DISASTER RELIEF:
HOW TO BUILD
HEALTHCARE RESILIENCE

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Louisiana hospital staff stayed behind to care for 19 babies as Hurricane Laura hit

By Christina Zdanowicz, CNN

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Hospital staff shelter in place as Hurricane Laura swept through Lake Charles, Louisiana.
• Impacts of extreme weather events
• Cases that highlight supply chain, energy system, and hospital infrastructure disruptions
• Toolkits to build climate resilience
Direct and insured losses from weather-related disasters have increased substantially.

Impacts from recent climate-related extremes, such as heat waves, droughts, floods, cyclones and wildfires, reveal significant vulnerability and exposure (very high confidence).

Climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods (high confidence).
“interruption of medical care was the primary cause of sustained high mortality rates in the months after the hurricane, a finding consistent with the widely reported disruption of health systems”
Disproportionate loss of access to health services can further exacerbate health disparities.

- 6.6 million hospital employees
- ~27 million uninsured in U.S.
- ~140 million ED visits annually

High utilizers are infants, nursing home residents, homeless, Black, and people over age 75.

CDC, Kaiser, ACEP
1980-2020 BILLION-DOLLAR DISASTER EVENT FREQUENCY, UNITED STATES

Statistics valid as of July 8, 2020.

https://www.ncdc.noaa.gov/billions/
CASES
Wildfires

In 2018 58,083 wildfires and >8.7 million acres burned in the U.S.

Feather River Hospital evacuation of 280 people
1989 Hurricane Hugo

2017 Hurricane Maria hit Puerto Rico, the largest foreign producer of pharmaceuticals for the U.S. (intravenous fluids, medications, cardiac devices)

12 new shortages of sterile solutions reported in 2017

Mazer-Amirshahi et al, 2018; Mazer-Amirshahi and Fox, 2018; https://www.fda.gov/media/108975/download
43 deaths & 6,300 patients evacuated from 37 healthcare facilities during or after the storm.

Patients were evacuated from the darkened NYU Langone Medical Center at the height of Hurricane Sandy on 29 October 2012. The hospital remained closed for two months after the storm, the emergency room even longer. Image: © Michael Heiman/Getty Images.
<table>
<thead>
<tr>
<th>Providers</th>
<th>Impact</th>
<th>Building</th>
<th>Equipment (elevators, imaging)</th>
<th>Utilities (power, water)</th>
<th>Heating/cooling</th>
<th>Communications/IT</th>
<th>Staff</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>Evacuations/ closures/ reduced services</td>
<td>Flooded</td>
<td>Flooded</td>
<td>Back-up failed</td>
<td>Flooded</td>
<td>Phone/ internet outages</td>
<td>Staff couldn't travel</td>
<td>Limited deliveries</td>
</tr>
<tr>
<td>Nursing homes/ adult care facilities</td>
<td>Evacuations</td>
<td>Flooded</td>
<td>No back-up power</td>
<td>Back-up failed (NH) / no back-up (ACF)</td>
<td>No back-up</td>
<td>Phone/ internet outages</td>
<td>Staff couldn't travel</td>
<td>Limited deliveries</td>
</tr>
<tr>
<td>Community-based providers</td>
<td>Closures / reduced services</td>
<td>Flooded</td>
<td>No back-up power</td>
<td>No back-up</td>
<td>No back-up</td>
<td>Phone/ internet outages</td>
<td>Staff couldn't travel</td>
<td>Limited deliveries</td>
</tr>
<tr>
<td>Home-based providers</td>
<td>Reduced services</td>
<td>Disruptions in patients' homes/residences, e.g. loss of power, elevators not working</td>
<td></td>
<td></td>
<td></td>
<td>Phone/ internet outages</td>
<td>Staff couldn't travel</td>
<td>Delayed deliveries</td>
</tr>
</tbody>
</table>

SIRR Interviews
Tornadoes

- EF5 Medical Center
- 200 MPH
- 45 seconds
- Est Total Cost: $980M
- Est lost revenue: $125M
- 6 deaths

NOAA; HCWH “Safe Haven in the Storm”
Extreme Heat

2010 Heat Wave
24 NICU admissions for heat
No air conditioning in the hospital
Kakkad et al, 2014

12 residents in a Florida nursing home died after Hurricane Irma shut-off power

Salas et al, 2019; NOAA
Dust Storms

An increase in total ICU admissions of 4.8% and respiratory admissions of 9.2% on the day of the storm.
Wastewater Systems
Potable Water
Food
Medications
Energy
Transportation
Infrastructure
RESILIENCE

The ability of a system and its component of parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.
TEN COMPONENTS COMPRISING THE WHO FRAMEWORK FOR BUILDING CLIMATE-RESILIENT HEALTH CARE SYSTEMS
HELP YOUR HEALTH CARE SYSTEM PREPARE
# Overview of Three Resiliency Toolkits for Health Care Facilities


<table>
<thead>
<tr>
<th>Category</th>
<th>Health Care Facility Climate Change Resiliency Toolkit (Canada)</th>
<th>Sustainable and Climate Resilient Health Care Facilities Toolkit (U.S.)</th>
<th>PAHO SMART Hospitals Toolkit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of facility</td>
<td>Hospitals</td>
<td>Hospitals, residential health care, ambulatory care, and home care</td>
<td>Hospitals with 200+ beds, small and medium sized facilities</td>
</tr>
<tr>
<td>Focus resiliency areas</td>
<td>Emergency management, sustainability, infrastructure</td>
<td>Infrastructure, critical services, personnel, supply chain</td>
<td>Sustainability and infrastructure</td>
</tr>
<tr>
<td>Format</td>
<td>Facilitator’s guide, resiliency assessment checklist, resources</td>
<td>Best practices document, 5 element framework, checklists</td>
<td>Hospital Safety Index, the Green Checklist, cost benefit analysis, training aids</td>
</tr>
</tbody>
</table>
Tropical Storm Allison
Hurricane Harvey

Hazard Mitigation Plan
Stakeholder engagement

Installed 48-megawatt combined heat and power utility plant

Relocated their critical infrastructure and program areas above projected flood elevations

Creation of fortified flood gates

42 proactive, sustainable measures to reduce the impact of future extreme weather events
SPAULDING REHABILITATION HOSPITAL

Elevated ground level floor

Backup power on the roof

Reinforced infrastructure for storm surge

https://practicegreenhealth.org/sites/default/files/2019-03/spauldingrehabilitationcase_study__0.pdf
SAN DIEGO MEDICAL CENTER

Solar Costs Dropped by a Factor of 5 Since 2010

Utility Scale Solar Price per kWh

Fossil Electricity Cost Range

Ramez Naam - rameznaam.com
NICKLAUS CHILDREN’S HOSPITAL


Updated exterior to withstand a hurricane Category 4 force winds

Zorrilla C. The View from Puerto Rico—Hurricane Maria and Its Aftermath. NEJM. 2017;377(19).
“New Climate Reality”

Employee trainings
A lifecycle cost analysis
Emissions
Design standards

SMART HOSPITALS TOOLKIT

- Hospital Safety Index
- Green Checklist
- Cost Benefit Analysis
- Training Aids
GEORGETOWN HOSPITAL IN SAINT VINCENT AND THE GRENADINES

58% reduction in electrical consumption following the update
PEEBLES HOSPITAL IN THE BRITISH VIRGIN ISLANDS

Hurricane Irma

PAHO

UW-Madison/CIMSS
CLIMATE-SMART HEALTHCARE

Sustainability
- Lifestyle disease prevention
- Care closer to home
- Low VOC materials
- Local food suppliers
- Waste recycling
- Air quality

Sustainability and Resilience
- Health system strengthening
- Universal health coverage
- Energy, water efficiency
- Daylighting
- Natural ventilation
- Rainwater capture
- Solar shading

Resilience
- Risk and disaster preparedness and planning
- Climate related disease monitoring
- Flood barriers
- Elevation
- Backup generators

Source: Health Care Without Harm/World Bank.

HELP YOUR PATIENTS PLAN
NATIONAL PREPAREDNESS MONTH

2020
Disasters Don’t Wait.
MAKE YOUR PLAN TODAY.

ready.gov

HEALTHCARE READY
STRENGTHEN. SAFEGUARD. RESPOND.

Rx on the Run, healthcareready.org

Address vulnerabilities

Social Determinants of Health
SUMMARY

• Preparedness + Response
• Choose to transform & recover better than before
• We need you! Toolkits need to be utilized to keep our own arenas operational

Health care facility resilience is community resilience.