



DISASTER RELIEF: HOW TO BUILD HEALTHCARE RESILIENCE

Caitlin Rublee, MD, MPH
Assistant Professor of Emergency Medicine
Medical College of Wisconsin
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@CaitlinRublee

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



By [Christina Zdanowicz](#), CNN

🕒 Updated 6:18 AM ET, Fri August 28, 2020



Hospital staff shelter in place as Hurricane Laura swept through Lake Charles, Louisiana.



Mike De Sisti, Milwaukee Journal Sentinel

A satellite map of the Caribbean region, showing the Florida peninsula and the surrounding islands. The map is dark and textured, with white outlines for landmasses. Labels for 'Florida', 'Grand Bahama', and 'Great Abaco' are visible. A vertical white line separates the map from the text on the right.

OUTLINE

- 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)

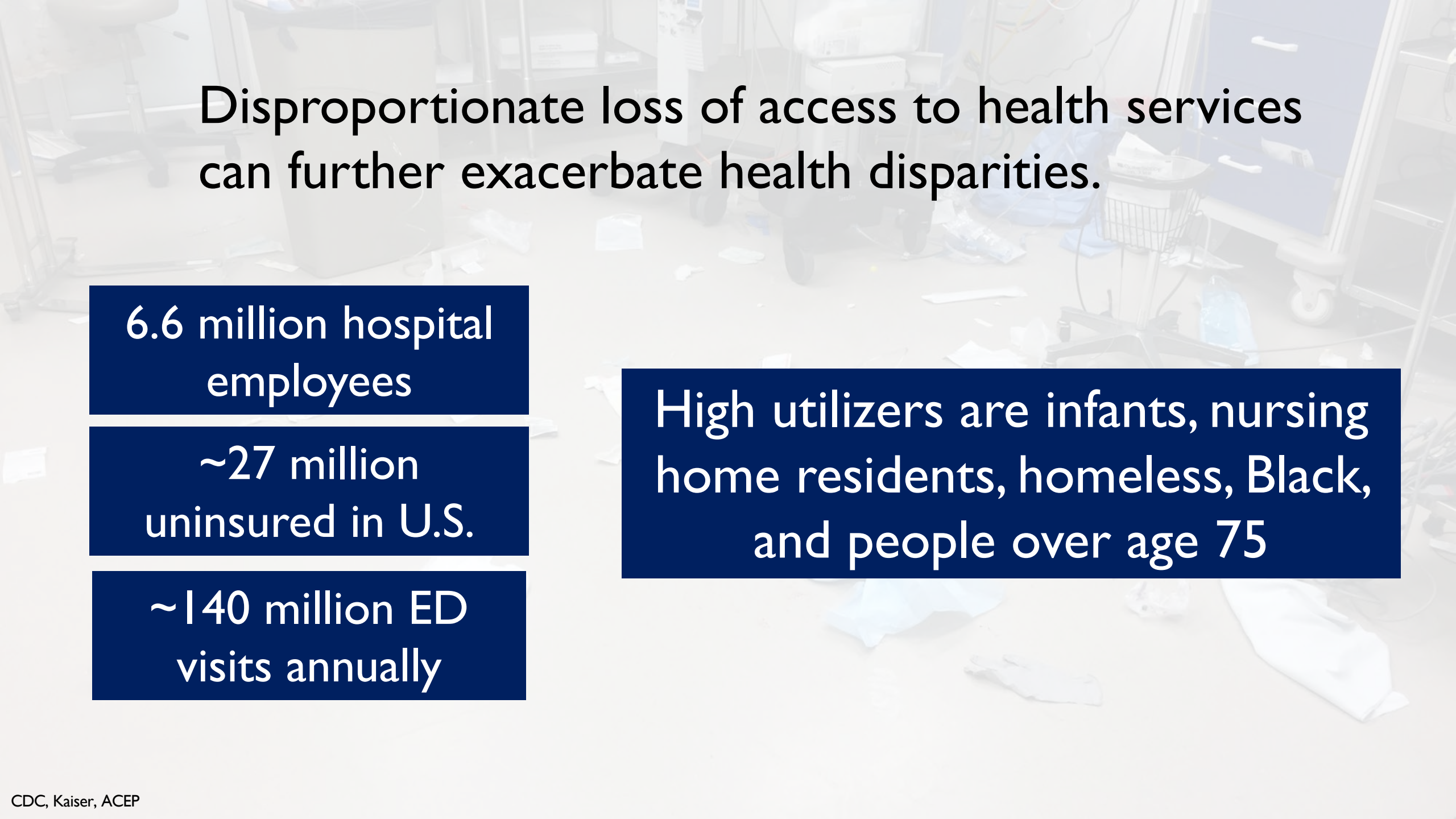
Climate-related hazards exacerbate other stressors, often with **negative outcomes** for livelihoods (high confidence)

SPECIAL ARTICLE

Mortality in Puerto Rico after Hurricane Maria

Nishant Kishore, M.P.H., Domingo Marqués, Ph.D., Ayesha Mahmud, Ph.D.,
Mathew V. Kiang, M.P.H., Irmay Rodriguez, B.A., Arlan Fuller, J.D., M.A.,
Peggy Ebner, B.A., Cecilia Sorensen, M.D., Fabio Racy, M.D., Jay Lemery, M.D.,
Leslie Maas, M.H.S., Jennifer Leaning, M.D., S.M.H., Rafael A. Irizarry, Ph.D.,
Satchit Balsari, M.D., M.P.H., and Caroline O. Buckee, D.Phil.

“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.

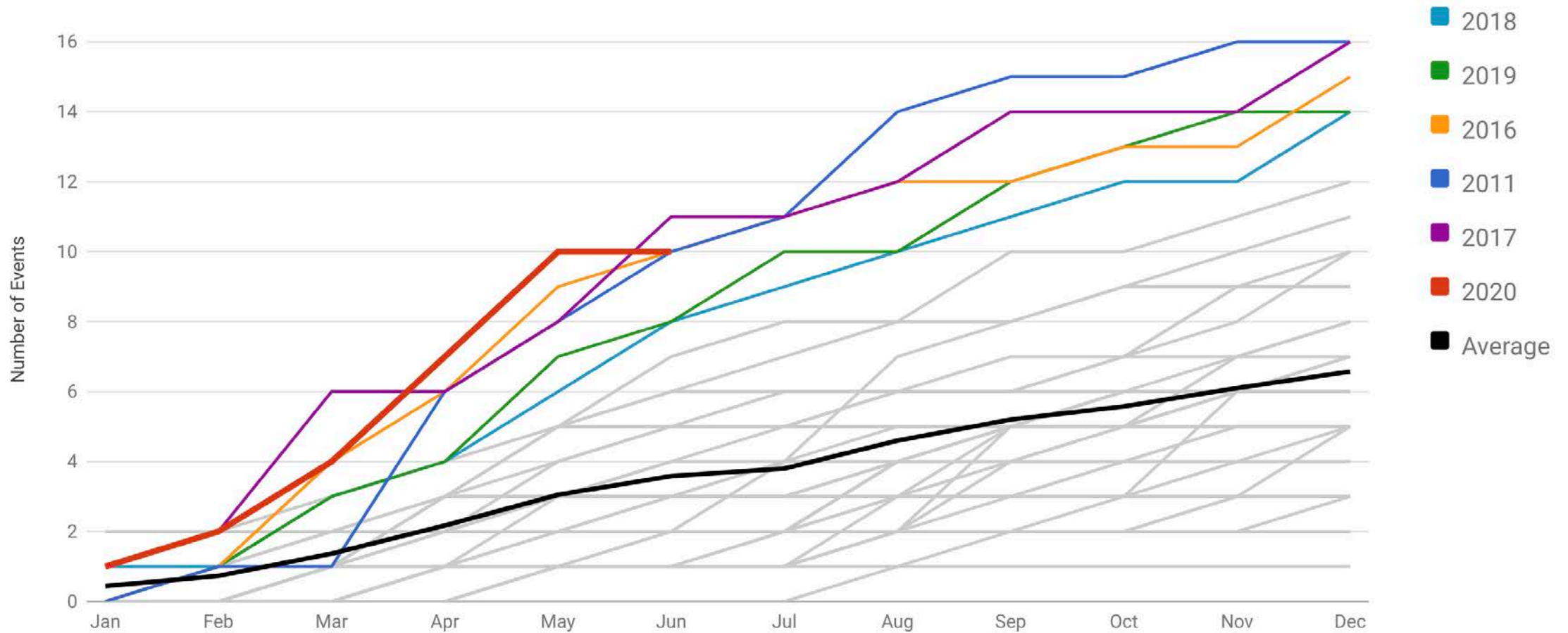
6.6 million hospital
employees

~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

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

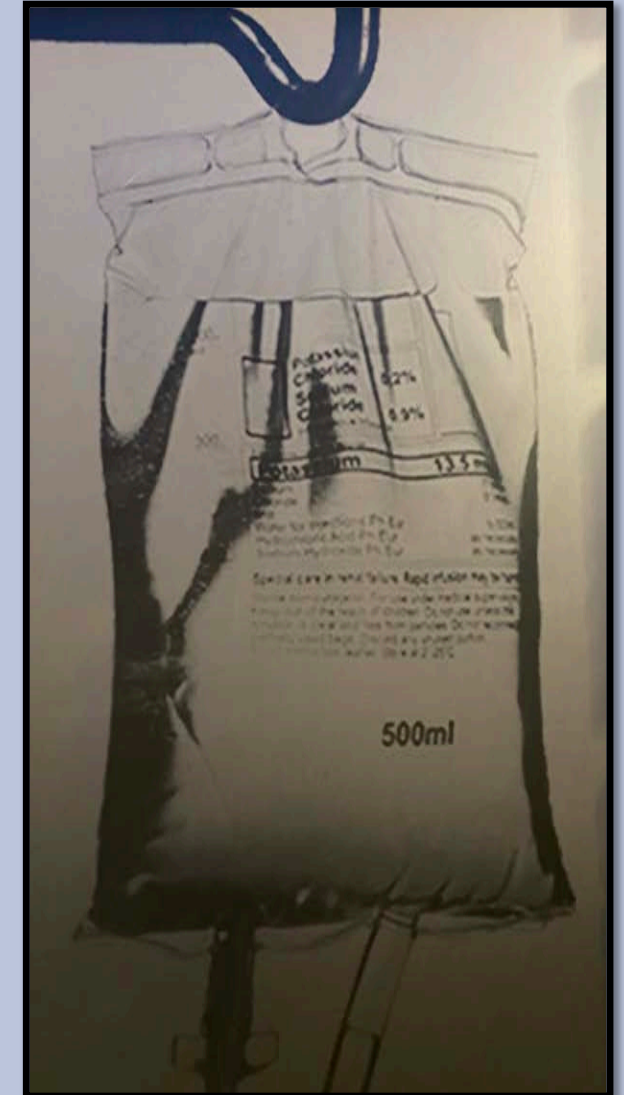


Hurricanes

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



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.

Providers	Impact	Building	Equipment (elevators, Imaging)	Utilities (power, water)	Heating/ cooling	Communi- cations/ IT	Staff	Supplies
Hospital	Evacuations/ closures/ reduced services	Flooded	Flooded	Back-up failed	Flooded	Phone/ internet outages	Staff couldn't travel	Limited deliveries
Nursing homes/ adult care facilities	Evacuations	Flooded	No back-up power	Back-up failed (NH) / no back- up (ACF)	No back-up	Phone/ internet outages	Staff couldn't travel	Limited deliveries
Community-based providers	Closures / reduced services	Flooded	No back-up power	No back-up	No back-up	Phone/ internet outages	Staff couldn't travel	Limited deliveries
Home-based providers	Reduced services	Disruptions in patients' homes/residences, e.g. loss of power, elevators not working				Phone/ internet outages	Staff couldn't travel	Delayed deliveries

Tornadoes



NOAA; HCWH "Safe Haven in the Storm"

EF5
Medical Center

200 MPH

45 seconds

Est Total Cost
\$980M

Est lost revenue
\$125M

6 deaths

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

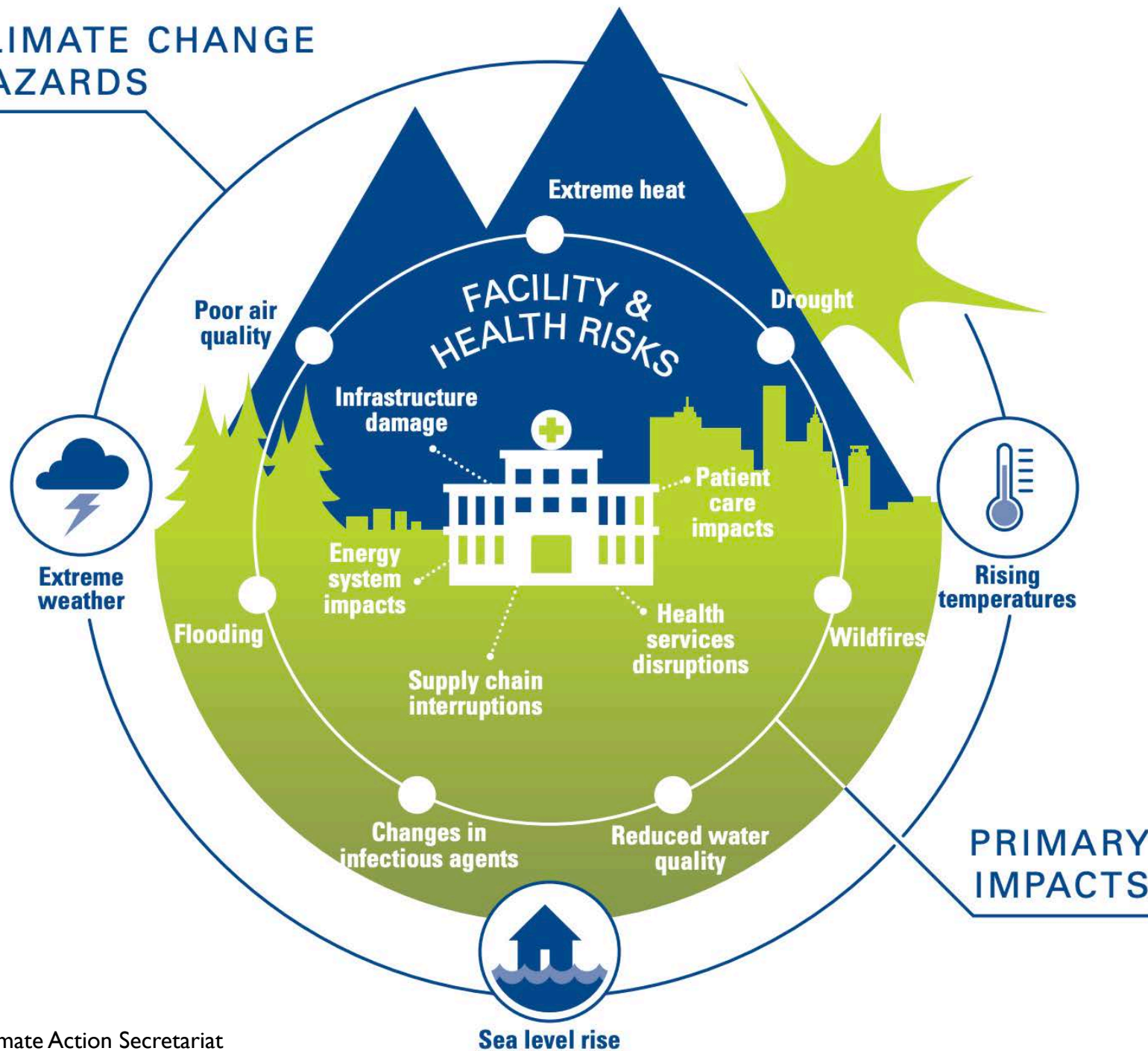


Dust Storms



An increase in
total ICU
admissions of 4.8%
and respiratory
admissions of 9.2%
on the day of the
storm

CLIMATE CHANGE HAZARDS



Wastewater Systems

Potable Water

Food

Medications

Energy

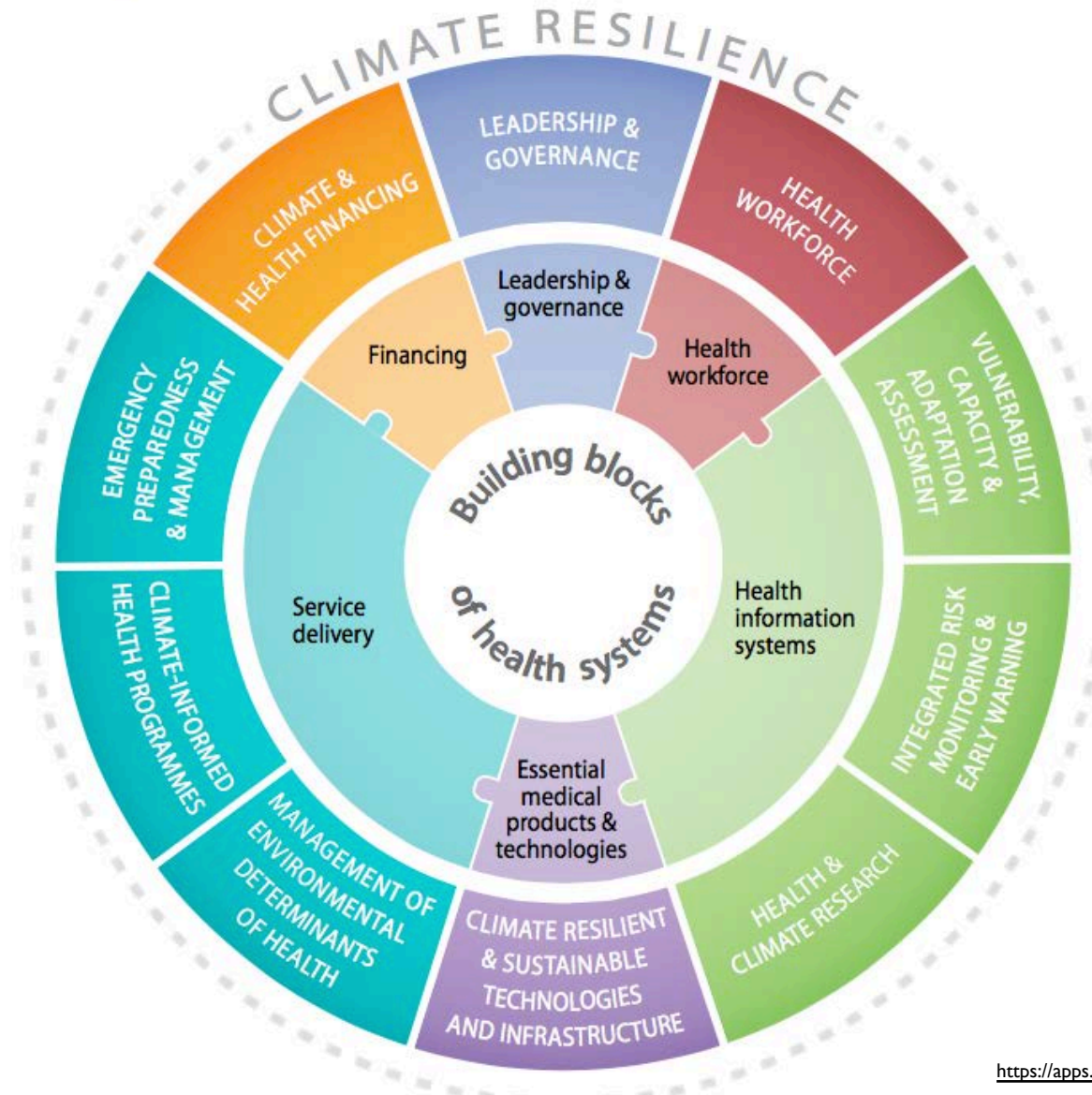
Transportation

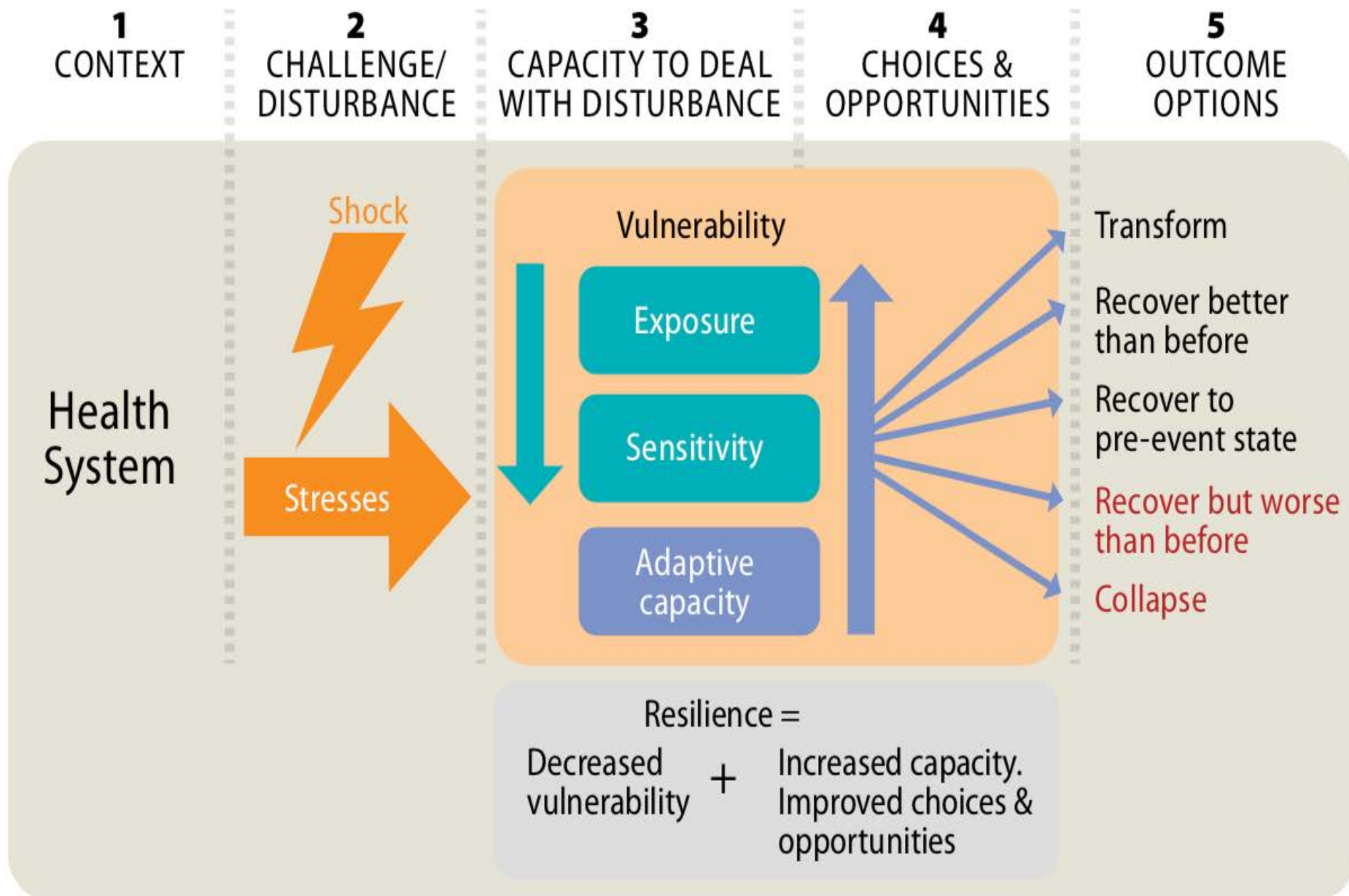
Infrastructure

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





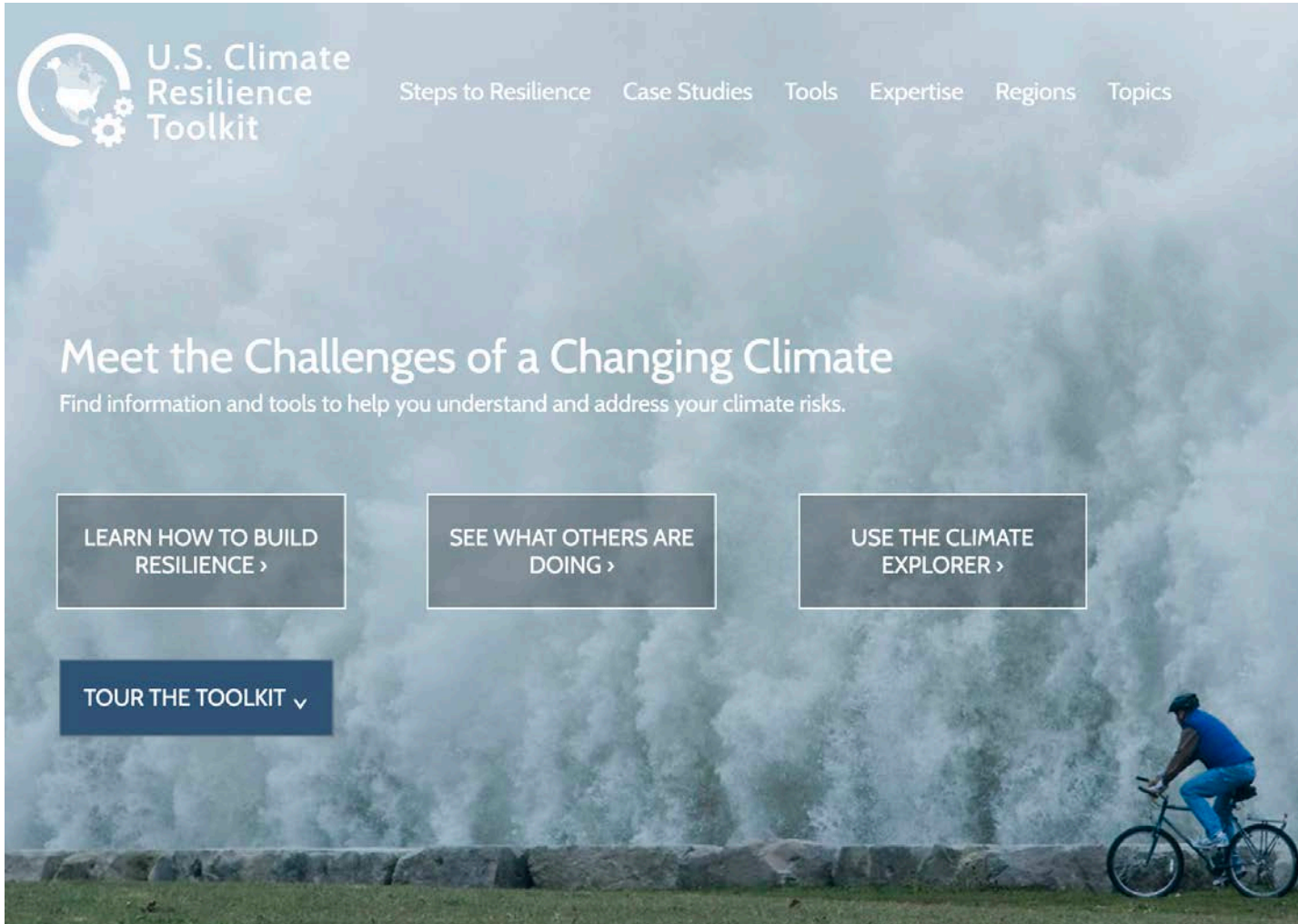
HELP YOUR HEALTH CARE
SYSTEM PREPARE

OVERVIEW OF THREE RESILIENCY TOOLKITS FOR HEALTH CARE FACILITIES

Category	Health Care Facility Climate Change Resiliency Toolkit (Canada)	Sustainable and Climate Resilient Health Care Facilities Toolkit (U.S.)	PAHO SMART Hospitals Toolkit
Type of facility	Hospitals	Hospitals, residential health care, ambulatory care, and home care	Hospitals with 200+ beds, small and medium sized facilities
Focus resiliency areas	Emergency management, sustainability, infrastructure	Infrastructure, critical services, personnel, supply chain	Sustainability and infrastructure
Format	Facilitator's guide , resiliency assessment checklist, resources	Best practices document , 5 element framework, checklists	Hospital Safety Index , the Green Checklist, cost benefit analysis , training aids
Website	http://www.greenhealthcare.ca	www.toolkit.climate.gov	www.paho.org

Modified from Balbus et al, 2016 <https://envirn.org/wp-content/uploads/2017/05/Practice-WG-Article-2.pdf>

SUSTAINABLE AND CLIMATE RESILIENT HEALTH CARE FACILITIES INITIATIVE



<https://toolkit.climate.gov/topics/human-health/building-climate-resilience-health-sector>

UNIVERSITY OF TEXAS MEDICAL CENTER



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

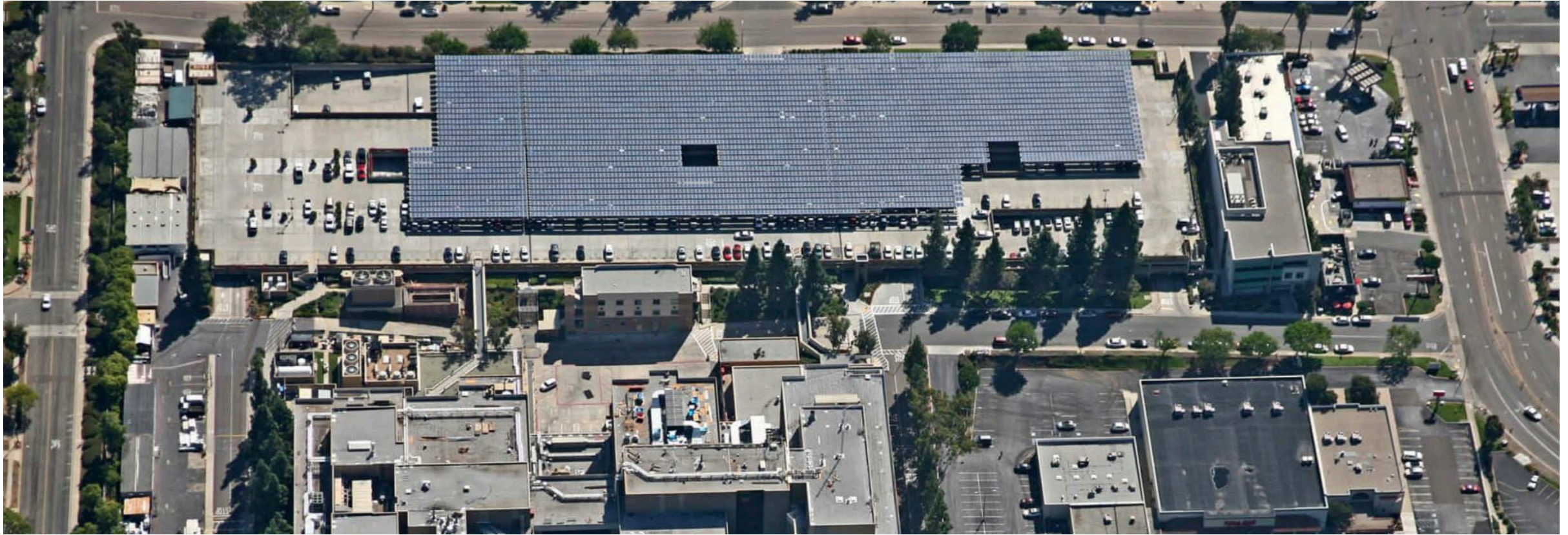
Backup power on the roof

Reinforced infrastructure for storm surge



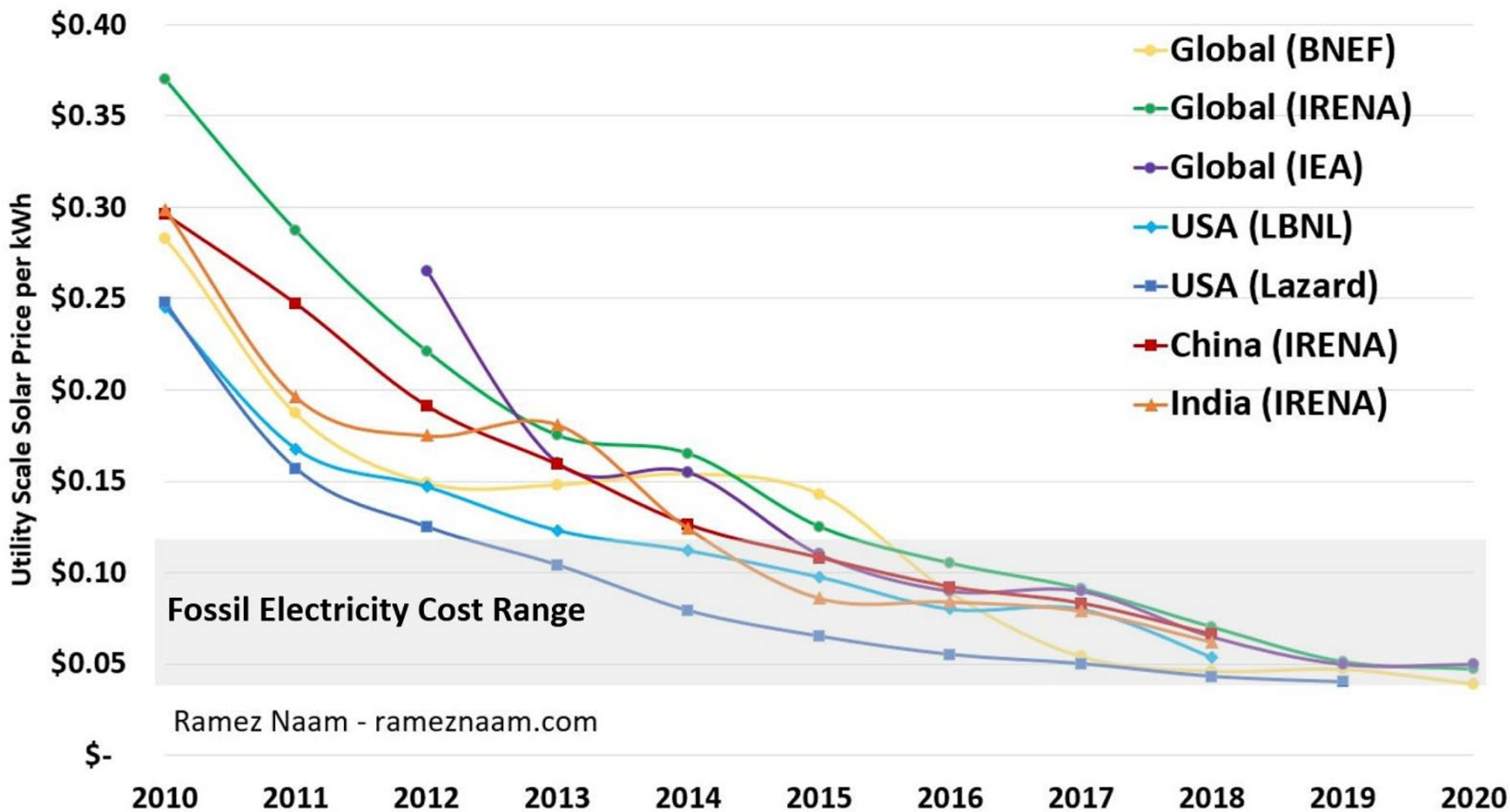
https://practicegreenhealth.org/sites/default/files/2019-03/spauldingrehabilitationcase_study__0.pdf

SAN DIEGO MEDICAL CENTER



<https://www.swinertonrenewable.com/projects/kaiser-permanente-san-diego-medical-center-solar>

Solar Costs Dropped by a Factor of 5 Since 2010



NICKLAUS CHILDREN'S HOSPITAL



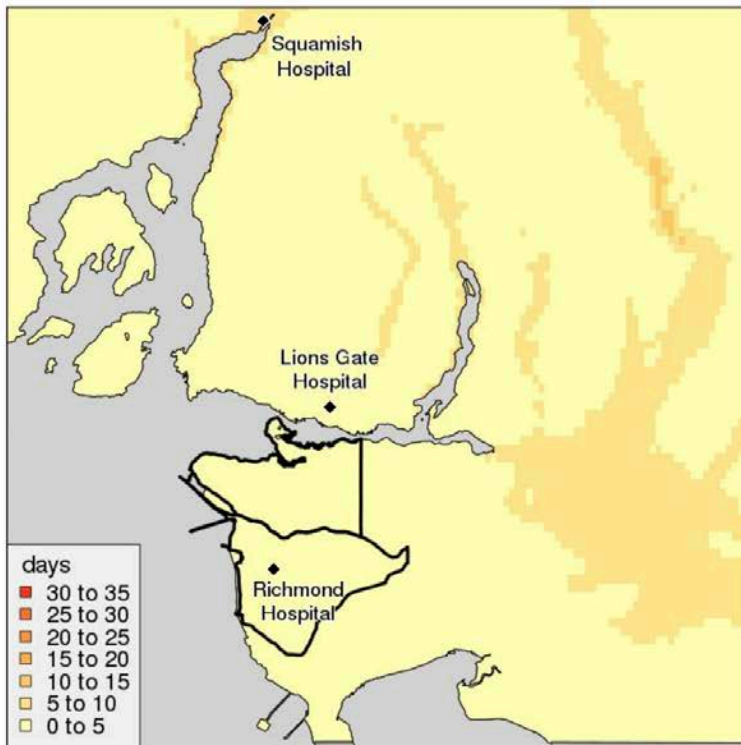
https://www.fema.gov/sites/default/files/2020-07/fema_bric_session-4_community-lifelines.pdf

Updated
exterior to
withstand a
hurricane
Category 4
force winds

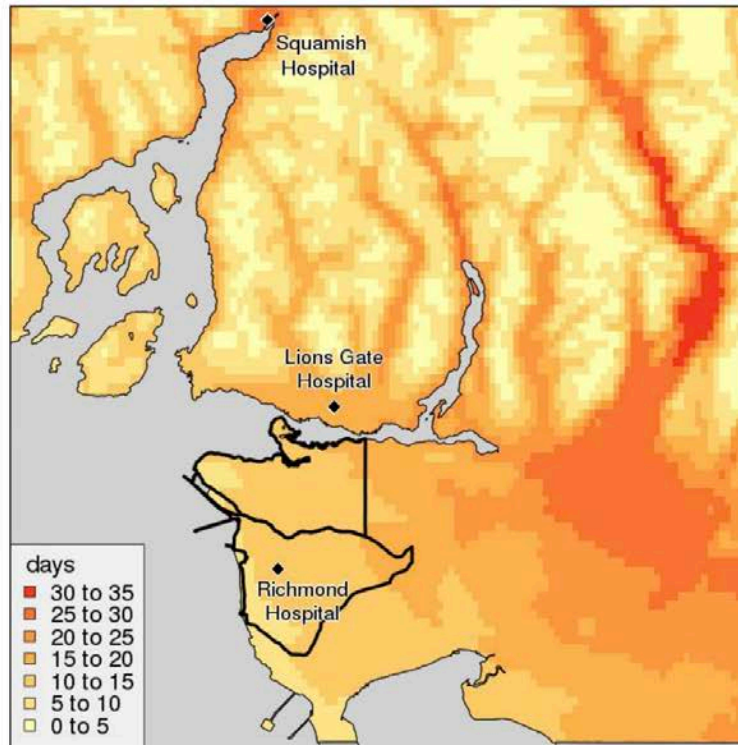
VANCOUVER COASTAL HEALTH

“New Climate Reality”

Days Above 30°C – Past



Days Above 30°C – Future (2050)



Employee trainings
A lifecycle cost analysis
Emissions
Design standards

SMART HOSPITALS TOOLKIT

- Hospital Safety Index
- Green Checklist
- Cost Benefit Analysis
- Training Aids



SMART HOSPITALS TOOLKIT

GEORGETOWN HOSPITAL IN SAINT VINCENT AND THE GRENADINES



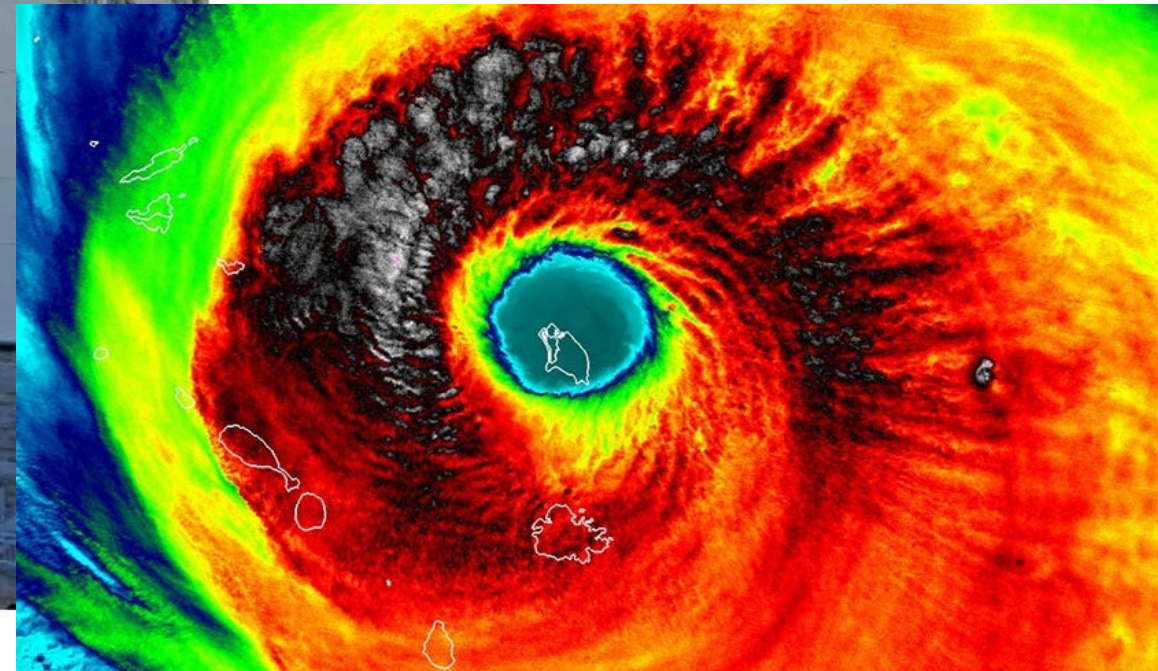
58% reduction in
electrical consumption
following the update

PEEBLES HOSPITAL IN THE BRITISH VIRGIN ISLANDS



PAHO

Hurricane Irma



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

HELP YOUR PATIENTS PLAN



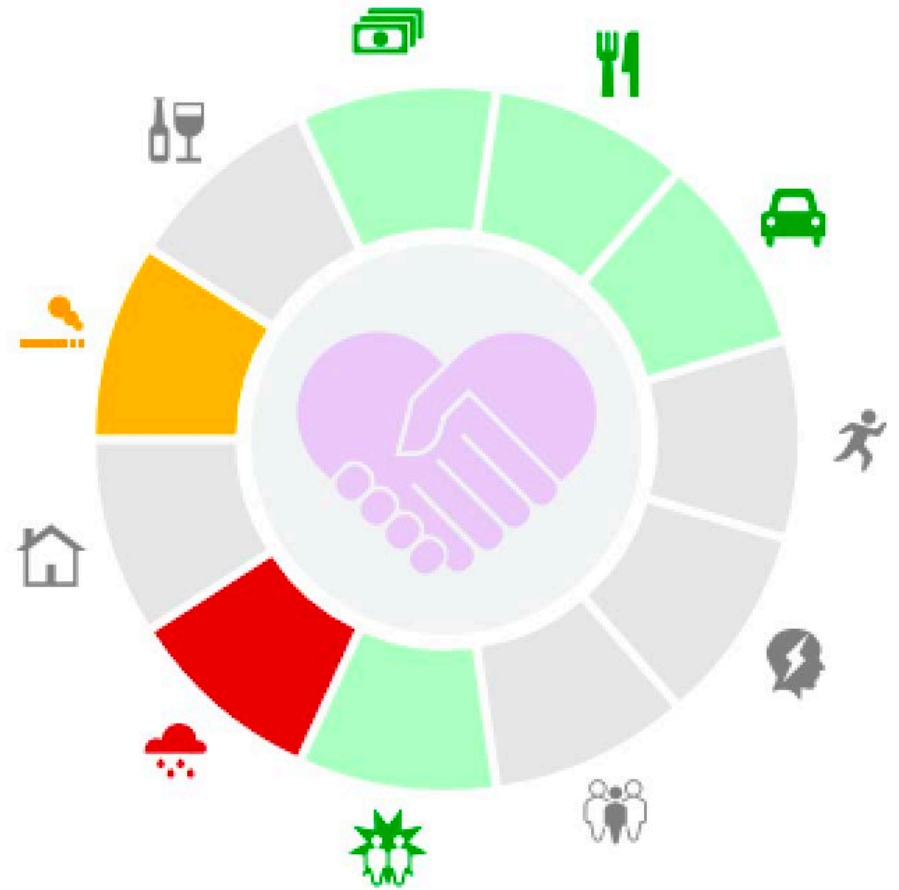
2020 Disasters Don't Wait.
MAKE YOUR PLAN TODAY.

ready.gov



Rx on the Run, healthcareready.org

♥ Social Determinants of Health ↗



Address vulnerabilities

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.