners and the weather and climate science community could help develop knowledge and tools around seasonal public concerns. Two promising topics to pursue relate to heat and respiratory issues (e.g. mold and asthma). Future workshops could incorporate the island-wide community to discuss actions, information needs and decision support tools, and planning strategies focused.
- Catalog existing information and data for weather, climate, respiratory, heat-related afflictions, and vector-borne diseases. From this, develop a calendar and/or action-oriented strategies for each public health concern.
- Collaboratively develop stronger messaging the development of stronger messaging around current National Weather Service heat products. There are also opportunities to augment, test, and/or provide feedback on existing heat-related tools developed in the medical community to support existing community efforts.
- Develop a climate and health information platform that helps information and data accessibility.

IRAP Project Goals

Project team members will explore these opportunities, seeking additional insights from public health and climate and weather scientists in Puerto Rico. The objective of the IRAP project is to work collaboratively with decision makers and partner organizations to increase resilience to weather and climate by identifying climate- and weather-related decision support resources (*Figure 1*). Specifically, the project team will first identify and then create and/or tailor informational resources or decision support tools. In the first year, workshops, including the one reported on here, will help highlight applications for new or existing information to build resilience in public health. From this will emerge directed research to be implemented in the second year. In so doing, the project team will investigate: (1) how weather and climate shapes public health decision-making; (2) the types of weather and climate information resources that increase public health resilience; and (3) the challenges and opportunities the in the development of climate science for public health. This project is funded through August 2020.



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Workshop Institutional Representation

A total of 19 participants and 10 members of the research team attended the at least one day of the workshop. They represented the following institutions and groups:

Caribbean Institute of Meteorology and Hydrology	Cancer Control and Population Sciences, Univ. of Puerto Rico	Centers for Disease Control and Prevention-Dengue Branch
Comprehensive Cancer Center, Univ. of Puerto Rico	Department of Environmental and Natural Resources-Coastal Zone Management Program and Climate Change Office.	Department of Health-Environmental Health Office
Endowed Health Services Research Center, School of Medicine, Univ. Puerto Rico	Environmental Protection Agency	Federal Emergency Management Agency
Heart to Heart International	International Research Institute for Climate and Society, Columbia University	Department of Health-Office of Public Health Preparedness and Response
National Weather Service, San Juan Office	Department of Health-Office for Animal Control	Tulane Univ.
Univ. of Arizona	Univ. of Puerto Rico, Medical Sciences Campus	

