Climate & Disaster Data

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Director, Institute of Behavioral Science
Co-Director, Center for Aging, Climate, and Health (CACHE)
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Prepared for Cross-Network Meeting to Advance Research on Aging, Health, & Place

IBS INSTITUTE OF BEHAVIORAL SCIENCE

cupc CU Population Center

CACHE Center for Aging, Climate & Health

Climate & Disaster Data

- Research Examples
- Weather / climate data
- Disaster data
- SEDAC, CACHE
- Summary

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SCIENCE ADVANCES | RESEARCH ARTICLE

PUBLIC HEALTH

Ambient outdoor heat and accelerated epigenetic aging among older adults in the US

Eun Young Choi*, Jennifer A. Ailshire

nature communications

Article

https://doi.org/10.1038/s41467-024-47197-5

Global projections of heat exposure of older adults

Received: 25 April 2023

Accepted: 24 March 2024

Giacomo Falchetta[1,2,3], Enrica De Cian[1,2,4], Ian Sue Wing[5] & Deborah Carr[6]

International Journal of *Environmental Research and Public Health*

MDPI

Article

Weather Woes? Exploring Potential Links between Precipitation and Age-Related Cognitive Decline

Jessica Finlay [1,*], Anam Khan [1,2], Carina Gronlund [1], Ketlyne Sol [3], Joy Jang [1], Robert Melendez [1], Suzanne Judd [4] and Philippa Clarke [1,2]

Weather/climate

The Impact of Natural Hazards on Older Adult Health: Lessons Learned From Hurricane Maria in Puerto Rico

Part of: Hurricanes Collection

Published online by Cambridge University Press: **02 November 2021**

Elizabeth L. Andrade, Megan Jula, Carlos E. Rodriguez-Diaz, Lauren Lapointe, Mark C. Edberg, Maria I. Rivera and Carlos Santos-Burgoa

Show author detai

International Journal of Disaster Risk Science (2024) 15:213–225
https://doi.org/10.1007/s13753-024-00548-8

www.ijdrs.com
www.springer.com/13753

ARTICLE

Check for updates

Extreme Weather Disruptions and Emergency Preparedness Among Older Adults in Ohio: An Eight-County Assessment

Smitha Rao[1] · Fiona C. Doherty[1] · Anthony Traver[1] · Marisa Sheldon[2] · Emma Sakulich[3] · Holly Dabelko-Schoeny[1]

JOURNAL ARTICLE

Health Outcomes After Disaster for Older Adults With Chronic Disease: A Systematic Review

FREE

Sue Anne Bell, PhD, FNP-BC, Jennifer Horowitz, MA, Theodore J Iwashyna, MD, PhD

The Gerontologist, Volume 60, Issue 7, October 2020, Pages e535–e547,

Extreme events

nature climate change

Review article

https://doi.org/10.1038/s41558-024-02156-2

A framework for ageing and health vulnerabilities in a changing climate

Received: 10 May 2024

Accepted: 5 September 2024

Jenna F. Tipaldo[1,2] ✉, Deborah Balk[2,3] & Lori M. Hunter[4]

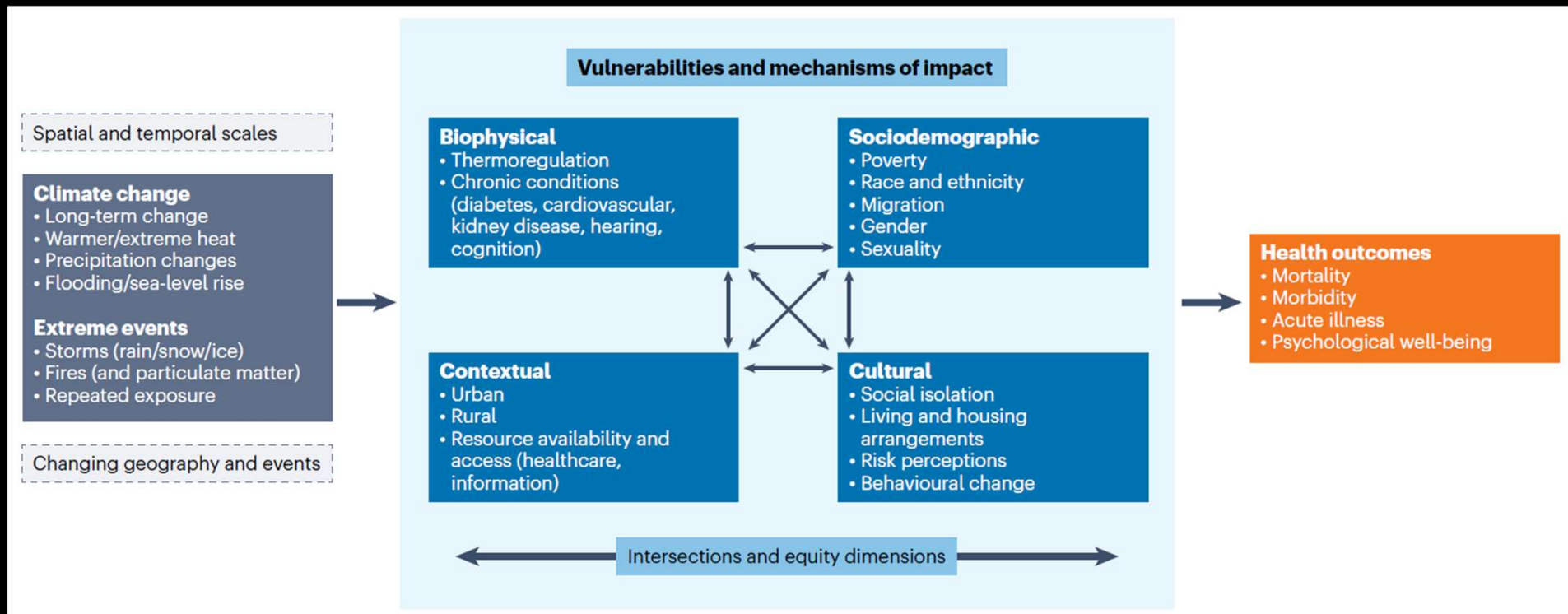

Fig. 2 | Framework for studying ageing, climate and health. Vulnerabilities and mechanisms of impact may interact, and intersect with dimensions of equity, to influence health outcomes in older adults due to climate change and extreme weather events.

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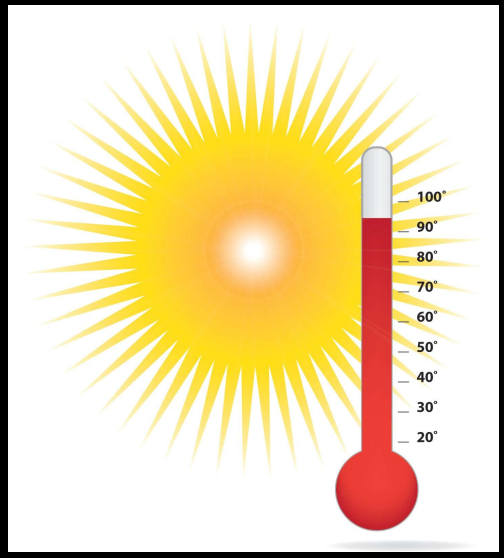
Ambient outdoor heat and accelerated epigenetic aging among older adults in the US

Eun Young Choi*, Jennifer A. Ailshire



gridMet

https://www.climatologylab.org/gridmet.html

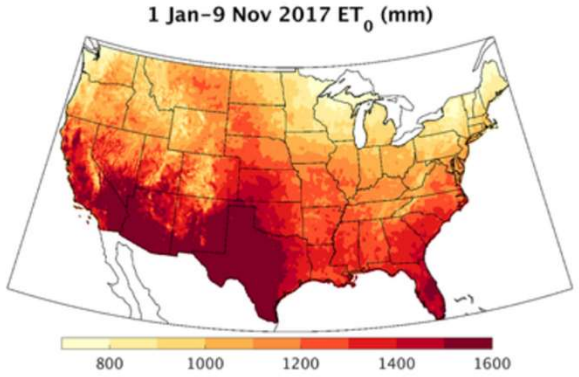
Climatology Lab

HOME TEAM PRODUCTS TEACHING

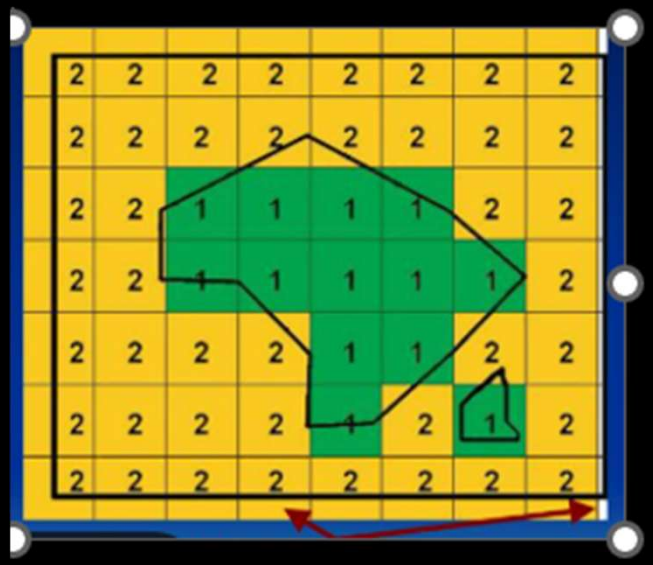
About | Download | Updates | References | Known Issues

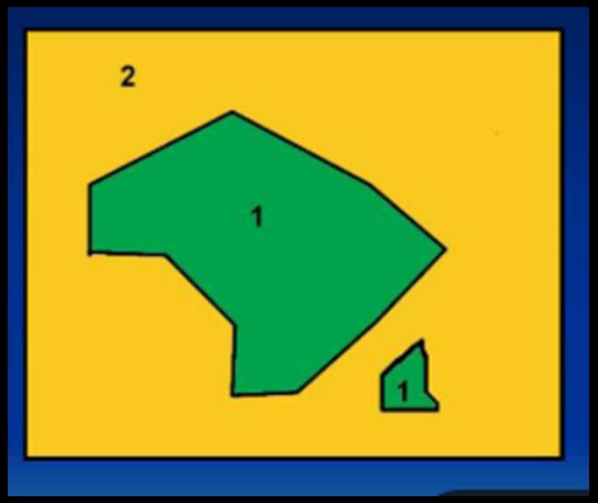
GRIDMET

1 Jan–9 Nov 2017 ET_0 (mm)



- gridMet
- PRISM, Oregon State University +
- 4 km^2 grid
- 1979 - “yesterday”
- Daily, max/min, temp & humidity

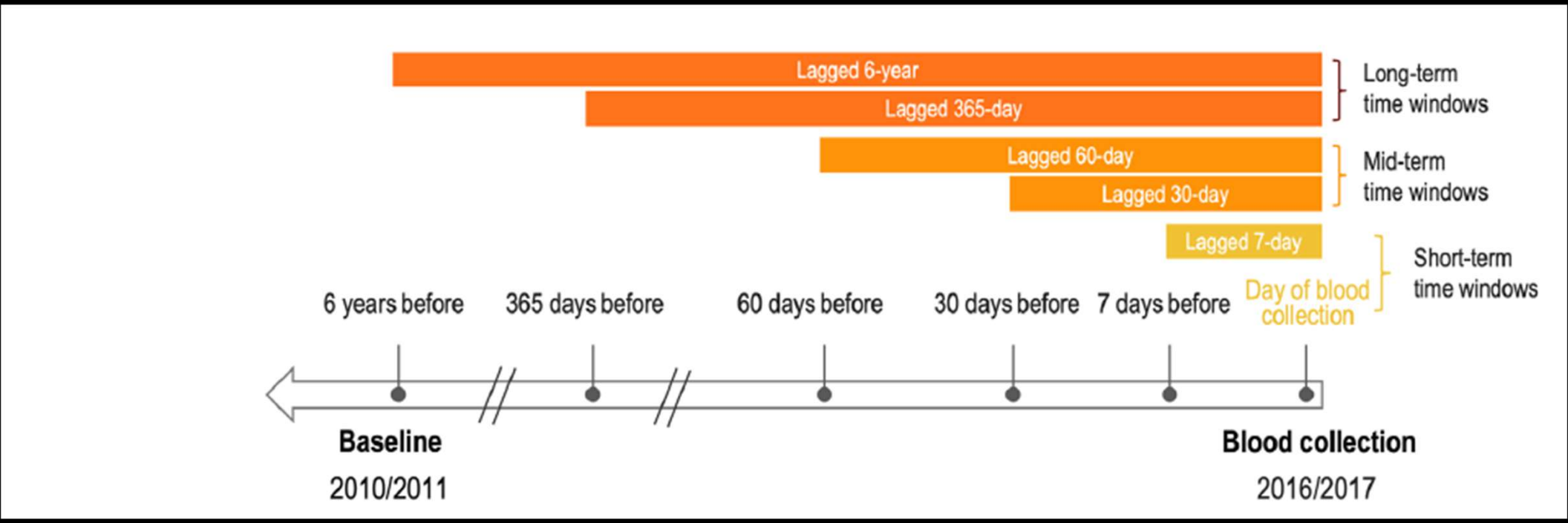




- calculated Heat Index value, NWS
  - 4 categories, thresholds
- link to census tracts
- area-weighted average
- Integrated – every respondent for 2010-2016

Temporal Scale

Exposure



Choi & Ailshire (2025)

Other Measurements / Variables

Combination of threshold and duration

ID	Indicator name	Definitions	Units
SU25	Summer days	Annual count when TX (daily maximum) > 25°C	Days
ID0	Ice days	Annual count when TX (daily maximum) < 0°C	Days
TR20	Tropical nights	Annual count when TN (daily minimum) > 20°C	Days
FD0	Frost days	Annual count when TN (daily minimum) < 0°C	Days
TXx	Max Tmax	Annual maximum value of daily maximum temp	°C
TXn	Min Tmax	Annual minimum value of daily maximum temp	°C
TNx	Max Tmin	Annual maximum value of daily minimum temp	°C
TNn	Min Tmin	Annual minimum value of daily minimum temp	°C
TX90p	Warm days	Percentage of days when TX > 90th percentile	%
TX10p	Cool days	Percentage of days when TX < 10th percentile	%
TN10p	Cool nights	Percentage of days when TN < 10th percentile	%
TN90p	Warm nights	Percentage of days when TN > 90th percentile	%
GSL	Growing season length	Annual (1 Jan–31 Dec in NH) count between first span of at least 6 days with TG > 5°C and first span after 1 July of 6 days with TG < 5°C	Days
DTR	Diurnal temperature range	Annual mean difference between TX and TN	°C
WSDI	Warm spell duration indicator	Annual count of days with at least 6 consecutive days when TX > 90th percentile	Days
CSDI	Cold spell duration indicator	Annual count of days with at least 6 consecutive days when TN < 10th percentile	Days

Brown et al 2010

“Wet bulb”

nature communications

Article

https://doi.org/10.1038/s41467-024-47197-5

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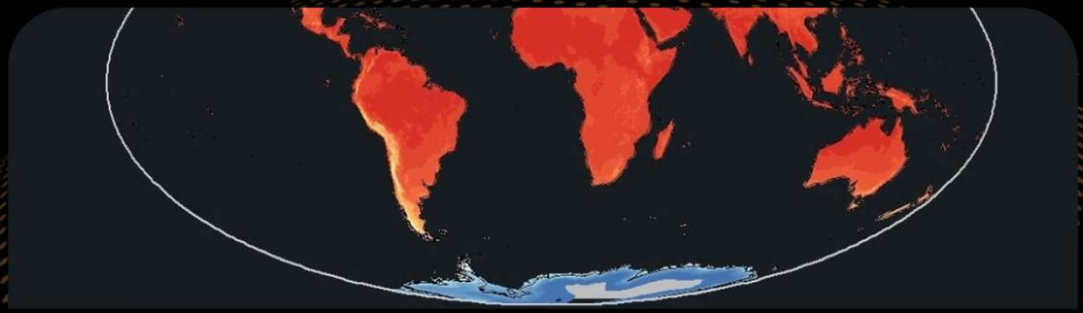
CMIP6 projections at high-resolution

Product update • September 16, 2021 • 2:48 pm

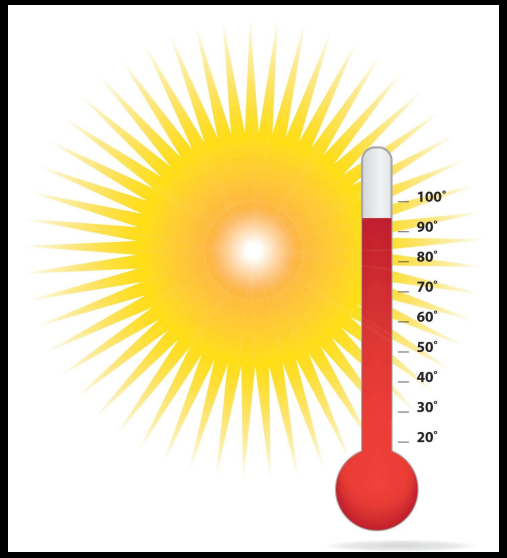


CMIP

- Coupled Model Intercomparison Project (CMIP6)
- 1983-2016
- Chronic & acute exposure
- Chronic:
  - Annual cooling degree days above 24°C
- Acute:
  - annual # hot days max temp >27.5°C and 95th percentile of the 20y daily max temp

CHIRTS

- Climate Hazards InfraRed Temperature with Stations (CHIRTS-daily)
  - UCSB Climate Data Center
- Global
- Daily
- Min/max temperature
- 1983-2016



How decide?

- Collaborate
- Coverage
- Resolution
- Literature
- Outcome, mechanisms → measures

Weather / Climate Data

- Climate Hazards InfraRed Precipitation with Stations (CHIRPS)
- 25+ year, 1981 …
- Quasi-global
- Satellite imagery + station data
- Daily precipitation
- 0.05° gridded

Measurements / Variables

RX1day	Max 1-day precipitation amount	Annual maximum 1-day precipitation	mm
RX5day	Max 5-day precipitation amount	Annual maximum consecutive 5-day precipitation	mm
SDII	Simple daily intensity index	Annual total precipitation divided by the number of wet days (defined as PRCP >= 1.0 mm) in the year	mm day^{-1}
R10	Number of heavy precipitation days	Annual count of days when PRCP >= 10 mm	Days
R20	Number of very heavy precipitation days	Annual count of days when PRCP >= 20 mm	Days
R25	Number of days above 25 mm	Annual count of days when PRCP ≥ 25 mm, 25 is user-defined threshold	Days
CDD	Consecutive dry days	Maximum number of consecutive days with RR < 1 mm	Days
CWD	Consecutive wet days	Maximum number of consecutive days with RR ≥ 1 mm	Days
R95p	Very wet days	Annual total PRCP when RR > 95th percentile	mm

Brown et al 2010

How decide?

collaborate; literature; outcome; mechanism

Temporal Scale

Annual?
Growing season?

Weather / Climate Data

Landscape and Urban Planning 223 (2022) 104406

Contents lists available at ScienceDirect

Landscape and Urban Planning

journal homepage: www.elsevier.com/locate/landurbplan

Research Paper

Non-linear association between residential greenness and general health among old adults in China

Baishi Huang [a,b,c], Zeyi Yao [a], Jamie R. Pearce [d], Zhiqiang Feng [d], Andrew James Browne [e], Zehan Pan [f], Ye Liu [a,b,c,*]

Normalized Difference Vegetation Index (NDVI)

Earth Syst. Sci. Data, 15, 4181–4203, 2023
https://doi.org/10.5194/essd-15-4181-2023

Open Access Earth System Science Data

Spatiotemporally consistent global dataset of the GIMMS Normalized Difference Vegetation Index (PKU GIMMS NDVI) from 1982 to 2022

Muyi Li[1,2,3,★], Sen Cao[1,2,3,★], Zaichun Zhu[1,2,3], Zhe Wang[1,2,3], Ranga B. Myneni[4], and Shilong Piao[2,5,6]

[1]School of Urban Planning and Design, Shenzhen Graduate School, Peking University, Shenzhen 518055, China
[2]Institute of Carbon Neutrality, Peking University, Beijing 100871, China
[3]Key Laboratory of Earth Surface System and Human–Earth Relations, Ministry of Natural Resources of China, Shenzhen Graduate School, Peking University, Shenzhen 518055, China
[4]Department of Earth & Environment, Boston University, Boston, MA 02215, USA
[5]Sino-French Institute for Earth System Science, College of Urban and Environmental Sciences, Peking University, Beijing 100871, China
[6]State Key Laboratory of Tibetan Plateau Earth System, Environment and Resources, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100101, China
★These authors contributed equally to this work.

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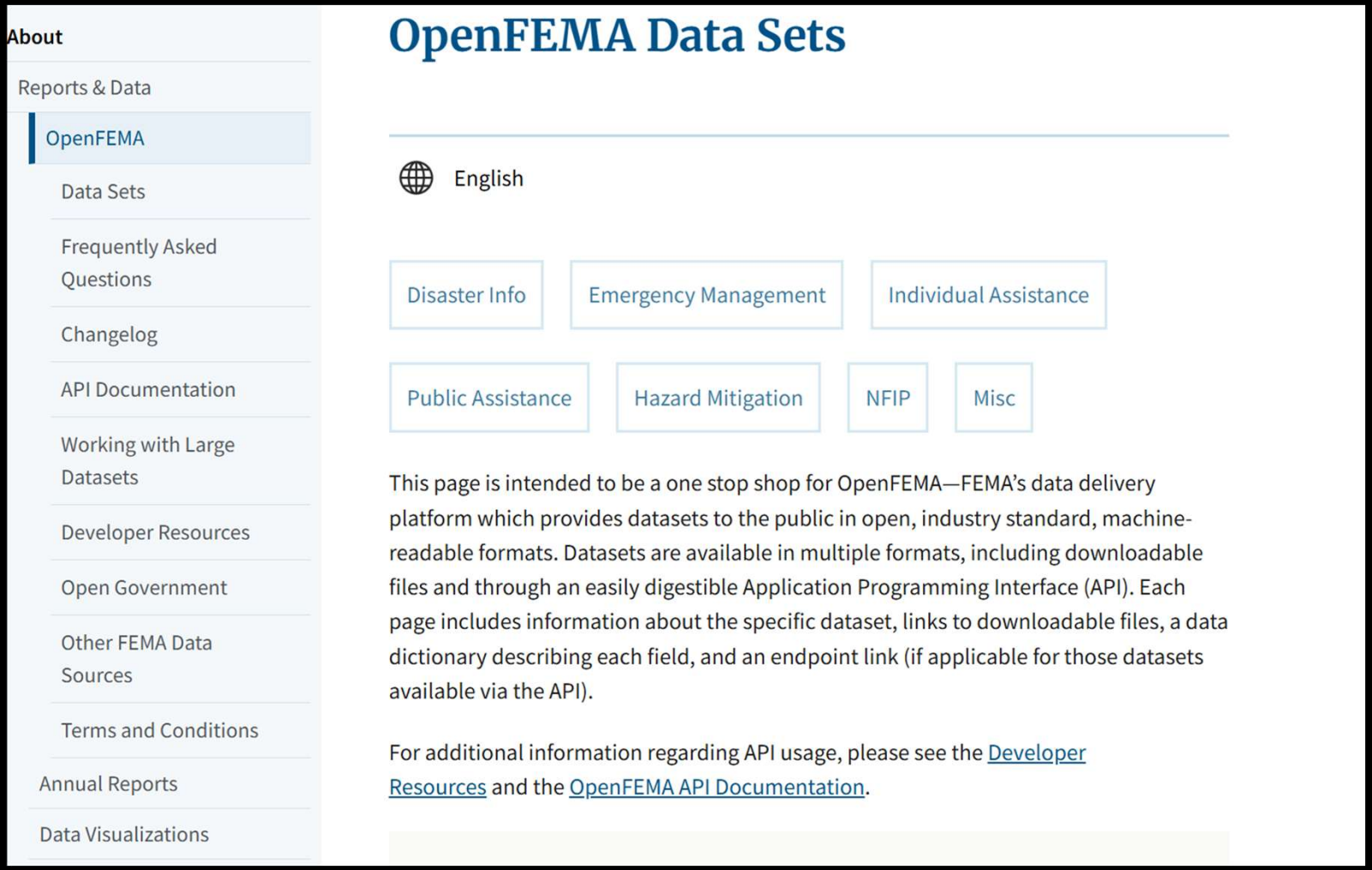
Disaster Data



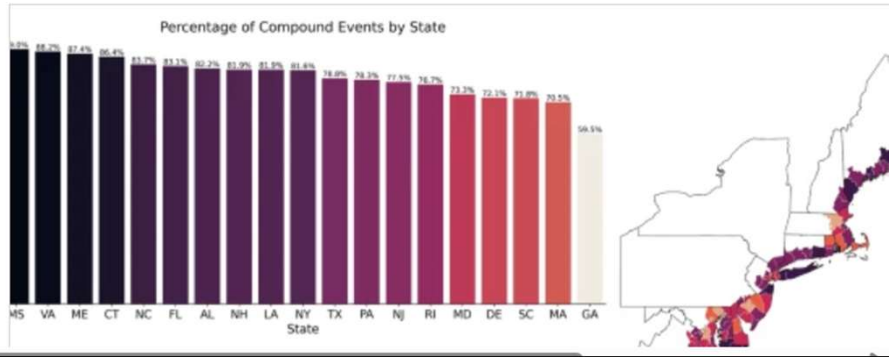
Disaster Information

Dataset Name	OpenFEMA API
Declaration Denials	V1
Disaster Declarations Summaries	V2
FEMA Web Declaration Areas	V1
FEMA Web Disaster Declarations	V1
FEMA Web Disaster Summaries	V1
Mission Assignments	V2

Arizona State University

Center for Emergency Management and Homeland Security

SHELDUS | Register/Log in | How to | Reports | Community | Metadata | FAQ | Contact



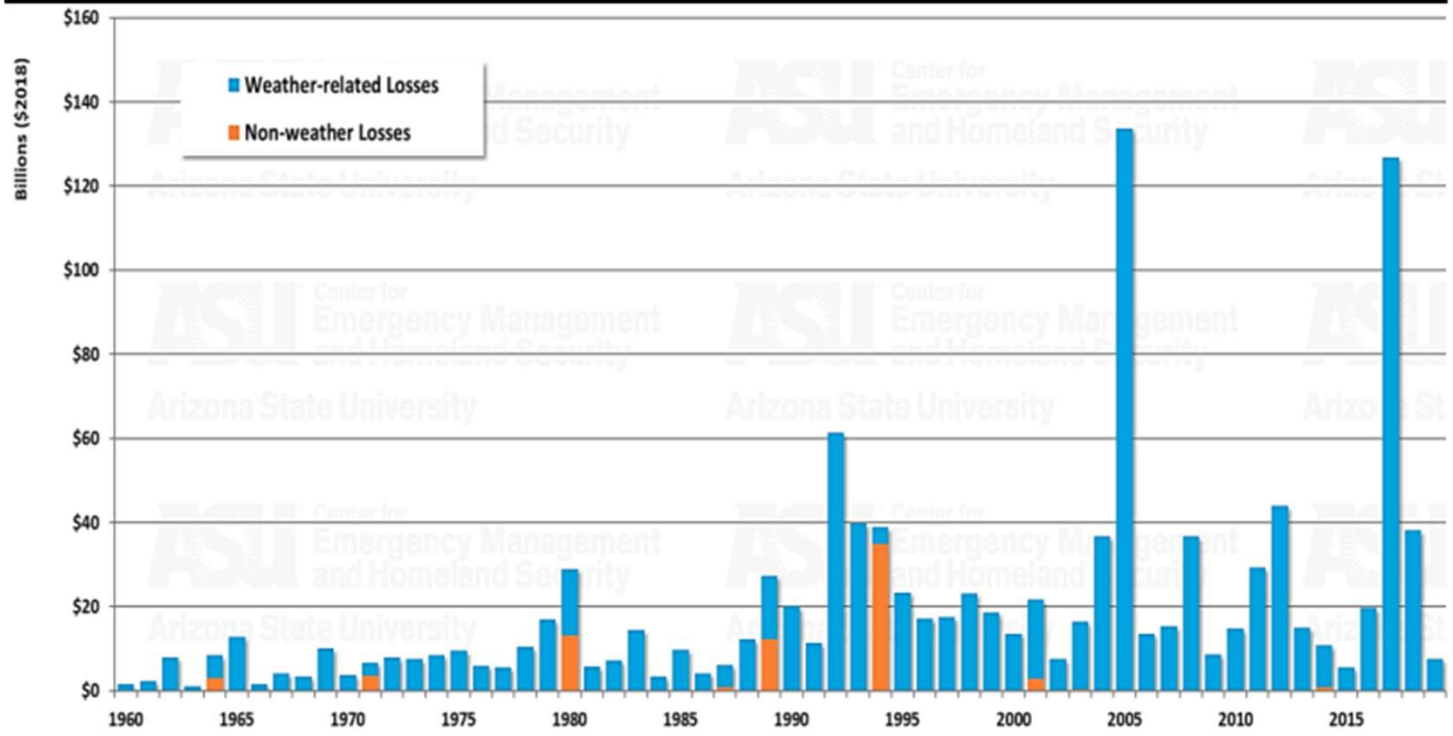
~subscription model

SHELDUS can be searched for the following hazard types:

1. Avalanche
2. Coastal
3. Drought
4. Earthquake
5. Flood
6. Fog
7. Hail
8. Heat
9. Hurricane/Tropical Storm
10. Landslide
11. Lightning
12. Severe Thunderstorm
13. Tornado
14. Tsunami/Seiche
15. Volcano
16. Wildfire
17. Wind
18. Winter Weather

- **County scale**
- **1960– 2023 …**
- **Injuries, fatalities**
- **Property, crop losses**

Annual Losses

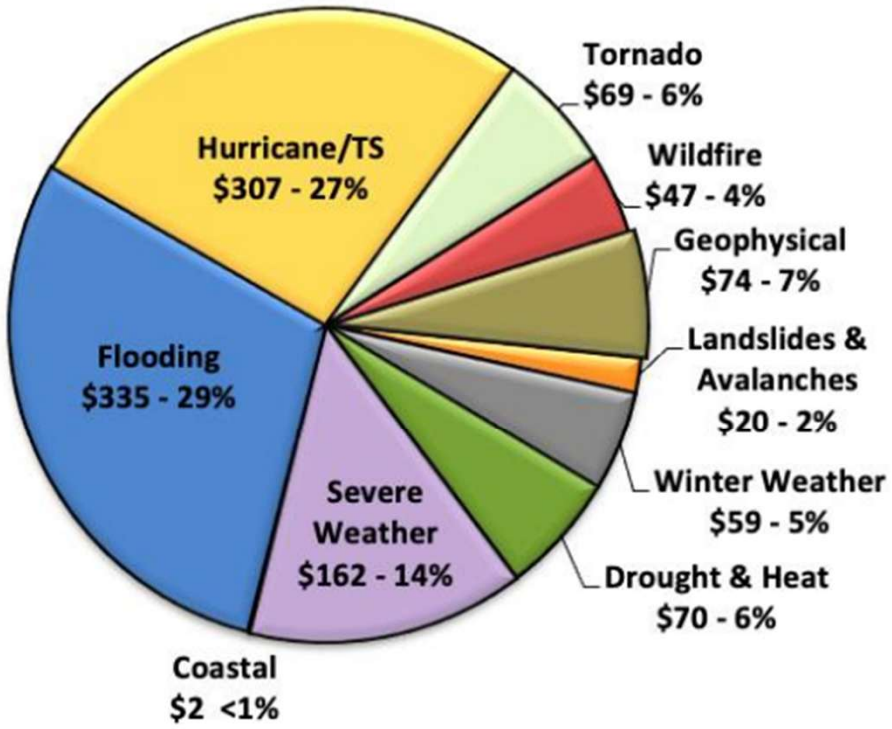


Record Years

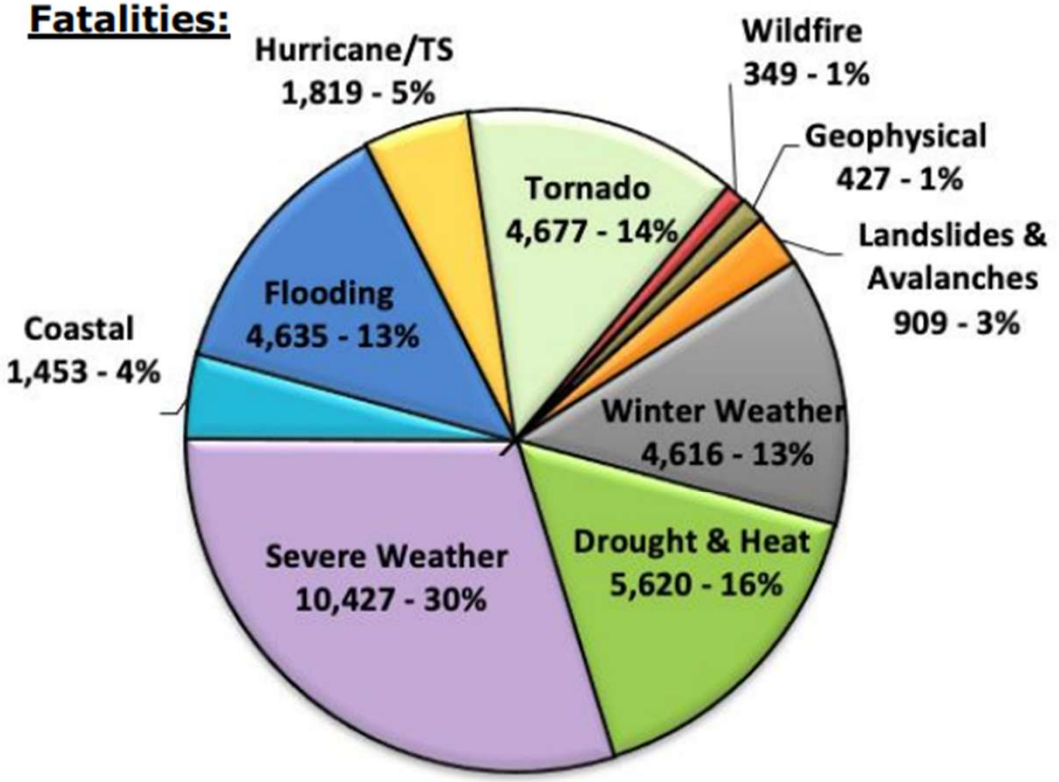
Year	Costliest	Deadliest	Year
2005	$133.6	1,638	1995
2017	$126.8	1,449	2005
1992	$61.4	1,156	2011
2012	$44.0	1,054	1980
1993	$39.8	998	1972
1994	$38.9	917	1999
2018	$38.3	871	1974
2008	$36.8	816	1969
2004	$36.7	748	1971
2011	$29.4	718	1960
1980	$29.0	707	1965
1989	$27.3	671	1998
1995	$23.3	669	1983
1998	$23.2	623	1985
2001	$21.8	618	1989

Costliest and Deadliest Hazards

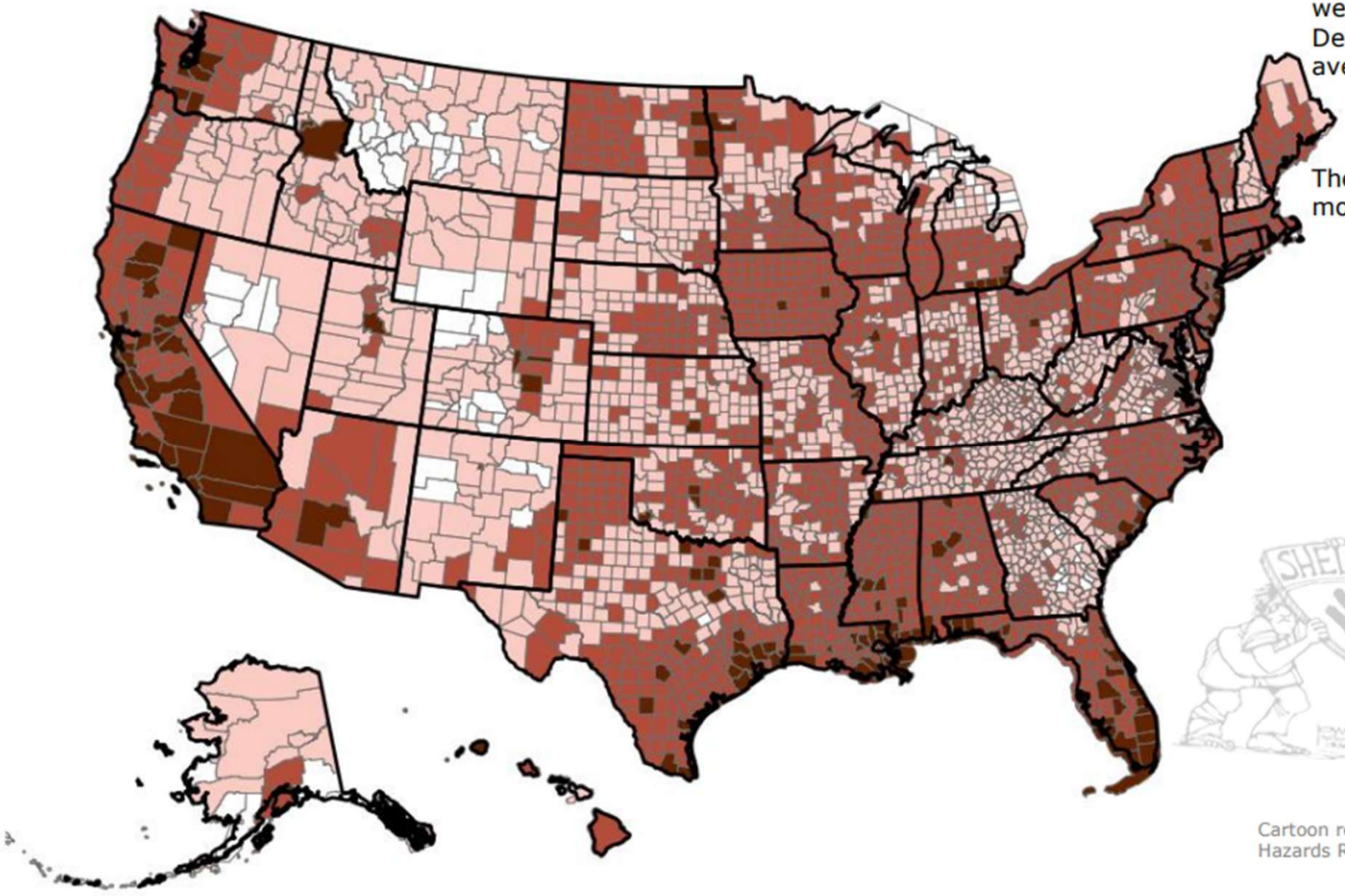
Losses ($2019 Billion):



Fatalities:



Total Losses from Natural Hazards between 1960 and 2019



Between 1960 and 2019, there were 2,377 Presidential Disaster Declarations (PDDs). The annual average number of PDDs is 40.

The states that received PDDs most frequently were:

Texas	93
California	91
Oklahoma	80
Florida	72
New York	71
Kentucky	64
Louisiana	64
Alabama	63
Mississippi	62
Arkansas	61

Under $10 Million

Between $10 and $100 Million

Between $100 Million and $1 Billion

More than $1 Billion

For more information on Presidential Disaster Declarations go to FEMA (http://www.fema.gov/disasters/declarations).

Same issues ...

- Measurement
- Temporal scale
- Spatial scale

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SEDAC

Socioeconomic Data and Applications Center

NASA's Socioeconomic Data and Applications Center (SEDAC) focuses on archiving and distributing data related to human interactions in the environment. SEDAC synthesizes Earth science and socioeconomic data and information in ways useful to a wide range of decision-makers and other applied users, and seeks to improve access to and use of key socioeconomic and interdisciplinary data that are or can be integrated with remote sensing data.

SEDAC develops and maintains extensive fundamental data on human settlements, infrastructure, and population that underpin many different science and application areas.

LOCATION
Palisades, NY

MANAGER
Alex de Sherbinin
View All People

FOUNDED
1994

PARTNERS
CIESIN, Columbia University

Data From SEDAC Are Available Again in Earthdata Search

SEDAC data became unavailable almost two months ago. Today, that status has changed, and all SEDAC data are accessible through Earthdata Search.

CACHE

Center for Aging, Climate & Health

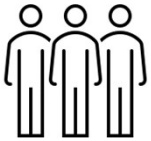
CACHE improves understanding of the public health consequences of environmental conditions and change of the 21st century

The virtual Center for Aging, Climate, and Health aims to facilitate research and foster collaborations among a wide-range of researchers working at the nexus of aging, health, climate change, and related extreme weather events through targeted interdisciplinary training, information sharing, and investments in research support.

A joint effort led by five population research units

Focus on climate-related health impacts on older adults

Targeted interdisciplinary training and funding



A hub for information and code sharing, and community building

Facilitate research and collaboration through network activities

Contact Us

Website: www.agingclimatehealth.org

Email: info@agingclimathealth.org

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Funded by the National Institute on Aging (NIA), "Aging and Health in a Changing Climate", R61AG086854

Seminars

Measuring Extreme Temperatures and Thermal Comfort in Aging and Demographic Research

March 19th, 2025

Social & Environmental Data Integration at the U.S. County Scale

February 18th, 2025

Climate Systems 101 with an Application to Health

May 15th, 2025

Workshops
Seed grants

Code

Office hours!

US Census Bureau Household Pulse Survey – Disaster Displacement

This code analyzes the questions regarding displacement due to disasters in US Census Bureau's Household Pulse Survey.

Learn more →

Code linking SHELDUS with ACS data

This code links the American Community Survey (ACS) microdata with the Spatial Hazards Events and Losses Database for the United States (SHELDUS).

Learn more →

Summary

- Many data sources
- Carefully consider measurement, spatial, and temporal scales
- Collaborate; Literature; Outcome/Mechanism
- Seek support – you’re not alone!

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