

# Climate and Health

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3/23/2021

# Overview

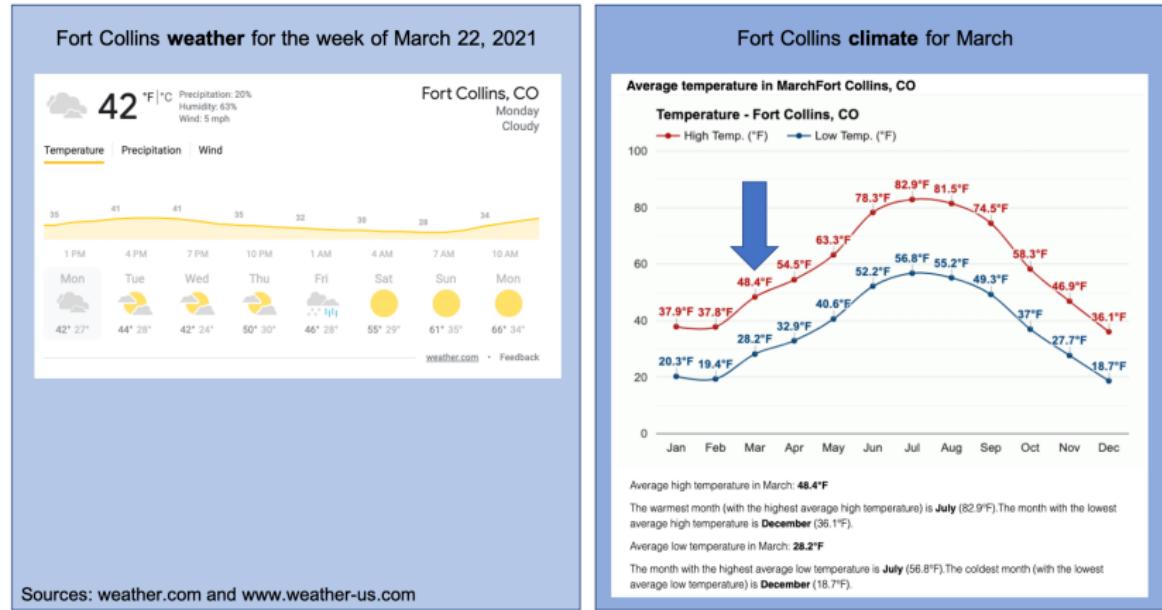
# Overview

- ▶ Climate change in the US
- ▶ Temperature and Human Health
- ▶ Climate-related Disasters and Human Health

Climate change

# Weather versus climate

**Climate is what you expect, weather is what you get.**

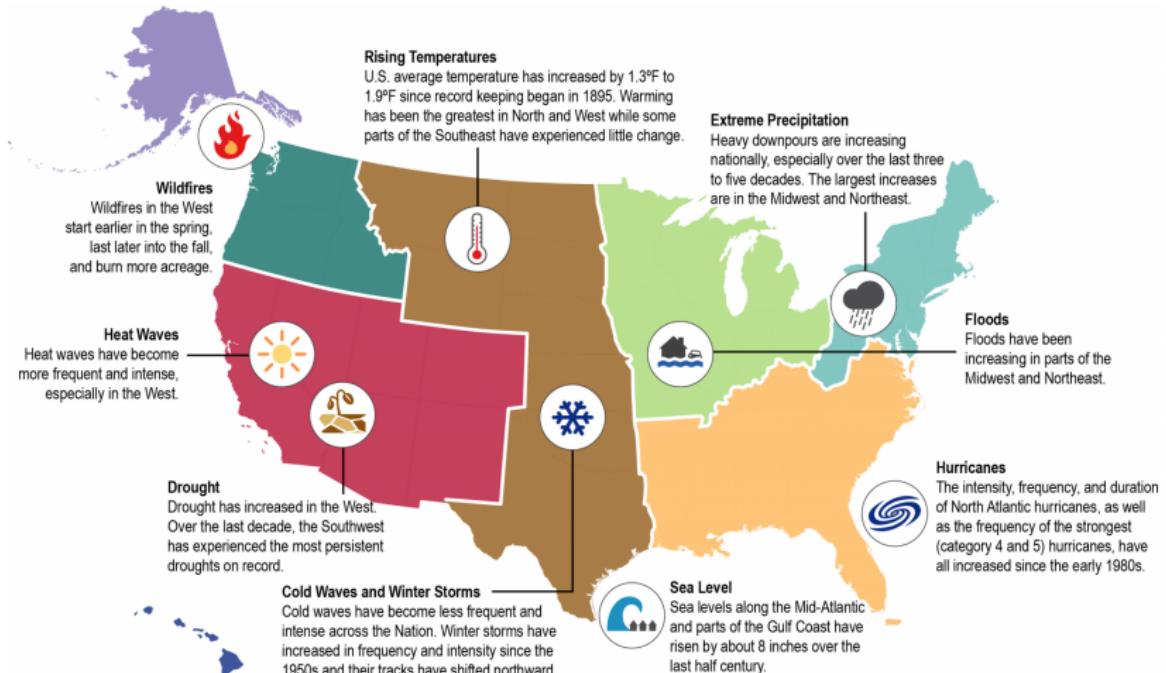


Sources: [weather.com](http://weather.com) and [www.weather-us.com](http://www.weather-us.com)

# What is climate change

# Why is climate changing?

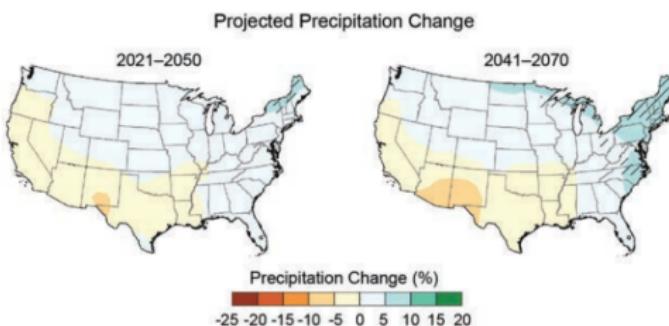
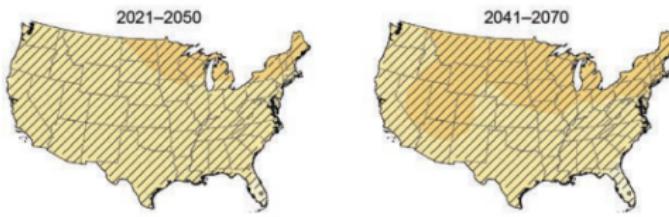
# Observed climate trends in the US



Source: <https://health2016.globalchange.gov/climate-change-and-human-health>

# Projected climate trends in the US

Projected changes in temperature and precipitation in the US under RCP6.0 scenario.



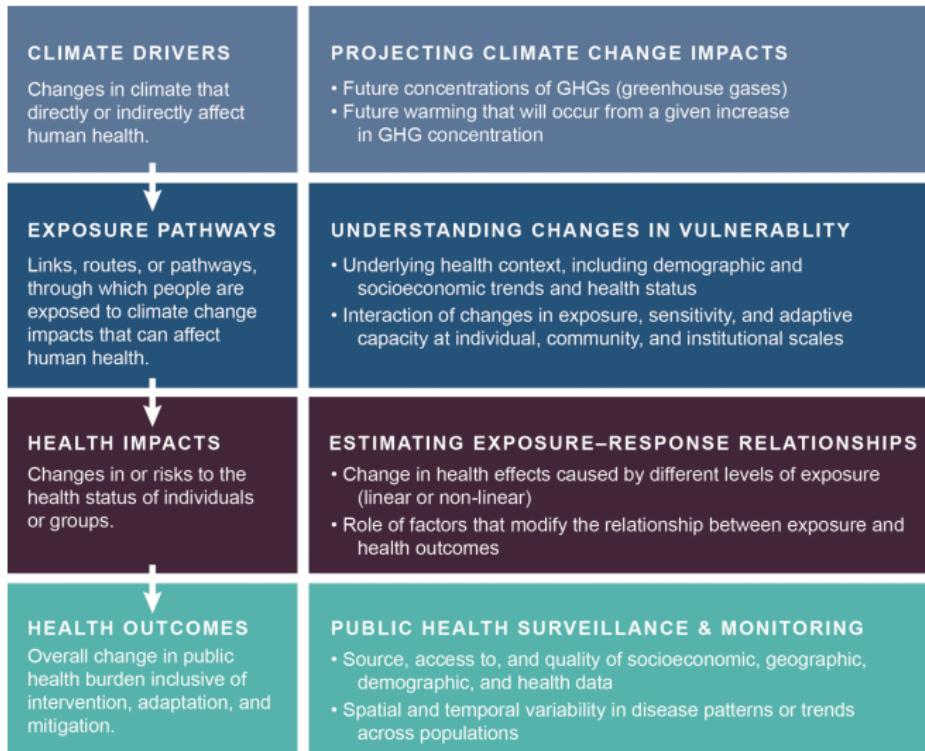
Source: <https://health2016.globalchange.gov>

# Projected health impacts



Source: <https://health2016.globalchange.gov>

# Projected health impacts



Source: <https://health2016.globalchange.gov>

# US Global Change Research Program (USGCRP)

## About USGCRP

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The U.S. Global Change Research Program (USGCRP) is a federal program [mandated by Congress](#) to coordinate federal research and investments in understanding the forces shaping the global environment, both human and natural, and their impacts on society. USGCRP facilitates collaboration and cooperation across its 13 federal [member agencies](#) to advance understanding of the changing Earth system and maximize efficiencies in federal global change research.

Together, USGCRP and its [member agencies](#) provide a gateway to authoritative science, tools, and resources to help people and organizations across the country manage risks and respond to changing environmental conditions.

Source: <https://www.globalchange.gov/about>

# US Global Change Research Program (USGCRP)



Includes thirteen agencies in the US government:

- ▶ Departments of Agriculture, Commerce, Defense, Energy, Health & Human Services, Interior, State, and Transportation
- ▶ Environmental Protection Agency
- ▶ National Aeronautics & Space Administration
- ▶ National Science Foundation
- ▶ Smithsonian Institution
- ▶ U.S. Agency for International Development

See <https://www.globalchange.gov/agencies> for the role each agency plays in the USGCRP.

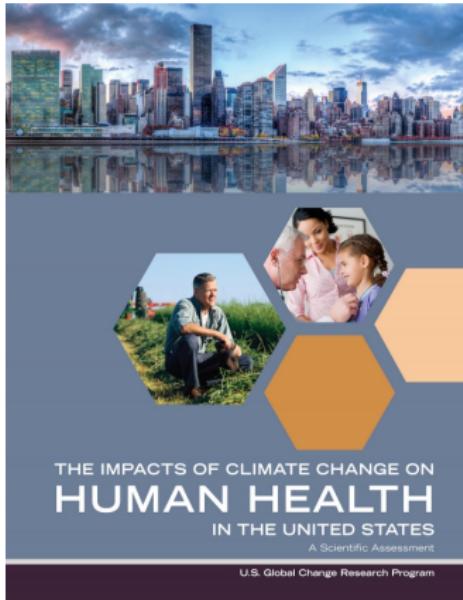
# US Global Change Research Program (USGCRP)

Key activities of USGCRP include:

- ▶ Advance global change science
  - ▶ Observe changes in the Earth system (including through indicators)
  - ▶ Improving understanding of earth systems
  - ▶ Modeling global change
- ▶ Prepare for climate change
  - ▶ US Climate Resilience Toolkit
- ▶ Assess the US Climate
  - ▶ National Climate Assessment (NCA) every four years (includes *Climate Science Special Report* and *Impacts, Risks, and Adaptation in the United States*)
- ▶ Coordinate internationally
  - ▶ Coordinate US participation in the Intergovernmental Panel on Climate Change (IPCC) Assessment Reports
- ▶ Provide data and tools
  - ▶ Climate Data Initiative

Source: <https://www.globalchange.gov/about>

# US Climate and Health Assessment



# Documenting uncertainty in key findings

## Likelihood

Very Likely ≥9 in 10	Likely ≥2 in 3	As Likely as Not ≈ 1 in 2	Unlikely ≤ 1 in 3	Very Unlikely ≤ 1 in 10
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## Confidence Level

<b>Very High</b> Strong evidence (established theory, multiple sources, consistent results, well documented and accepted methods, etc.), high consensus	<b>High</b> Moderate evidence (several sources, some consistency, methods vary and/or documentation limited, etc.), medium consensus	<b>Medium</b> Suggestive evidence (a few sources, limited consistency, models incomplete, methods emerging, etc.), competing schools of thought	<b>Low</b> Inconclusive evidence (limited sources, extrapolations, inconsistent findings, poor documentation and/or methods not tested, etc.), disagreement or lack of opinions among experts
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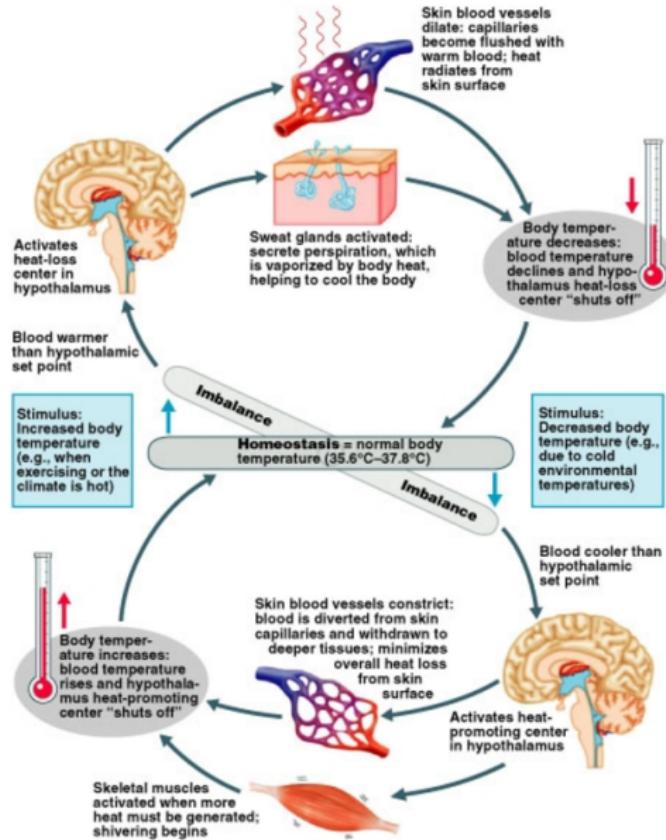
Source: <https://health2016.globalchange.gov/documenting-uncertainty>

## Temperature and Human Health

# Temperature extremes and human health

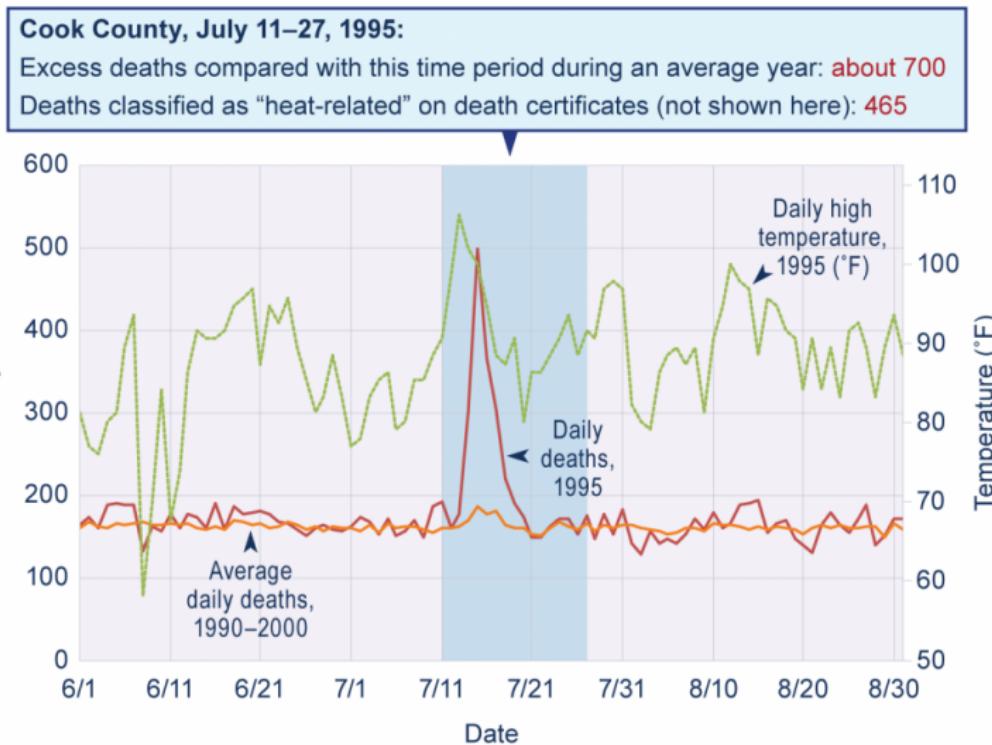


# Thermoregulation



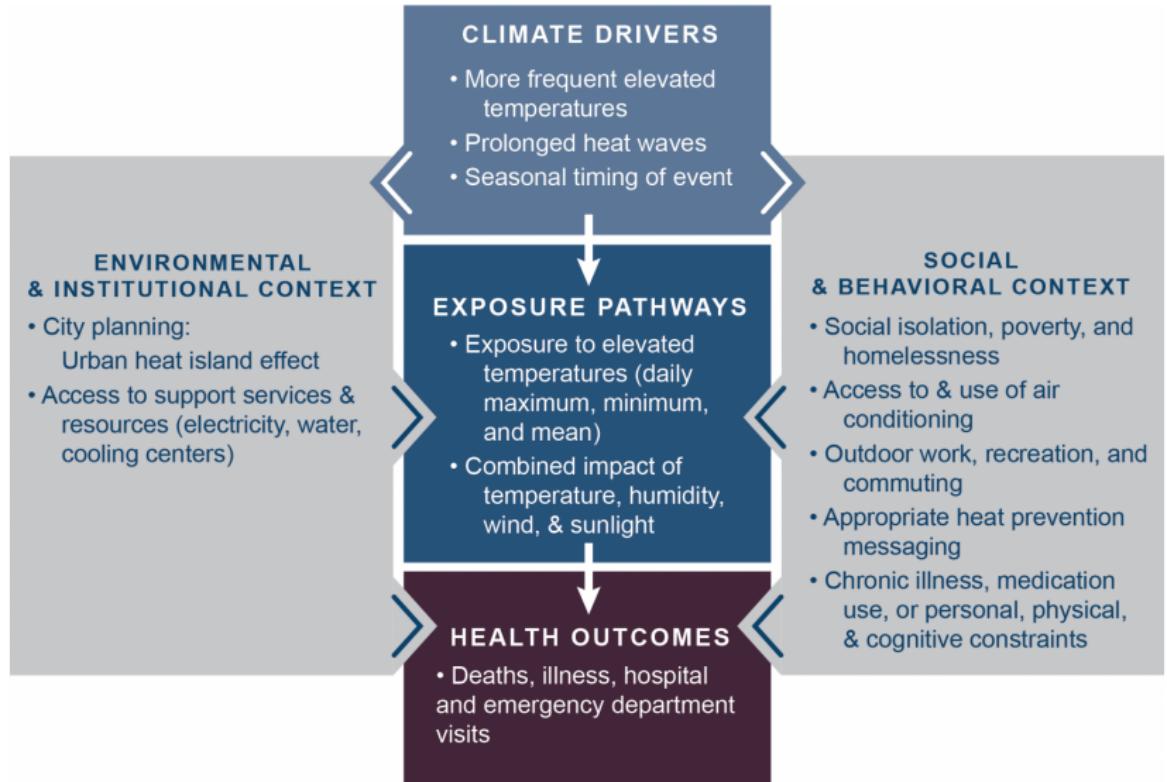
# Temperature extremes and human health

## Heat-Related Deaths in Chicago in the Summer of 1995



## Adaptation to temperature extremes

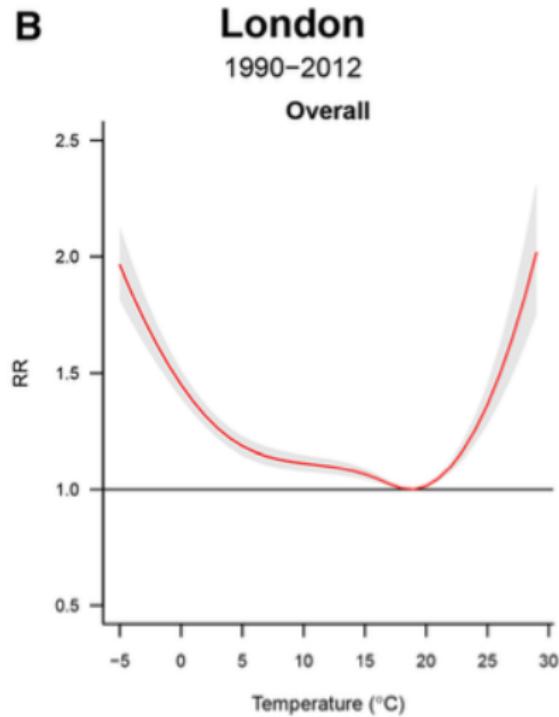
# Pathways for extreme heat and health



Source:

<https://health2016.globalchange.gov/temperature-related-death-and-illness>

## Key findings



Source: Vicedo-Cabrera et al., 2019, *Epidemiology*

# Key findings

## Key Finding 1: Future Increases in Temperature-Related Deaths

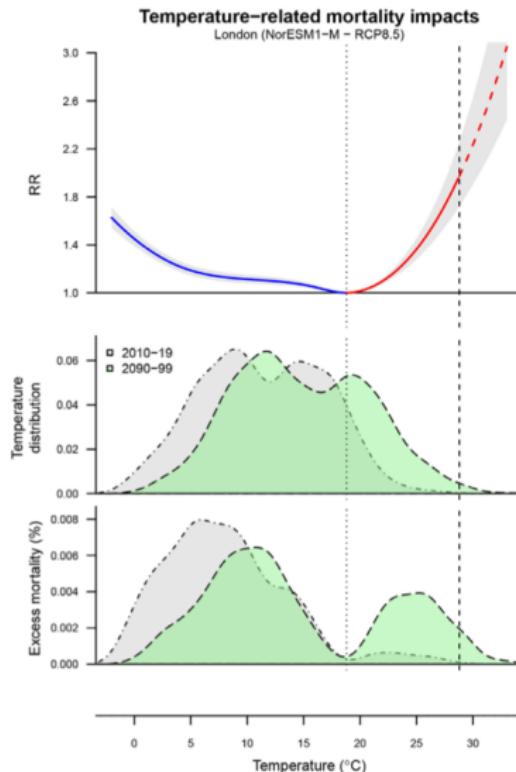


Based on present-day sensitivity to heat, an increase of thousands to tens of thousands of premature heat-related deaths in the summer [*Very Likely, High Confidence*] and a decrease of premature cold-related deaths in the winter [*Very Likely, Medium Confidence*] are projected each year as a result of climate change by the end of the century. Future adaptation will very likely reduce these impacts (see Changing Tolerance to Extreme Heat Finding). The reduction in cold-related deaths is projected to be smaller than the increase in heat-related deaths in most regions [*Likely, Medium Confidence*].

Source:

<https://health2016.globalchange.gov/temperature-related-death-and-illness>

# Key findings



Source: Vicedo-Cabrera et al., 2019, *Epidemiology*

# Key findings

## Key Finding 2: Even Small Differences from Seasonal Average Temperatures Result in Illness and Death



Days that are hotter than usual in the summer or colder than usual in the winter are both associated with increased illness and death *[Very High Confidence]*. Mortality effects are observed even for small differences from seasonal average temperatures *[High Confidence]*. Because small temperature differences occur much more frequently than large temperature differences, not accounting for the effect of these small differences would lead to underestimating the future impact of climate change *[Likely, High Confidence]*.

Source:

<https://health2016.globalchange.gov/temperature-related-death-and-illness>

# Key findings

## Key Finding 3: Changing Tolerance to Extreme Heat



An increase in population tolerance to extreme heat has been observed over time [*Very High Confidence*]. Changes in this tolerance have been associated with increased use of air conditioning, improved social responses, and/or physiological acclimatization, among other factors [*Medium Confidence*]. Expected future increases in this tolerance will reduce the projected increase in deaths from heat [*Very Likely, Very High Confidence*].

Source:

<https://health2016.globalchange.gov/temperature-related-death-and-illness>

# Key findings

## Key Finding 4: Some Populations at Greater Risk



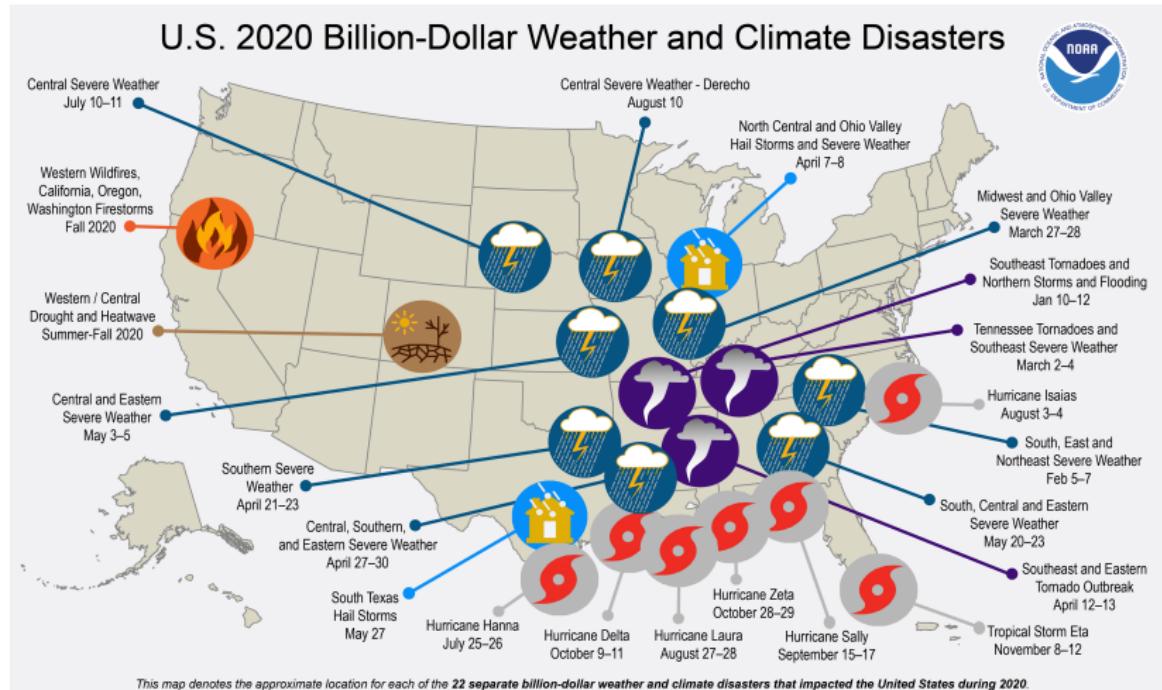
Older adults and children have a higher risk of dying or becoming ill due to extreme heat [*Very High Confidence*]. People working outdoors, the socially isolated and economically disadvantaged, those with chronic illnesses, as well as some communities of color, are also especially vulnerable to death or illness [*Very High Confidence*].

Source:

<https://health2016.globalchange.gov/temperature-related-death-and-illness>

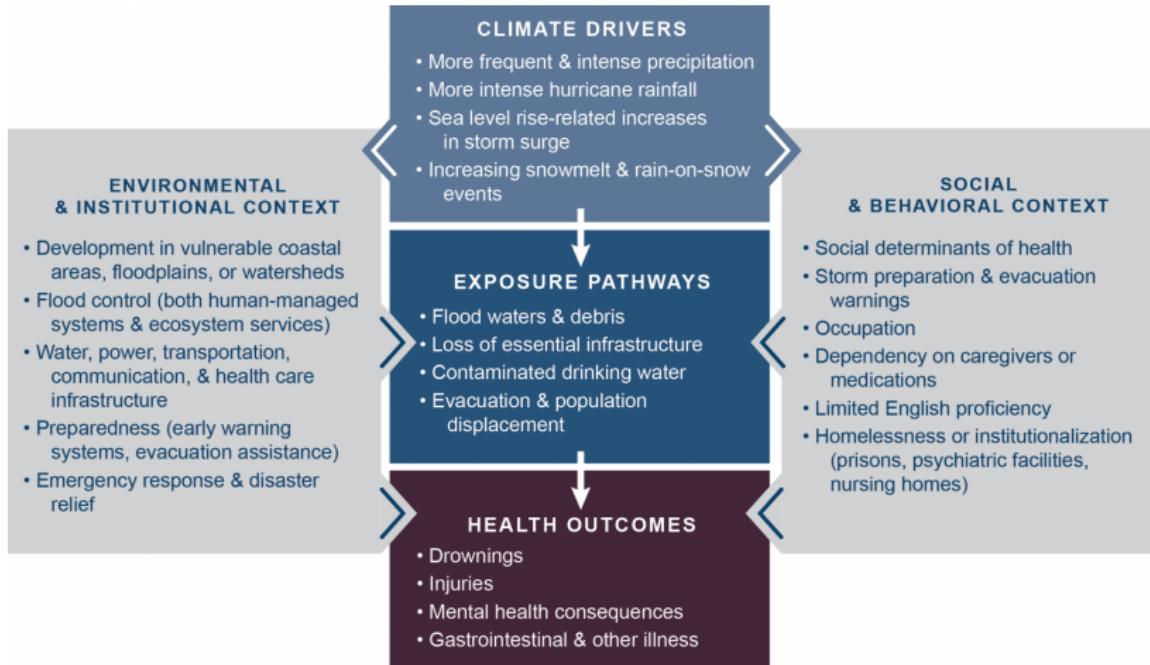
## Climate-related Disasters and Human Health

# Climate-related disasters



Source: <https://www.ncdc.noaa.gov/billions/>

# Pathways



Source: <https://health2016.globalchange.gov>

# Key findings

## Key Finding 1: Increased Exposure to Extreme Events



Health impacts associated with climate-related changes in exposure to extreme events include death, injury, or illness; exacerbation of underlying medical conditions; and adverse effects on mental health *[High Confidence]*. Climate change will increase exposure risk in some regions of the United States due to projected increases in the frequency and/or intensity of drought, wildfires, and flooding related to extreme precipitation and hurricanes *[Medium Confidence]*.

Source: <https://health2016.globalchange.gov>

# Key findings

## Key Finding 2: Disruption of Essential Infrastructure



Many types of extreme events related to climate change cause disruption of infrastructure, including power, water, transportation, and communication systems, that are essential to maintaining access to health care and emergency response services and safeguarding human health *[High Confidence]*.

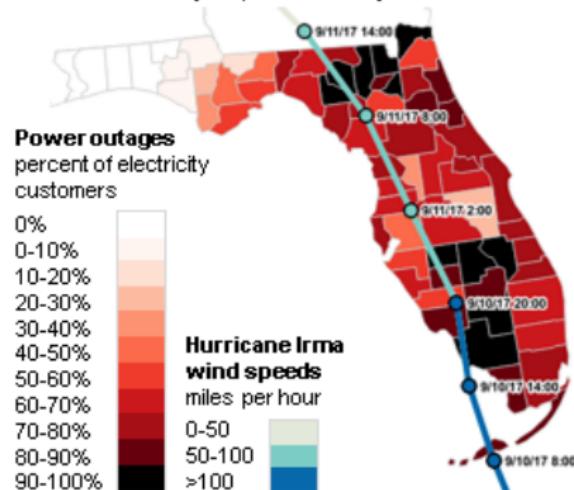
Source: <https://health2016.globalchange.gov>

# Key findings

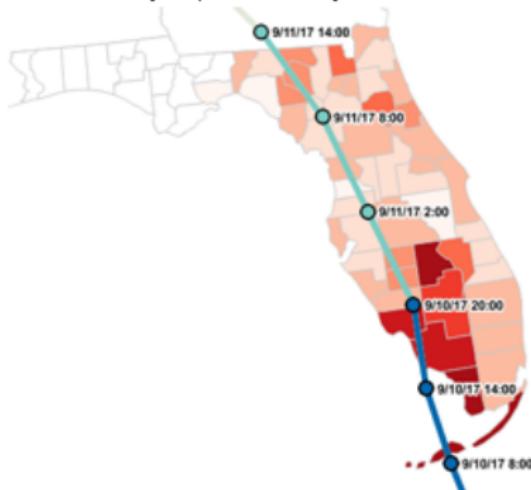
## Florida power outages by county during Hurricane Irma

eia

Sep 11, 2017 3:00 p.m.



Sep 14, 2017 3:00 p.m.



Source: U.S. Energy Information Administration based on data from Florida Division of Emergency Management and NOAA National Hurricane Center

## Key findings

### Six Dead At Florida Nursing Home After Irma Knocks Out Power

Wednesday, September 13th 2017, 9:49 am

By: News On 6



Source: [newsongsix.com](http://newsongsix.com)

# Key findings

## Key Finding 3: Vulnerability to Coastal Flooding



Coastal populations with greater vulnerability to health impacts from coastal flooding include persons with disabilities or other access and functional needs, certain populations of color, older adults, pregnant women and children, low-income populations, and some occupational groups [High Confidence]. Climate change will increase exposure risk to coastal flooding due to increases in extreme precipitation and in hurricane intensity and rainfall rates, as well as sea level rise and the resulting increases in storm surge [High Confidence].

Source: <https://health2016.globalchange.gov>

## Conclusion

## Other topics on climate and health

- ▶ Air quality
- ▶ Water-borne disease
- ▶ Vector-borne disease
- ▶ Food and nutrition
- ▶ Mental health
- ▶ Populations of concern

## Pathways forward

- ▶ International policy
- ▶ National policy
- ▶ Local preparations
- ▶ Learning how to adapt
- ▶ More extreme measures:
  - ▶ Migration
  - ▶ Geoengineering