

# Public Health Emergency Preparedness in a Changing World

Paul D. Biddinger, M.D. F.A.C.E.P.

Chief Preparedness and Continuity Officer, Mass General Brigham

Ann L. Prestipino, MPH Endowed Chair in Emergency Preparedness

Director, Center for Disaster Medicine, Massachusetts General Hospital Department of Emergency Medicine

Director, Harvard T.H. Chan School of Public Health Emergency Preparedness Research, Evaluation and Practice (EPREP) Program

# Overview

- Identify the changing preparedness threats facing public health
- Name concurrent operational challenges
- Discuss evolving trends in public health preparedness



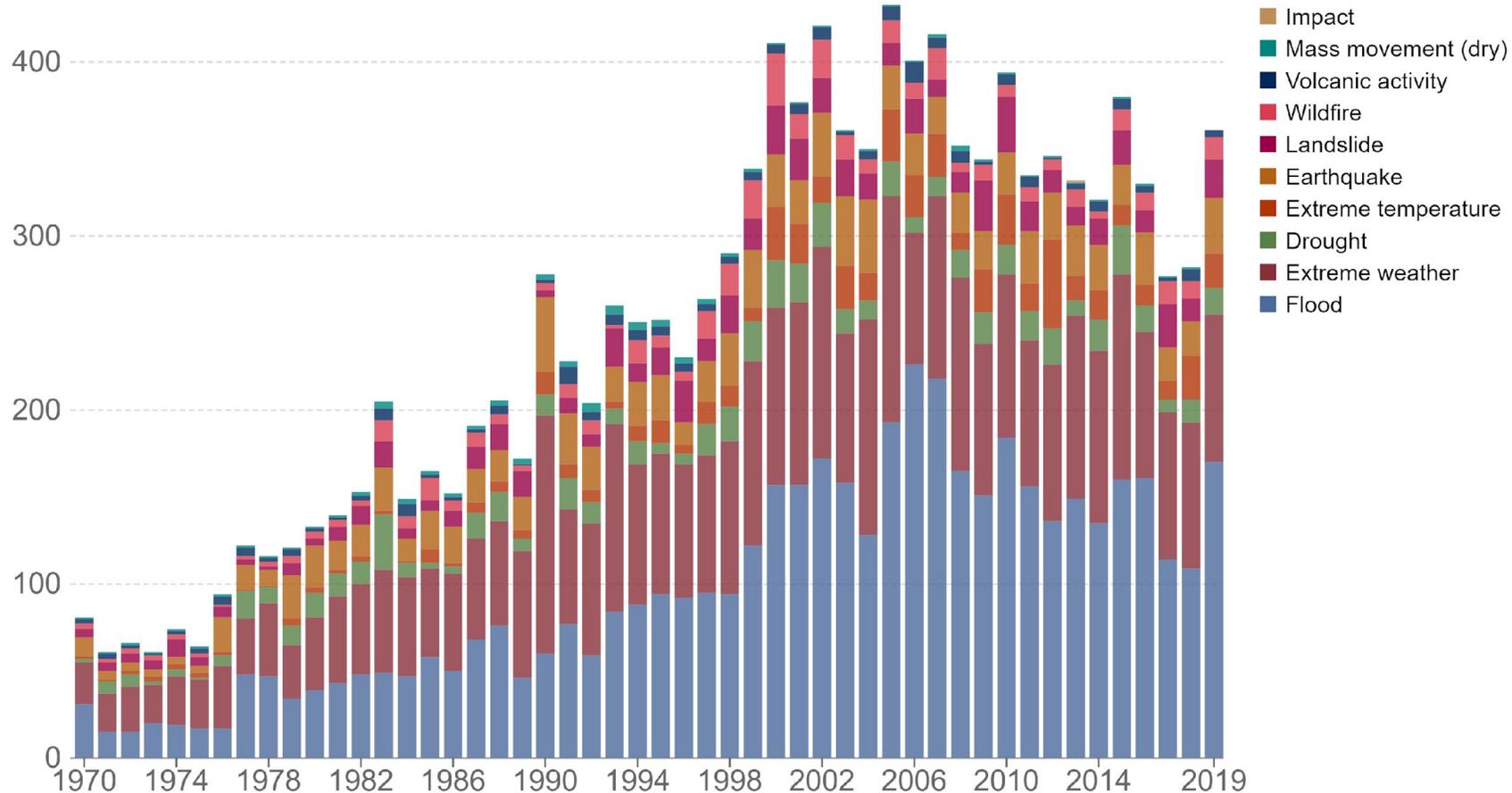
# The Evolving Threat Landscape



# Disaster Events are Increasing

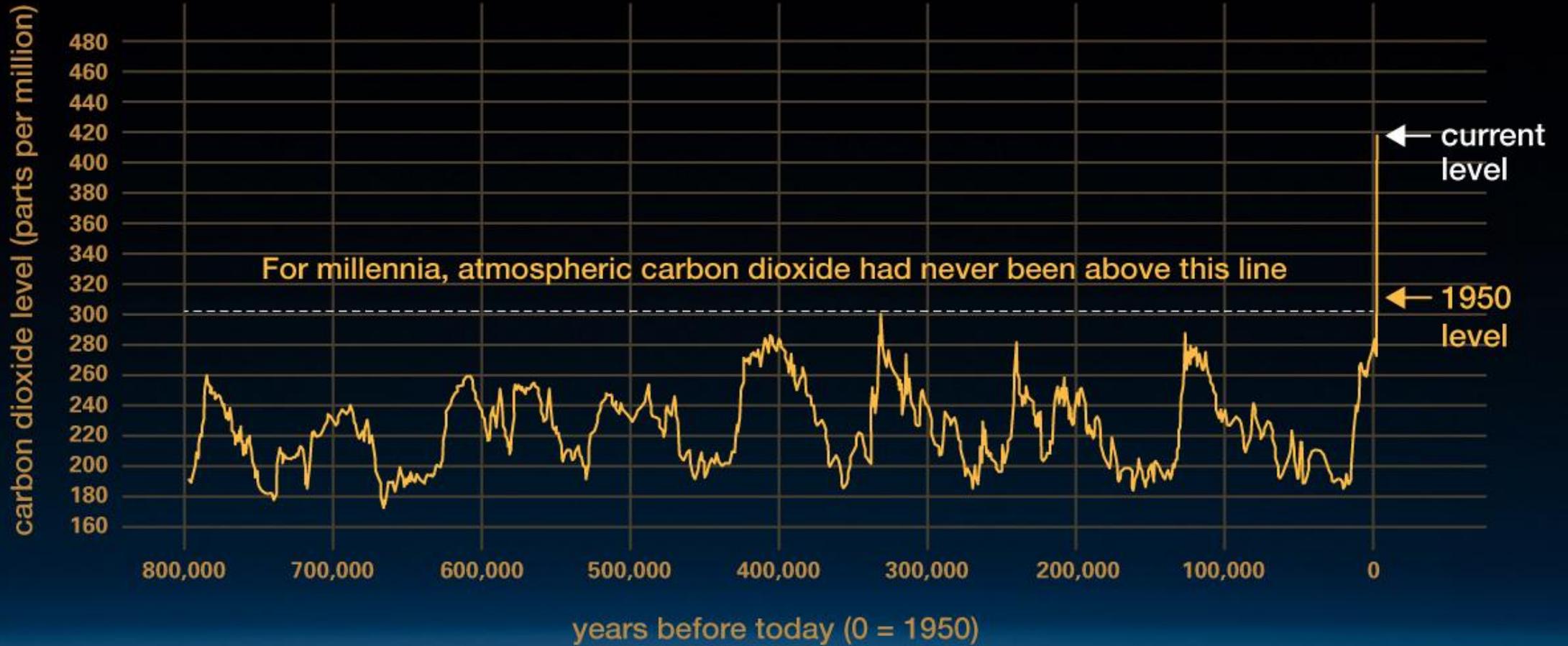
## Global reported natural disasters by type, 1970 to 2019

The annual reported number of natural disasters, categorised by type. This includes both weather and non-weather related disasters.



Source: EMDAT (2020): OFDA/CRED International Disaster Database, Université catholique de Louvain – Brussels – Belgium  
OurWorldInData.org/natural-disasters • CC BY

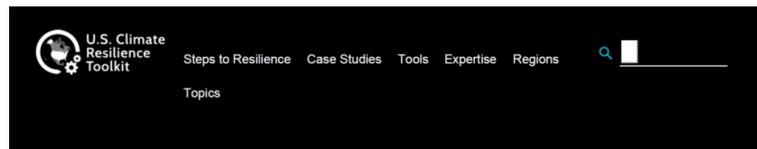




# The Biggest Public Health Threat of Our Time

“Climate change is the biggest global health threat of the 21st century... The impacts will be felt all around the world – and not just in some distant future but in our lifetimes and those of our children.”

- The Lancet



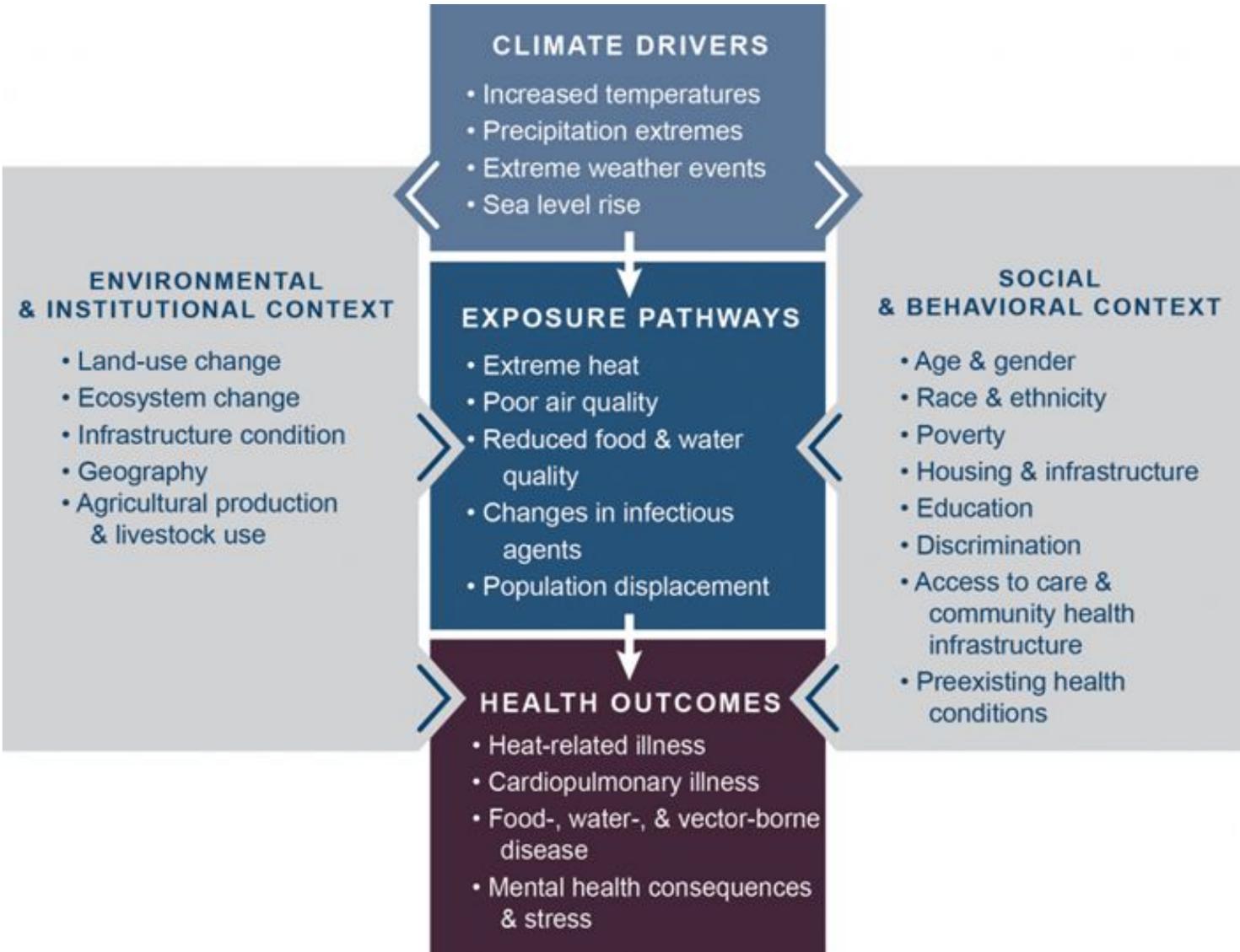
This knowledge management tool allows users to locate the most relevant scientific literature on the health implications of climate change, providing access to a database of studies from around the world published between 2007 and 2014.

Webpage:  
[Climate Change and Human Health Literature Portal](#)

Topics:



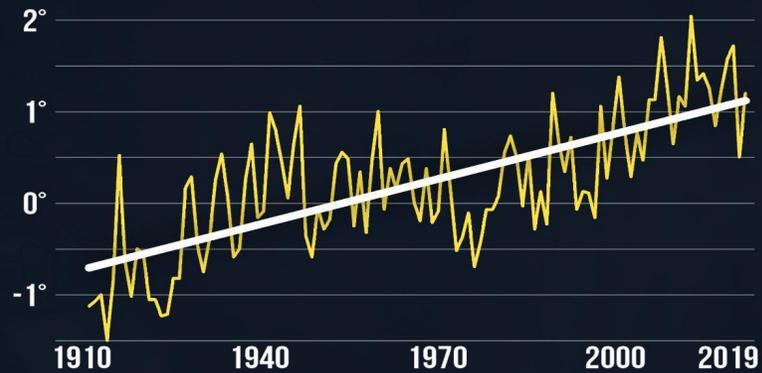
# Climate Change and Human Health



# Climate Change Indicators: Hurricane Activity

## WARMING TROPICAL ATLANTIC

HURRICANE SEASON WATER TEMPERATURES (°F)

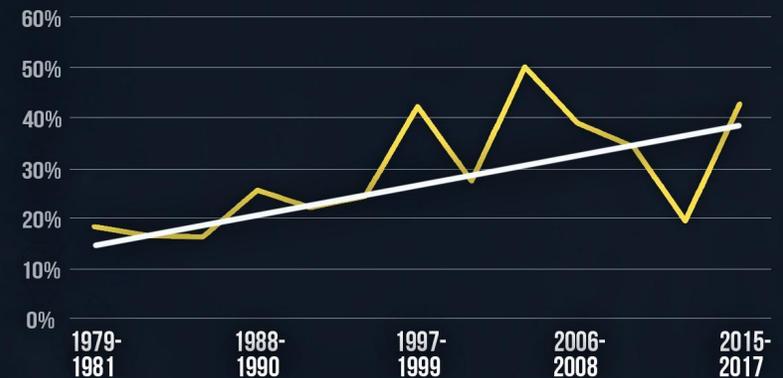


June–November departures (°F) from 1910–2000 average in the Main Development Region (MDR)  
Source: NOAA NCEI Climate at a Glance

CLIMATE CENTRAL

## ATLANTIC HURRICANES GETTING STRONGER

PERCENT OF ALL HURRICANES AS MAJOR STORMS



Based on 6-hour observations for major tropical cyclones (Cat 3-5 compared to all Cat 1+ tropical cyclones). Data collected into 3-year periods.  
Source: Kossin et al. (2020)

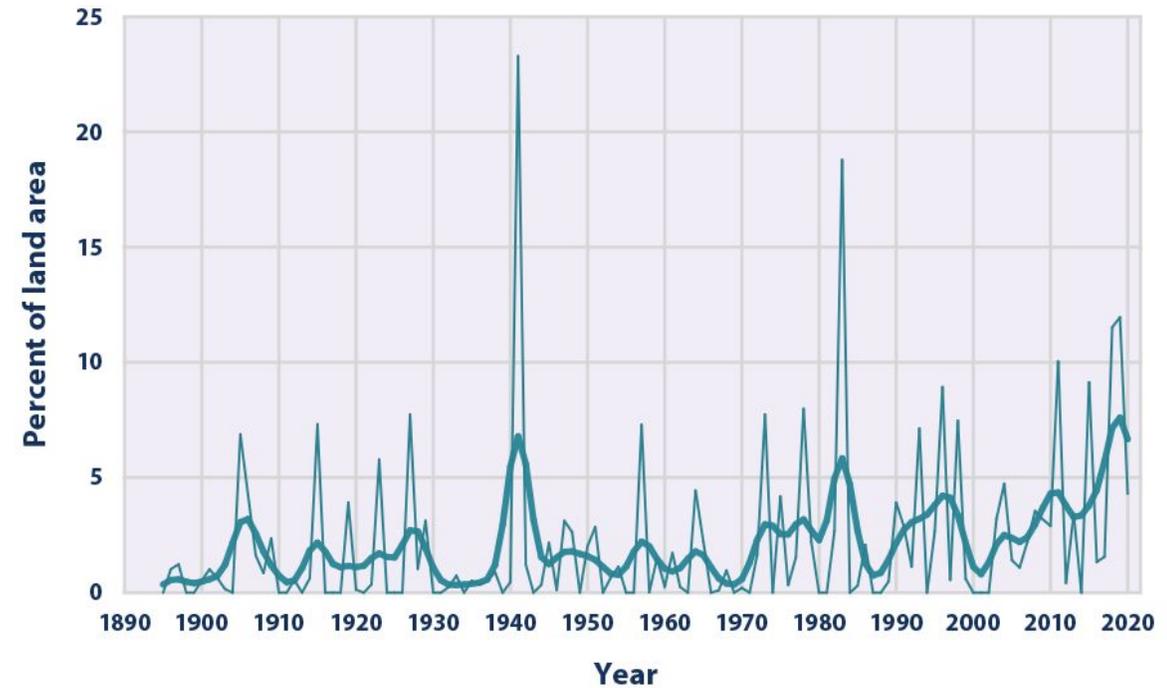
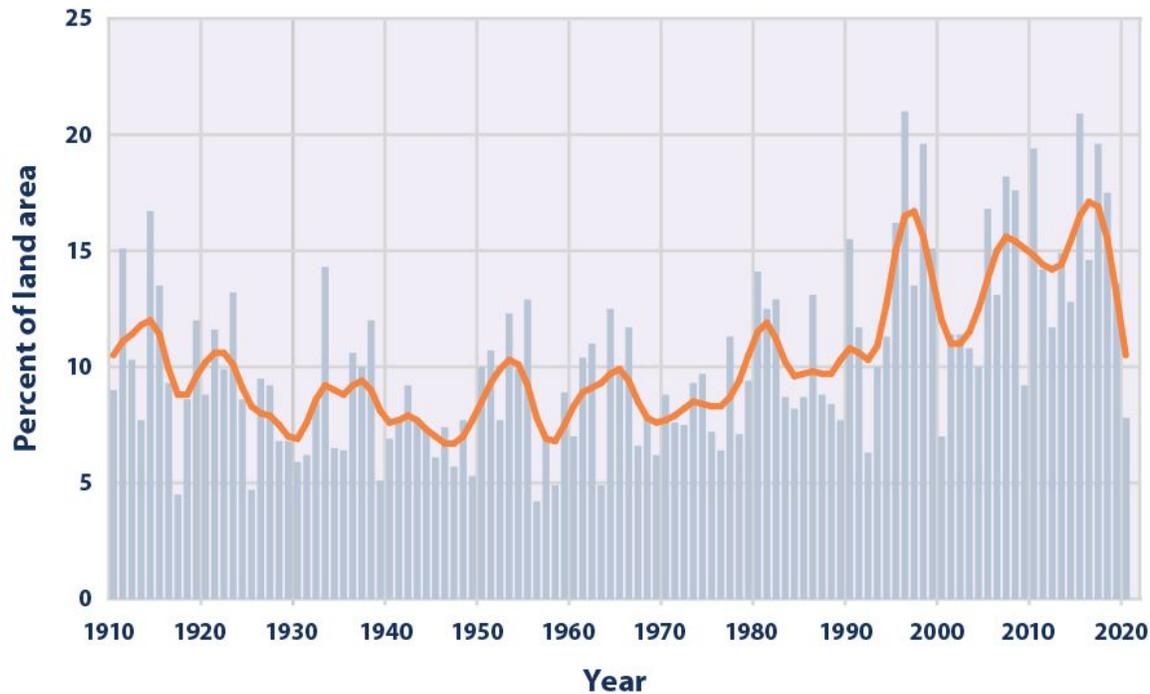
CLIMATE CENTRAL

<https://www.epa.gov/climate-indicators/climate-change-indicators-tropical-cyclone-activity>  
<https://www.climatecentral.org/climate-matters/2020-stronger-hurricanes>



# Climate Change Indicators: Heavy Precipitation

Extreme One-Day Precipitation Events in the Contiguous 48 States, 1910–2020 Unusually High Annual Precipitations in the Contiguous 48 States, 1895–2020



<https://www.epa.gov/climate-indicators/climate-change-indicators-heavy-precipitation>



# Historical Data is No Longer Useful for Good Disaster Planning



**Massachusetts Historic Snowfall, 2015**

Sgt. Michael Broughey, MA National Guard/Wikimedia  
<https://www.dvidshub.net/image/1782093>

**Louisiana Floods, 2016**

Patrick Dennis/The Advocate via AP



# Flooding Directly Threatens Healthcare Infrastructure

A 2022 Harvard T.H. Chan School of Public Health study demonstrated major threats to coastal hospitals in the US from hurricanes and sea level rise

25 of 78 metropolitan statistical areas (MSAs) on the U.S. Atlantic and Gulf Coasts have *half or more of their hospitals* at risk of flooding from relatively weak hurricanes

In 18 MSAs, at least half of the roads within 1 mile of hospitals were at risk of flooding from a category 2 hurricane

Metropolitan Boston was at the 3<sup>rd</sup> highest risk in the US

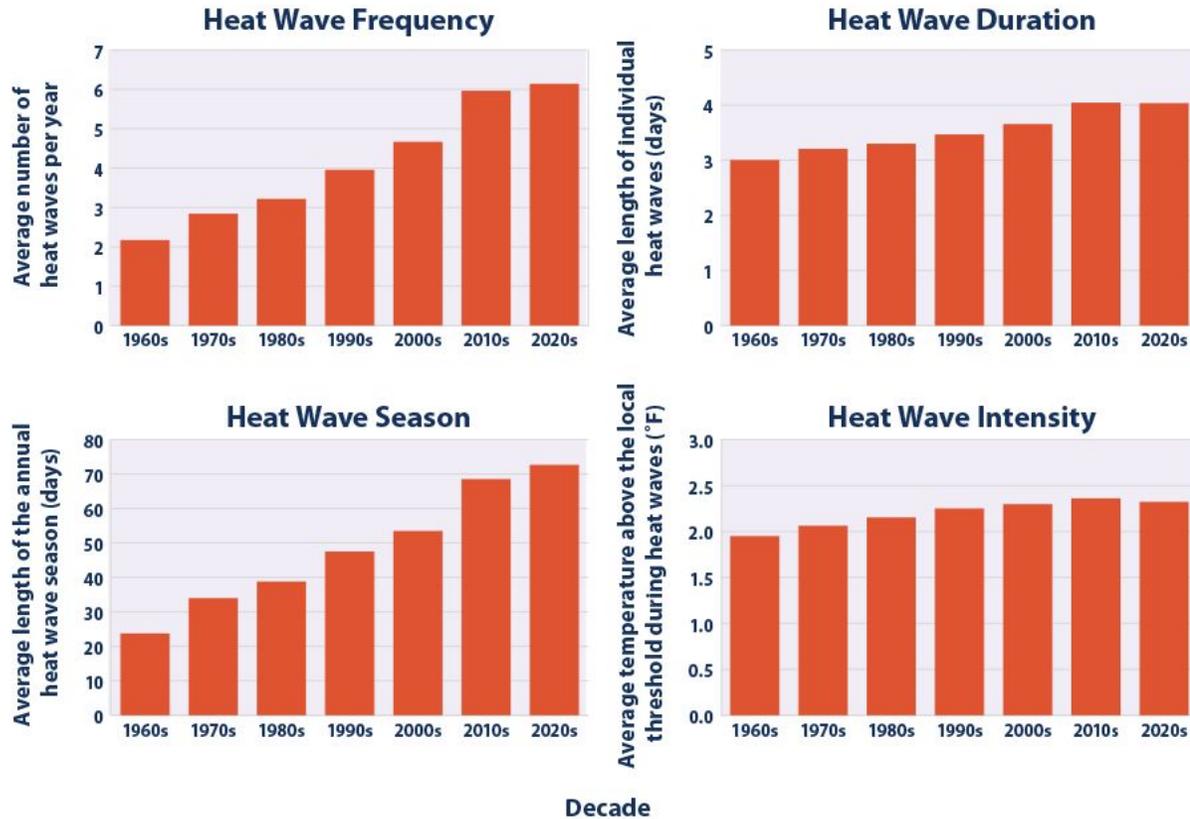


<https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2022GH000651>

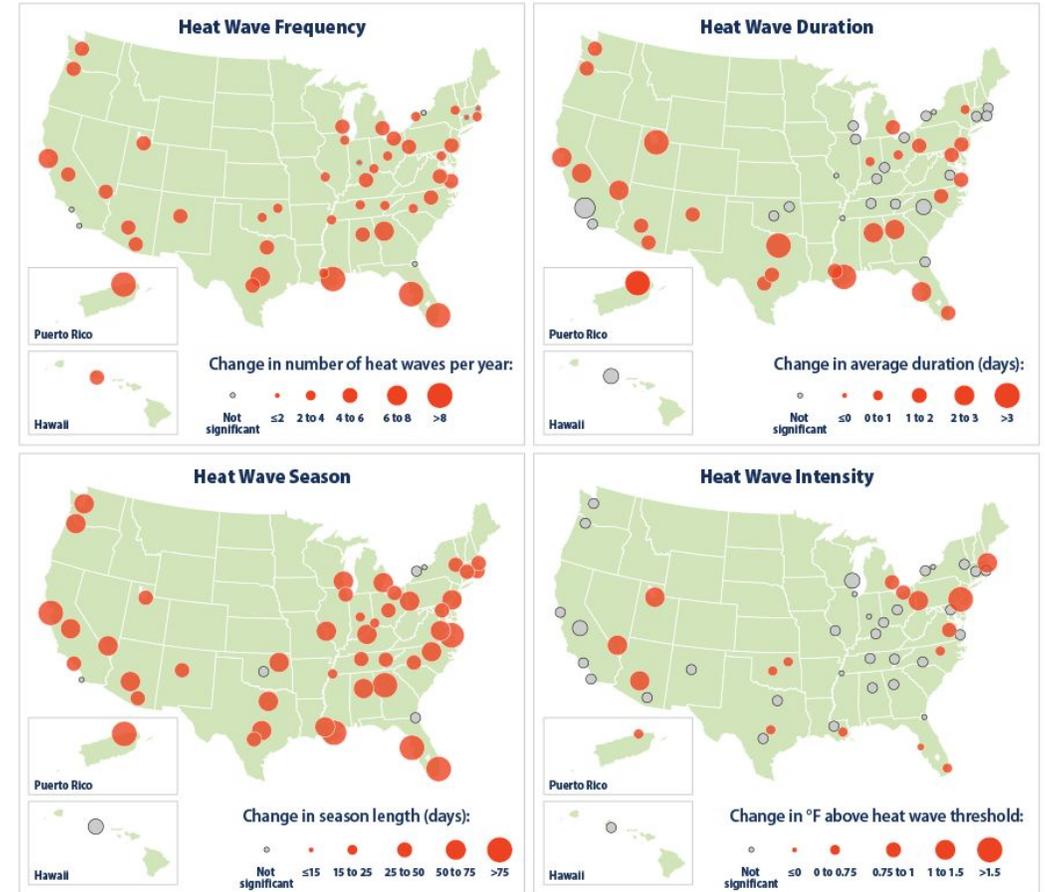


# Climate Change Indicators: Heat Waves

Heat Wave Characteristics in the United States by Decade, 1961–2021



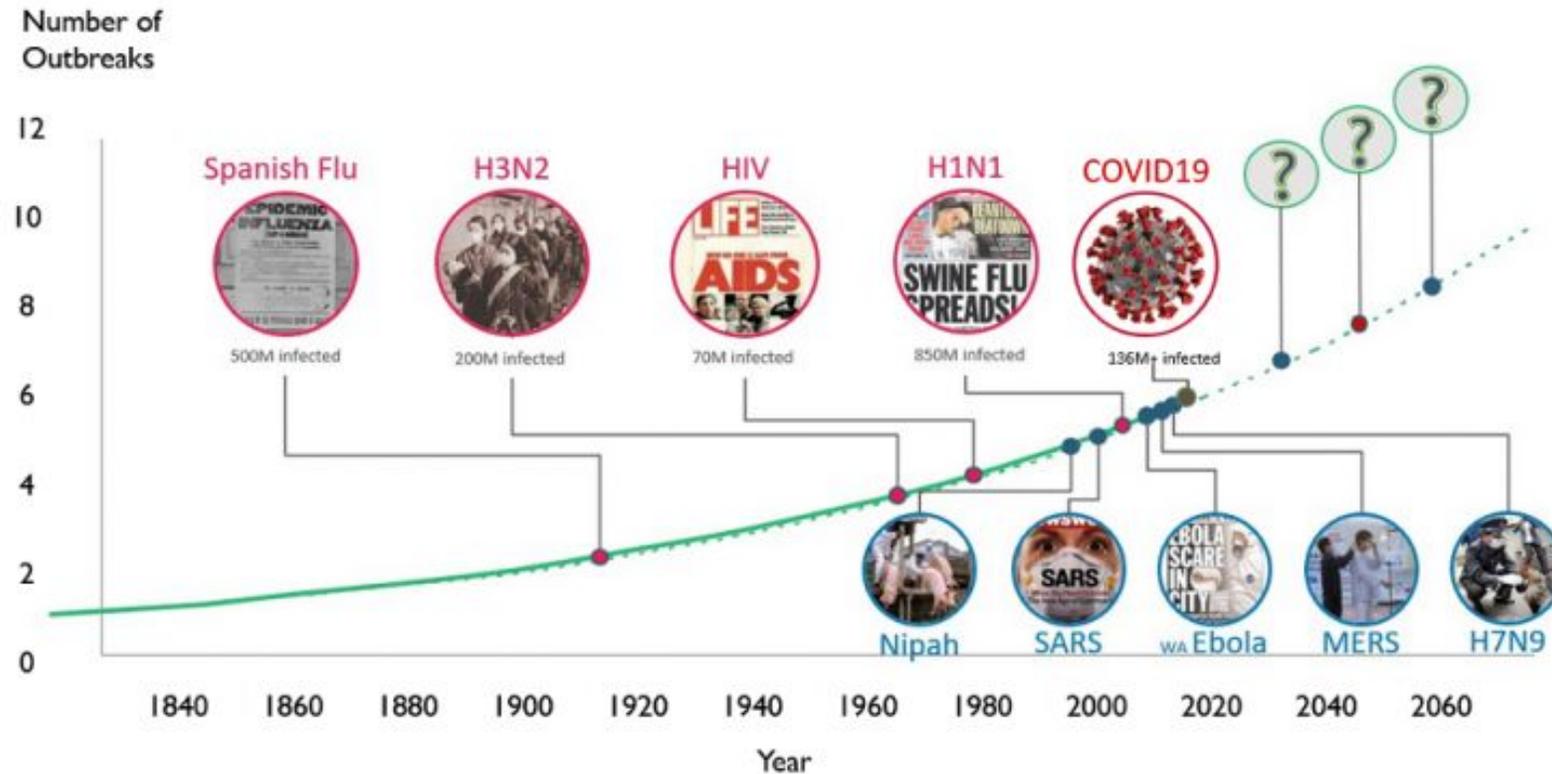
Heat Wave Characteristics in 50 Large U.S. Cities, 1961–2021



<https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves>



# Zoonotic Outbreaks



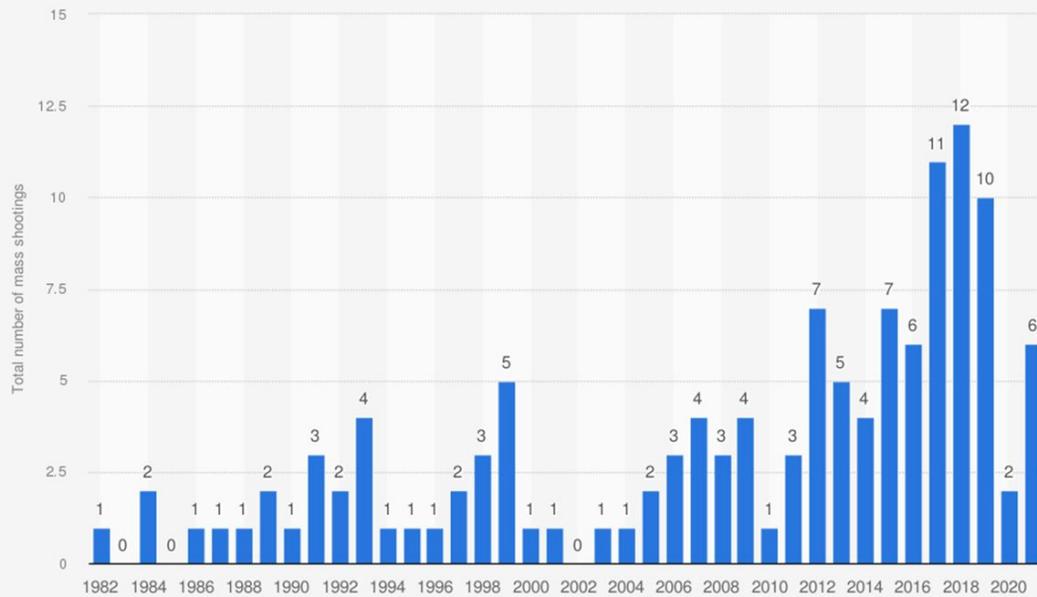
There have been many cross-species pathogen jumps in the recent past, including HIV, Ebola, and Zika viruses. In fact, more than **70 percent of emerging diseases are zoonotic**, transmissible between animals and people...an estimated 1.7 million as-yet undiscovered viruses are thought to be present in mammals and birds, and as many as **half of these could have the ability to infect humans.**

<https://www.usaid.gov/biodiversity/stories/human-health-environment>



# Active Shooter & Terrorist Incidents

Number of mass shootings in the United States between 1982 and November 2021

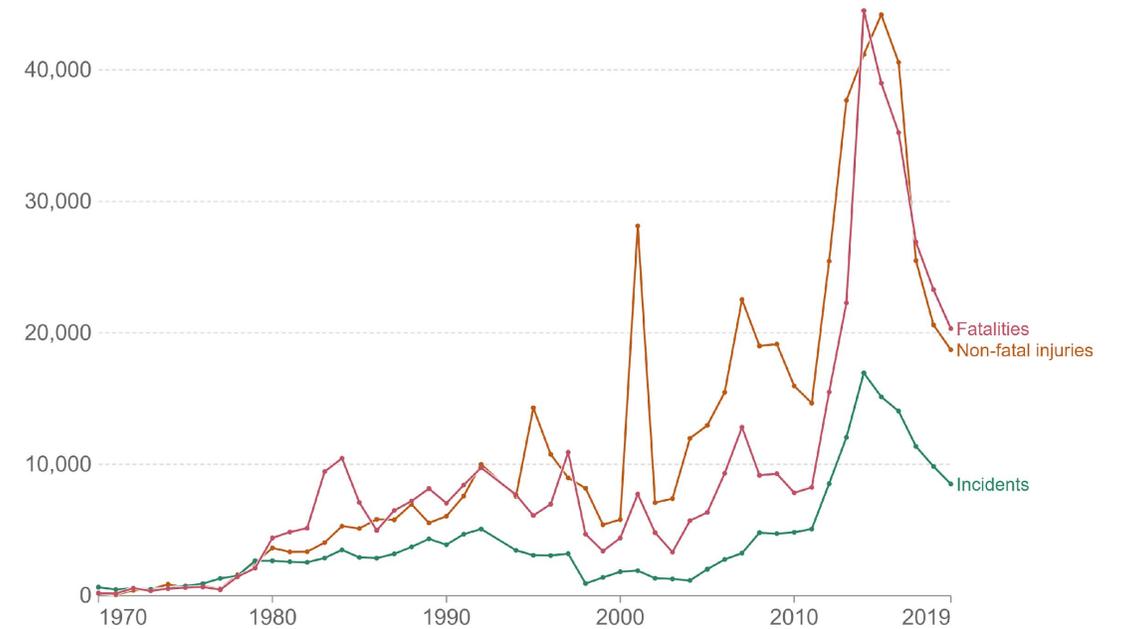


Source  
Mother Jones  
© Statista 2021

Additional Information:  
United States; 1982 to November 30, 2021

Incidence, fatality and injury from terrorist attacks, World, 1970 to 2019

The total number of recorded terrorist incidents, fatalities and non-fatal injuries by country or region. This includes fatalities or non-fatal injuries of both victims and perpetrators.



Source: Global Terrorism Database (2021)

OurWorldInData.org/terrorism • CC BY



# Cyberthreats

According to a May 2022 white paper from Sophos Cybersecurity, cyberattacks (ransomware) against healthcare entities rose from 34% of organizations in 2020 to 66% in 2021.<sup>1</sup>



## Ransomware attack disrupts Irish health services

IT systems shut down and some medical appointments cancelled after attempt to access data



Healthcare IT News

Healthcare hackers demanded an average ransom of \$4.6M last year, says BakerHostetler

The report found that healthcare was one of the industries most affected by tracked ransomware incidents in 2020, second only to education.



## Healthcare Vendor Ransomware Attack Stalls Cancer Treatments, 170 Health Systems Hit



## UVM Health Brings EHR Back Online, One Month After Ransomware Attack



TOPICS INDUSTRY EVENTS PODCASTS RESEARCH RECOGNITION

## Scripps Health cyberattack, EHR downtime caused \$112.7M in lost revenue, recovery

Jessica Davis August 12, 2021

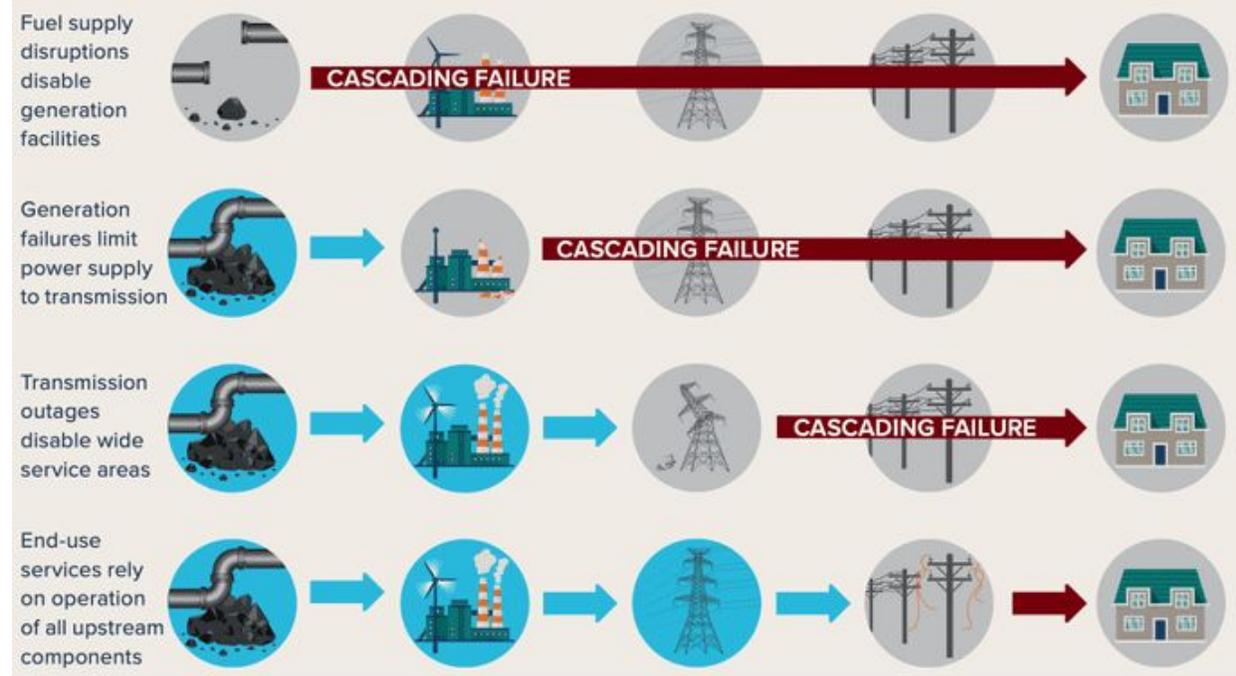
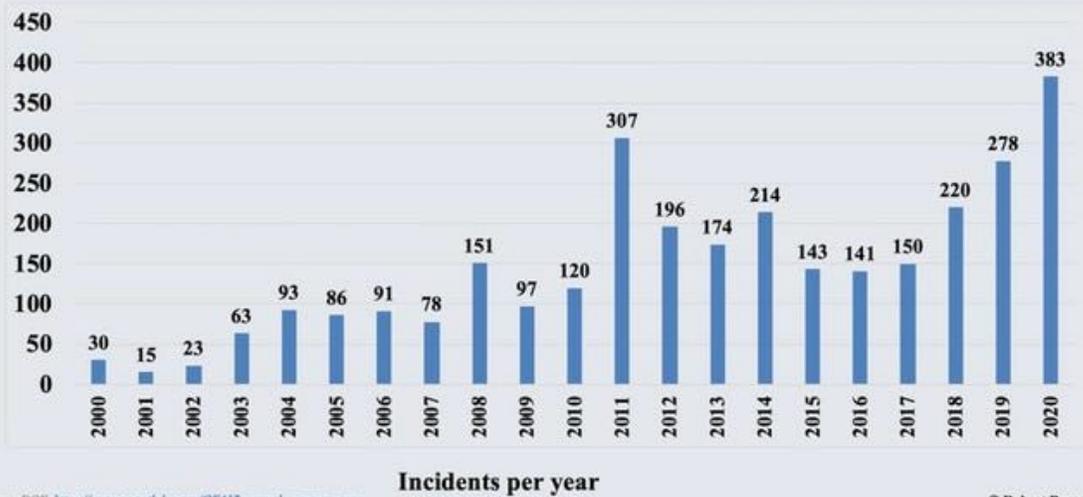


The ransomware attack that struck Scripps Health in May led to four weeks of EHR downtime and some emergency care diversion. (Photo credit: "Emergency Sign" by Open Social Scheduler / iStock Engine is marked with CC0 1.0)



# Utility Instability

## “Major Disturbances and Unusual Occurrences,” on US Grid, 2000 to 2020



HHS.gov U.S. Department of Health & Human Services

HHS emPOWER Program Platform



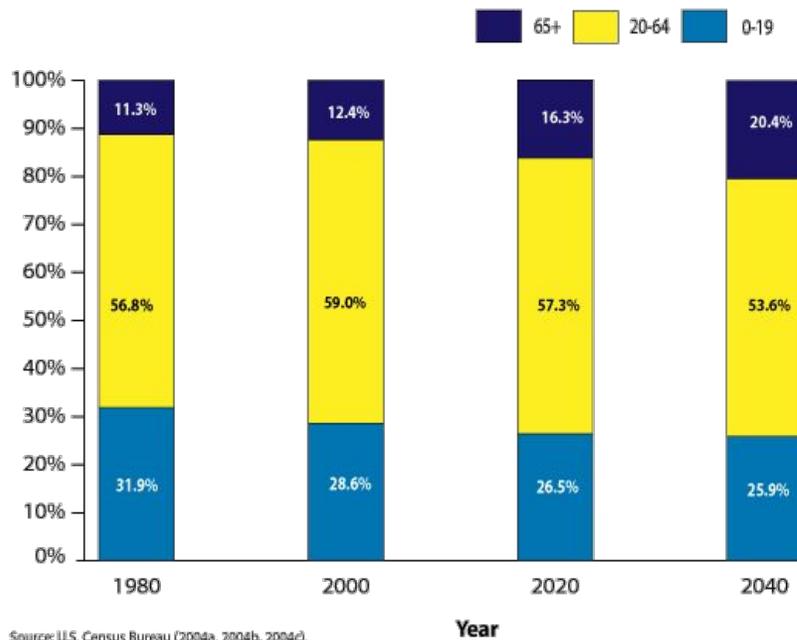
# Concurrent Operational Challenges



# Increasing Demands on the Healthcare System

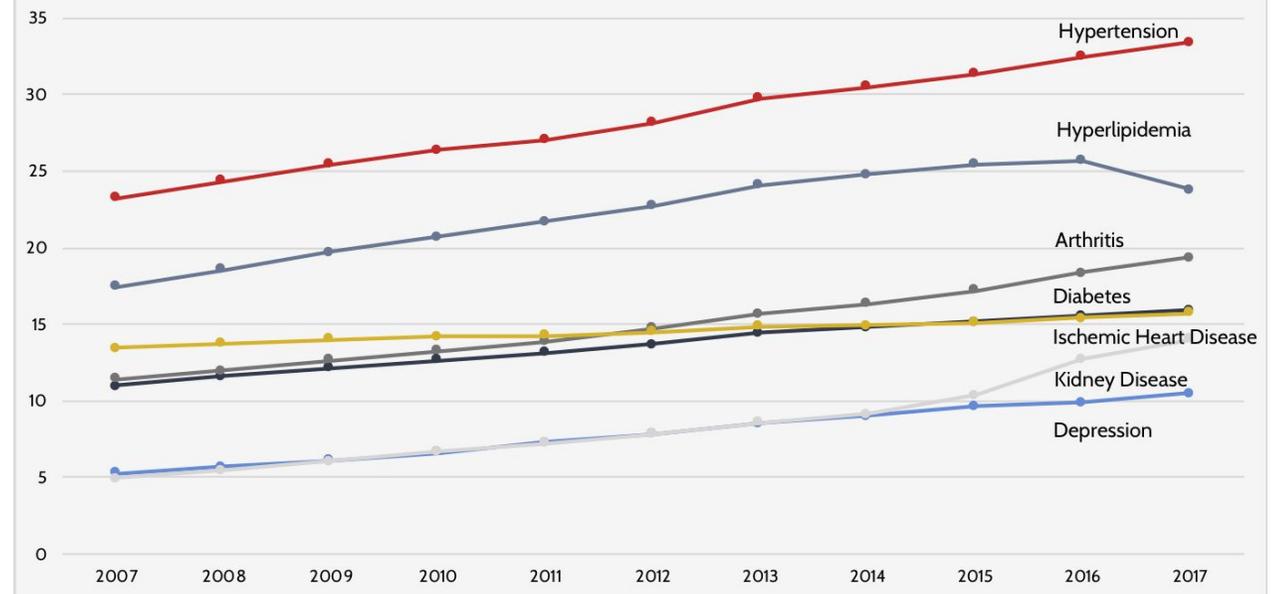
- Population is aging with increased prevalence of chronic illnesses
- Hospital crowding nationally is worsening, especially in the Northeast
  - Average length of patient stay has increased 8.8% compared to pre-pandemic levels

Age Distribution of the Population, 1980-2040



Source: U.S. Census Bureau (2004a, 2004b, 2004c).

Chronic Disease Prevalence Among Medicare Population (in Millions)



# Healthcare Adaptations in the Community

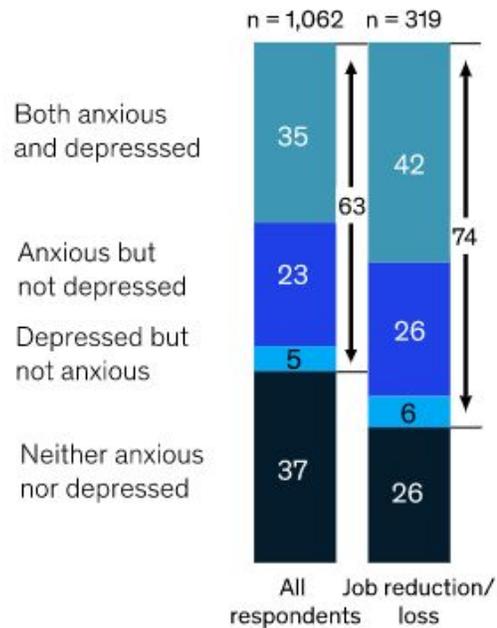
- Increasing efforts to deliver care outside of acute care hospitals
  - Telemedicine
  - Visiting nurse services
  - Home hospital
  - Others
- Increasing numbers of patients with major medical needs who receive care in their homes
  - Special vulnerability when utilities, roads, or other necessities are disrupted



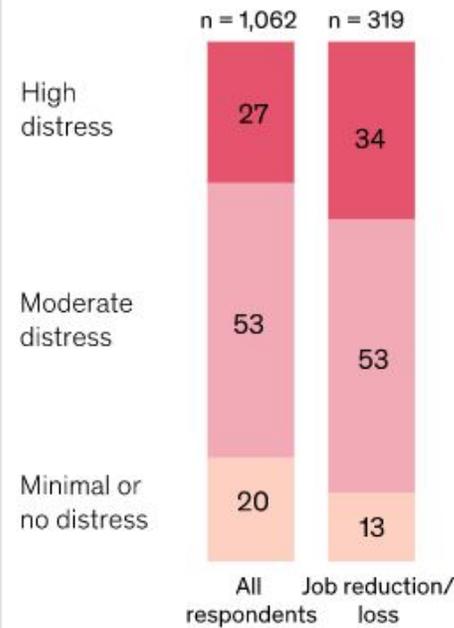
# Increasing Mental Health Needs

## Reported signs of distress related to COVID-19 in the United States

**Respondents reporting feeling anxious or depressed in past week**  
% of respondents



**Respondents' reported level of distress related to COVID-19**  
% of respondents



**Respondents' levels of reported substance use**



**1 out of 4** reported binge drinking\* at least once in the past week



**1 out of 5** reported taking prescription drugs for non-medical reasons



**1 out of 7** reported using illicit drugs

\* As defined by National Institute on Alcohol Abuse and Alcoholism,  $\geq 5$  drinks for men and  $\geq 4$  drinks for women

QFEEL1. Over the past week have you felt anxious?  
QFEEL2. Over the past week have you felt depressed?  
QFEEL2a. Please indicate your level of distress related to the Coronavirus/COVID-19 pandemic (10-point scale from least distressed to most distressed. "High" is 8-10, "Moderate" is 4-7, and "Low" is 1-3).

QEMP5. Since the Coronavirus/COVID-19 began impacting the US, has the number of hours you have worked increased, decreased, or stayed the same?

Source: McKinsey COVID-19 Consumer Survey, 3/29/2020



# Staffing Concerns

- Fatigue and burnout are affecting the national public health and healthcare workforce
- Based on data from Liquid Compass, job postings for clinical staff increased by 45% for nurses and 41% for other clinical staff between January 2020 and January 2022. Non-clinical staff postings increased by nearly 40%.

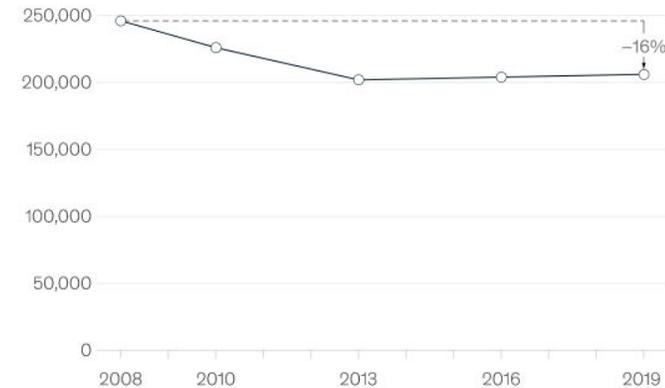


<https://www.aha.org/system/files/media/file/2022/01/Data-Brief-Workforce-Issues-012422.pdf>

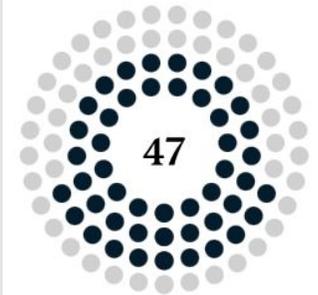


State and local public-health departments were experiencing workforce declines even prior to the COVID-19 pandemic.

Number of US public-health workers



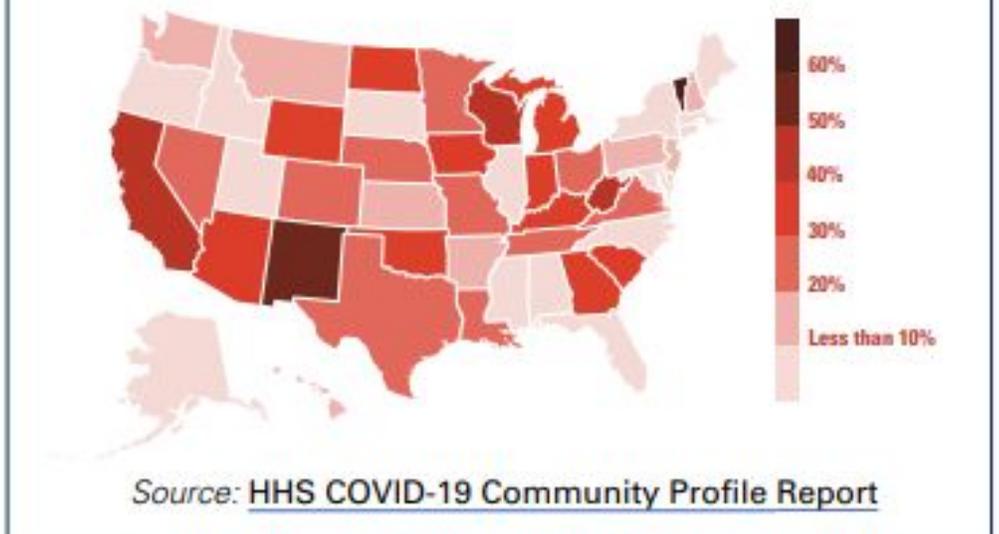
Share of US public-health workers with plans to leave the workforce or retire in the next 5 years,<sup>1</sup>%



<sup>1</sup>Survey data from 2017.

Source: *Public Health Workforce Interests and Needs Survey 2017*, de Beaumont Foundation, Association of State and Territorial Health Officials (ASTHO), National Association of County and City Health Officials (NACCHO), Big Cities Health Coalition, 2019; Brian C. Castrucci and Monica Valdes Lupi, "When we need them most, the number of public health workers continues to decline," de Beaumont Foundation, May 19, 2020

Figure 1: Percent of hospitals reporting a critical staffing shortage, as of January 19, 2022



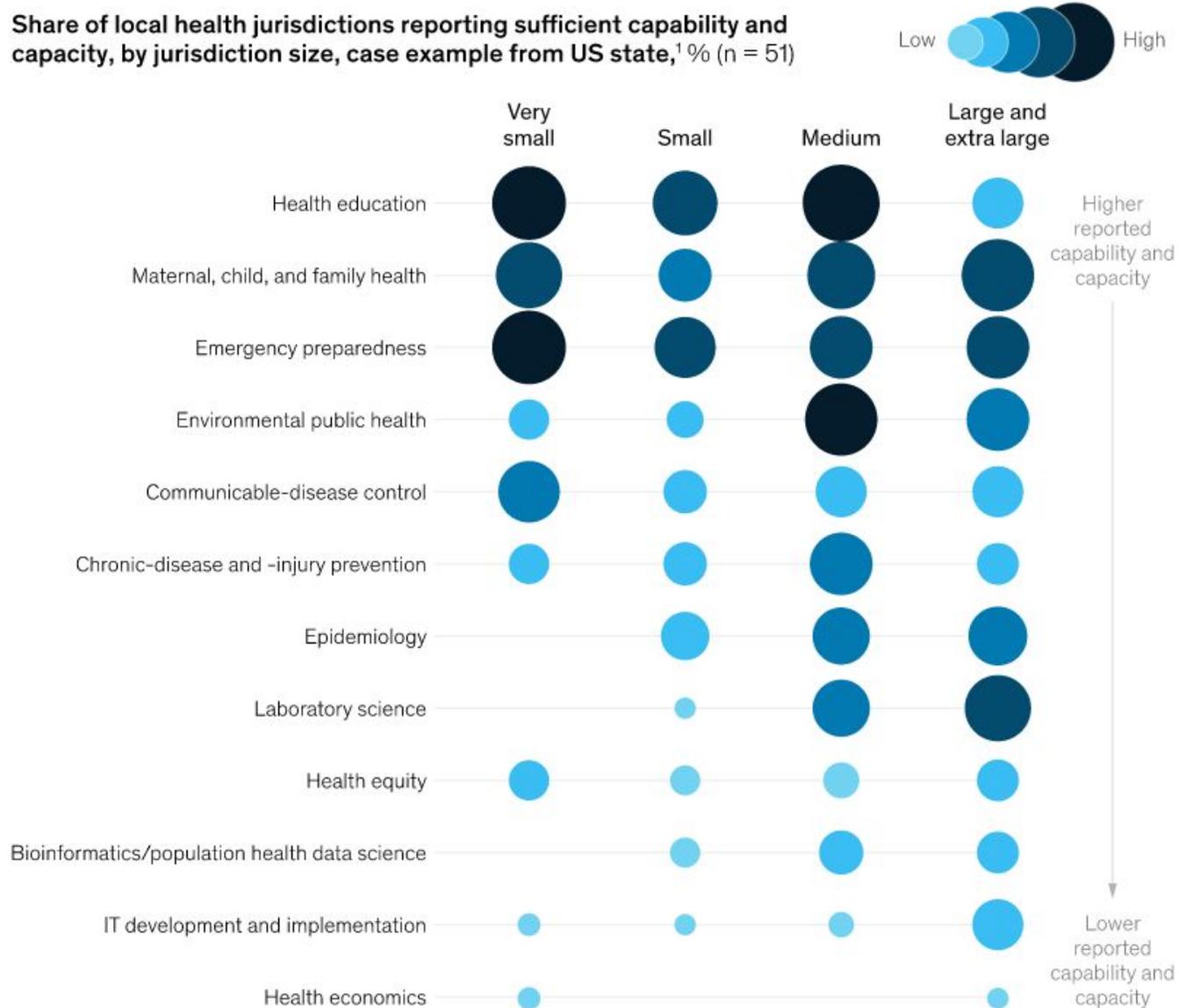
Source: HHS COVID-19 Community Profile Report

# Evolution in Public Health Preparedness Activities



# Capability and capacity among local health jurisdictions vary greatly depending on the area of expertise.

Share of local health jurisdictions reporting sufficient capability and capacity, by jurisdiction size, case example from US state,<sup>1</sup> % (n = 51)

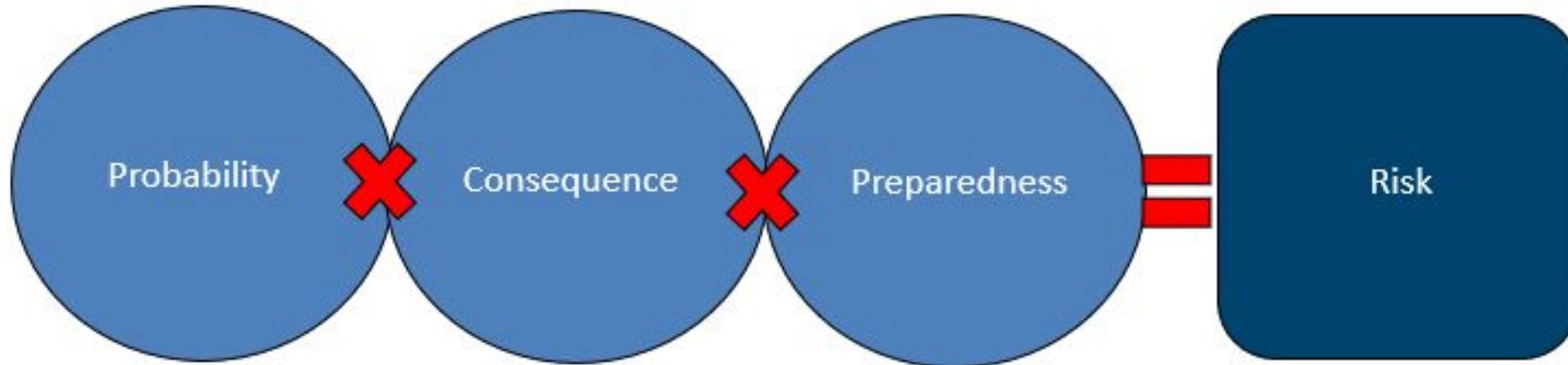


<sup>1</sup>Share of respondents within each size category who have responded with "Agree" or "Strongly agree" to the question: "The department/program has sufficient capacity and capabilities in each of the following areas of technical expertise."  
Source: Workforce Capabilities Assessment, Aug 2021



# Revisiting Risk Analyses

**Hazard Vulnerability Analysis** - Effective emergency management depends on accurate assessment of risks:

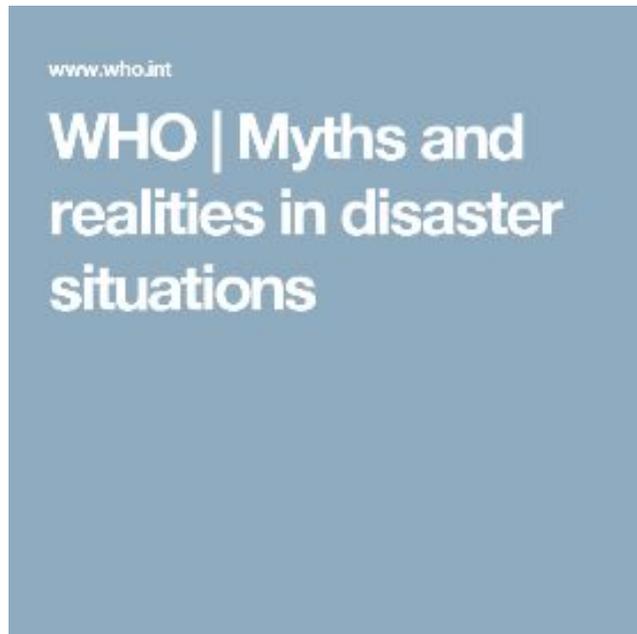


# Using Real-World Data

Historically, disaster planning has often focused more on “myths” and how we would like disasters to happen rather than how they actually happen

- Auf der Heide, E. The Importance of Evidence-Based Disaster Planning *Annals of Emergency Medicine* 2006 (47) 34-49

When tragic events occur, lessons are often “learned”, re-learned, and re-re-learned because they planners were unaware of the science



# Revisiting the LPHEP Basics

- Advocacy for health concerns before, during and after incidents
- Outbreak/incident recognition and investigation
- Risk communication
- Mass prophylaxis/vaccination
- Multi-jurisdictional coordination
- Support for population movement/evacuation
- Support for sheltering (especially medical needs sheltering)



# Future Use of NPIs

OPEN ACCESS

ORIGINAL RESEARCH

**bmj**medicine



## Non-pharmaceutical interventions and covid-19 burden in the United States: retrospective, observational cohort study

Michael Ahlers,<sup>1</sup> Hilary Aralis,<sup>2</sup> Wilson Tang,<sup>3</sup> Jeremy B Sussman ,<sup>4</sup> Gregg C Fonarow,<sup>5</sup> Boback Ziaeeian <sup>5,6</sup>

## Lives or Livelihoods? Perceived Tradeoffs and Public Demand for Non-Pharmaceutical Interventions

*CEBI Working Paper 19/20*

50 Pages • Posted: 26 May 2020 • Last revised: 19 Aug 2022

[Sonja Settele](#)

University of Copenhagen; CEBI

[Cortnie Shupe](#)

Consumer Financial Protection Bureau; University of Copenhagen and CEBI



# Refocusing Preparedness on Health Equity

N / NACCHO Voice

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HEALTH EQUITY & SOCIAL JUSTICE, LEADERSHIP,  
PRESIDENT'S CORNER

## Developing Emergency Preparedness Plans with a Health Equity Focus

Sep 22, 2020 | Jennifer C. Kertanis



# Coalitions, State, and Regional Planning



Mass.gov

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## Learn about the Health and Medical Coordinating Coalitions

Six regional Health and Medical Coordinating Coalition (HMCC) have been established to promote cross-disciplinary planning and support public health and medical response across the Commonwealth during emergencies and disasters.



### BUILDING REGIONAL SOLUTIONS

Enhancing collaboration, situational awareness, specialized clinical capabilities, and health care coalition participation

[LEARN MORE](#)

**Regional Disaster Health Response System**



# Public Health Emergency Preparedness – Priorities

- Ensuring vulnerable populations and equity are at the center of our planning and response
- Developing and using data to inform our risk assessments, planning and response
- Updating older plans to fit the changing landscape
- Increasing collaborations
- Increasing public health advocacy efforts at the local, regional, state and federal levels
- Developing better measures and metrics to chart our progress





**Mass General Brigham**