Addressing Public Health Risks for Health Center Patients After Natural Disasters

Presented by

Harleen Marwah, MD MS
Pediatrician, Mass General Brigham for Children
Instructor in Pediatrics, Harvard Medical School
Instructor in Environmental Health, Harvard T.H. Chan School of Public Health

James McKowen, Ph.D.
Assistant Professor of Psychiatry, Mass General Brigham & Harvard Medical School
Co-Chair, Climate Mental Health Initiative, MGB
Affiliate Faculty, Center for Climate, Health, and the Global Environment (C-CHANGE) Harvard T.H. Chan School of Public Health

7/22/26

NATIONAL LGBTQIA+ HEALTH EDUCATION CENTER
A PROGRAM OF THE FENWAY INSTITUTE

Our Roots

Fenway Health

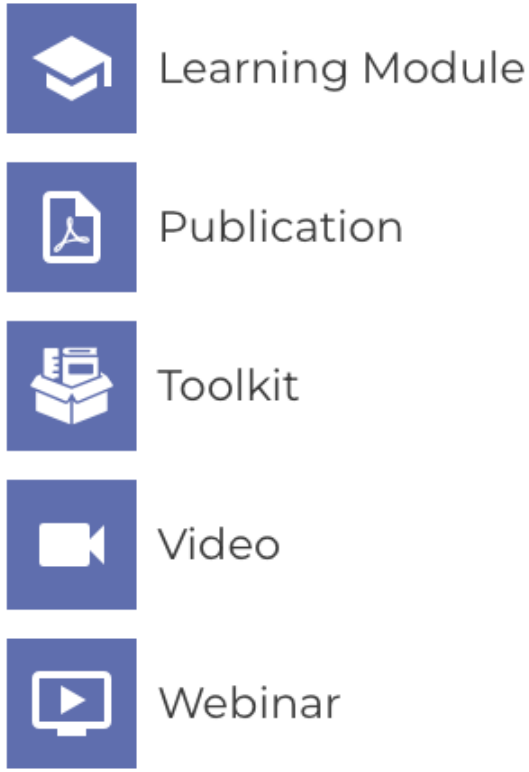
- Independent 501(c)(3) FQHC
- Founded 1971
- Mission: To enhance the wellbeing of the LGBTQIA+ community as well as people in our neighborhoods and beyond through access to the highest quality health care, education, research, and advocacy
- Integrated primary care model, including HIV and transgender health services

The Fenway Institute

- Research, Education, Policy

The National LGBTQIA+ Health Education Center

- Training and Technical Assistance
- Grand Rounds
- Online Learning
  - CE and HEI Credit
- Environmental Influences On Child Health Outcomes (ECHO) Programs
- Publications and Resources



NATIONAL LGBTQIA+ HEALTH EDUCATION CENTER
A PROGRAM OF THE FENWAY INSTITUTE

www.lgbtqiahealtheducation.org

Technical Questions?

- Please call Zoom Technical Support: 1.888.799.9666 ext 2
- You can contact the webinar host using the chat function in Zoom. Click the “Chat” icon and type your question.
- Alternatively, e-mail us at education@fenwayhealth.org for less urgent questions.

Sound Issues?

- Ensure your computer speakers are not muted
- If you cannot hear through your computer speakers, navigate to the bottom toolbar on your screen, go to the far left, and click the arrow next to the phone icon
- Choose “I will call in”
- Dial the phone number and access code

Mass General Brigham

Addressing Public Health Risks for Health Center Patients After Natural Disasters

Harleen Marwah, MD MS
Pediatrician, Mass General Brigham for Children
Instructor in Pediatrics, Harvard Medical School
Instructor in Environmental Health, Harvard T.H. Chan School of Public Health

James McKowen, Ph.D.
Assistant Professor of Psychiatry, Mass General Brigham & Harvard Medical School
Co-Chair, Climate Mental Health Initiative, MGB
Affiliate Faculty, Center for Climate, Health, and the Global Environment (C-CHANGE) Harvard T.H. Chan School of Public Health

Disclosures

Harleen Marwah, MD MS

Founder / Board of Directors Chairperson
Medical Students for a Sustainable Future

Board of Directors
Physicians for Social Responsibility

Environmental Justice Council
Commonwealth of Massachusetts

Guest Editor, Climate & Health Images in Clinical Medicine
New England Journal of Medicine

James McKowen, Ph.D.

Neither I nor my spouse/partner has a relevant financial relationship with a commercial interest to disclose.

Mass General Brigham
Mass General for Children

Why is it important to understand the links between environmental threats and health?

WEATHER

Gift Share

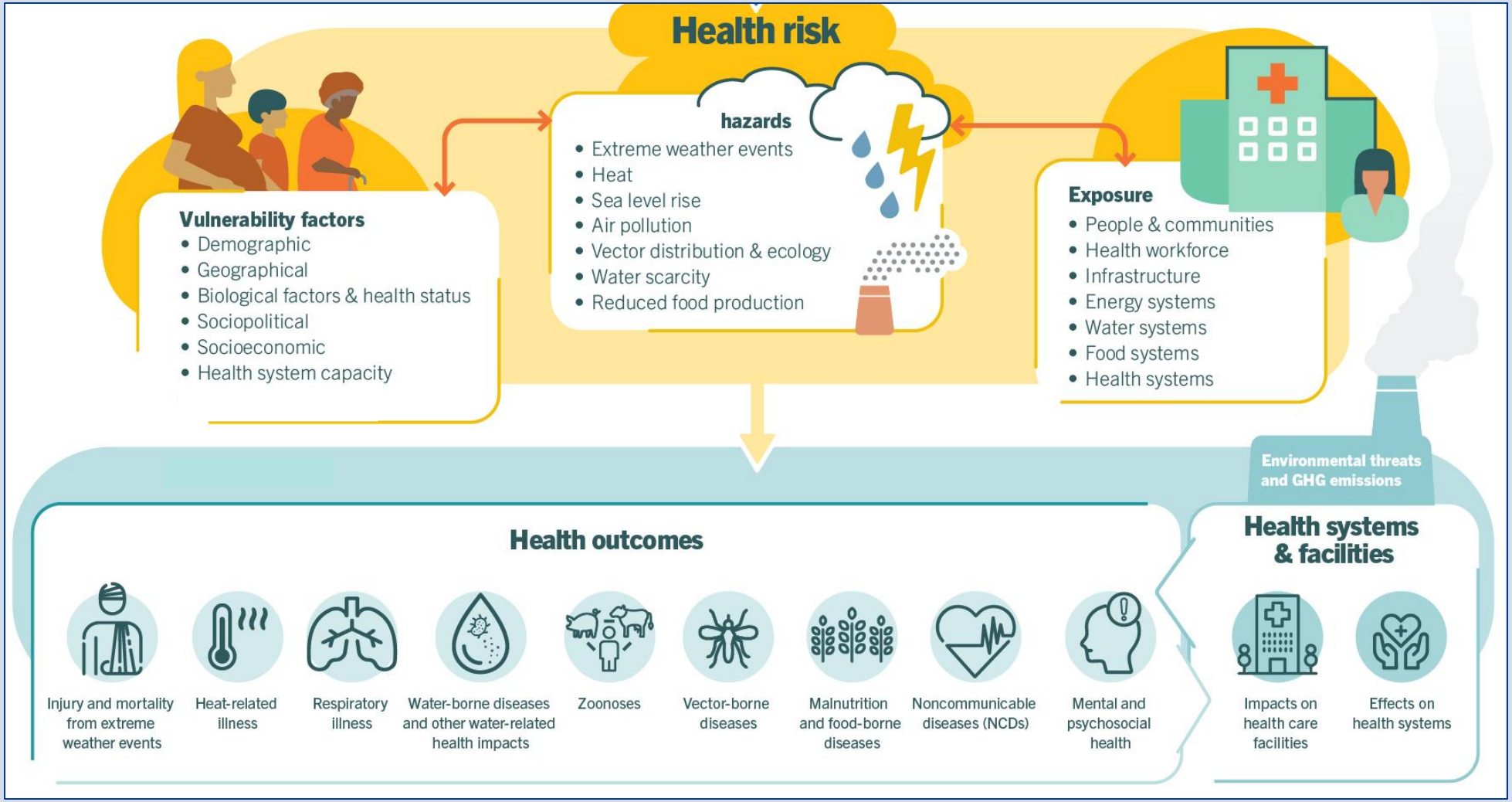
Air-quality issues from Canadian wildfire smoke will linger another day around Philly

When combined with the Philly area's warm, sunny weather, the incoming smoke stands to increase levels of ozone, the Pennsylvania Department of Environmental Protection said.

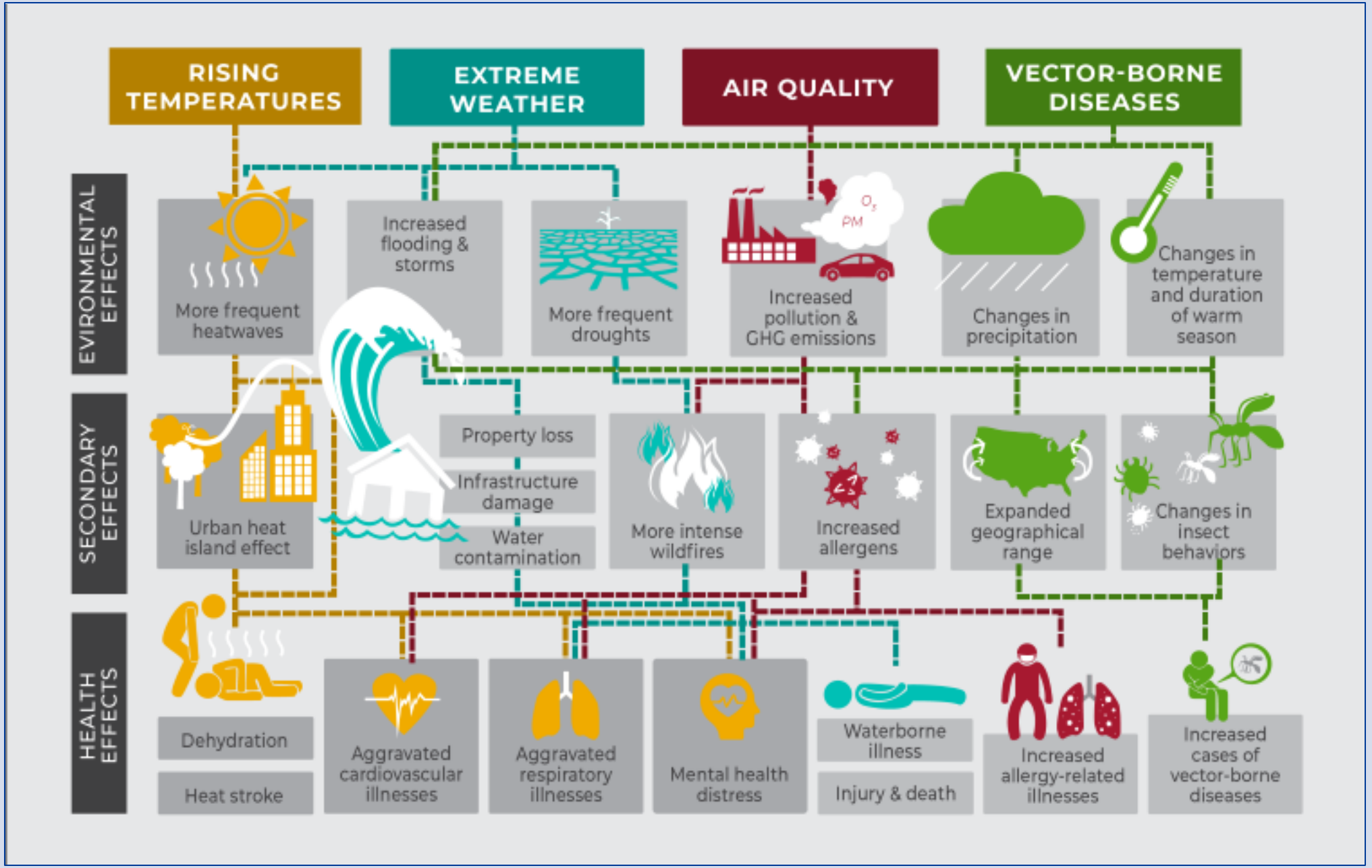
Health Department Recommends Residents Take Precautions Due to Wildfire Smoke

For immediate release: June 06, 2023 | **Published by:** Air Pollution Control Board, Board of Health, Department of Public Health | **Contact:** James Garrow phlpublichealth@phila.gov

Vadala, N. (2025, August 4). *Air-quality issues from Canadian wildfire smoke will linger another day around Philly*. The Philadelphia Inquirer.
BBC News. (2025, September 27). Canada wildfire smoke sparks cross-border tensions. BBC News.



GHG = greenhouse gas



GHG = greenhouse gas

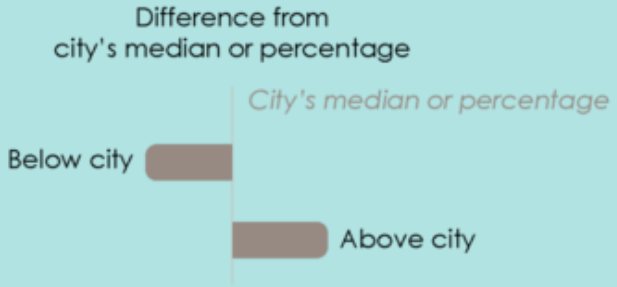
American Public Health Association. *How climate change affects your health* [Infographic].

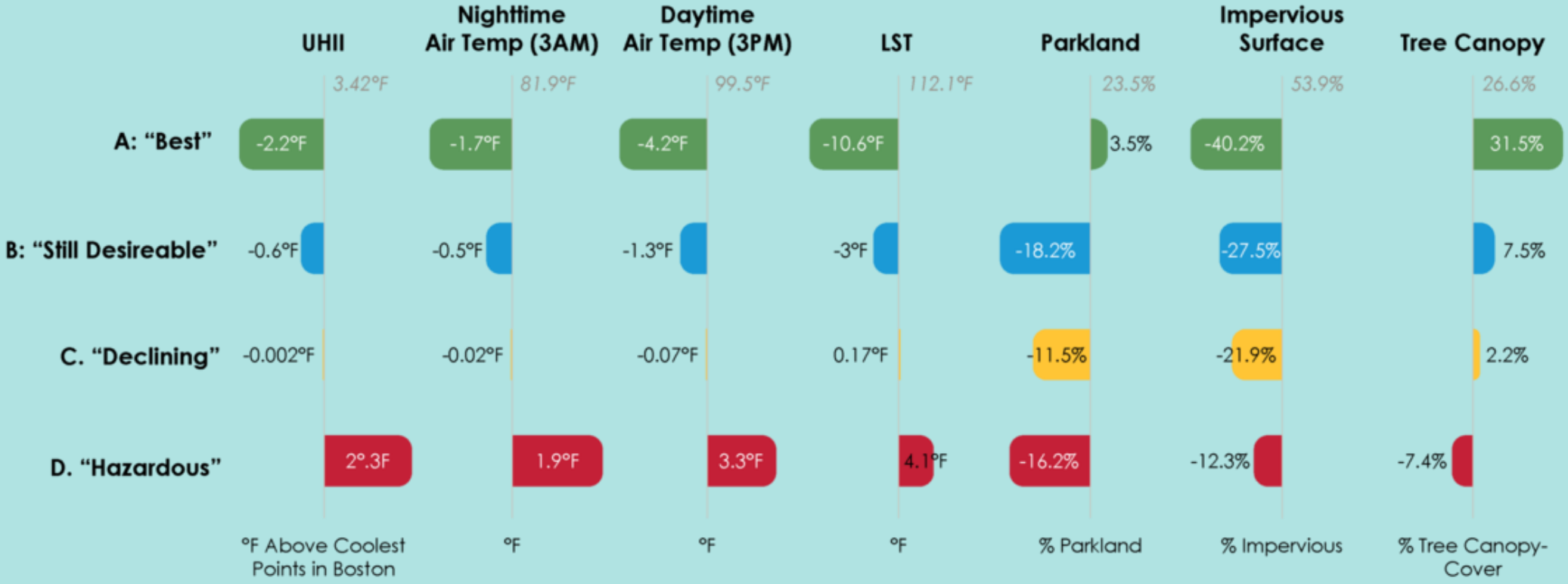
Exposure	Sensitivity and Susceptibility	Capacity to Adapt and Respond

• Geography and the nature of extreme weather impacts
  • Example:
  • Low lying coastal communities at greater risk of flooding and storm surges
• Occupation
  • Example:
  • Outdoor worker exposure to extreme heat
	• Pre-existing health conditions
	  • Example:
	  • Asthma at greater risk of respiratory illness from wildfire smoke or increased pollen
	• Baseline prevalence of weather-sensitive diseases
	  • Example:
	  • High levels of air pollution are vulnerable to higher ozone levels.
		• Access to resources
		  • Example:
		  • Air conditioning to reduce heat risk
		• Conditions of the built environment
		  • Example:
		  • Sewage infrastructure
		• Public health and emergency response infrastructure
		• Level of social cohesion and social and political will

American Public Health Association. *Climate, health, and equity.*
Intergovernmental Panel on Climate Change. (2023). *Climate Change 2023: Synthesis Report – Summary for Policymakers*

UHII = Urban Heat Island Intensity
LST = Land Surface Temperature





Why is it important to understand the links between extreme weather and health?

Health leaders agree extreme weather is a significant health threat.

It is impacting patient's health now.

Our patients expect and trust us to care for them in this context.

Mass General Brigham
Mass General for Children

Cases

A major flood event has disrupted operations at your clinic.

A 30-year-old woman calls the nursing triage line as she was displaced from her home four days ago during a major flood event. She is currently staying at a shelter set up in a neighboring town. She is breastfeeding her 15-week-old infant, but has noticed her milk supply dropped over the last week. She expresses feeling overwhelmed and does not know if she will have transportation to make the infant's 4-month well-child check next week.

A major flood event has disrupted operations at your clinic.

A 30-year-old woman calls the nursing triage line as she was displaced from her home four days ago during a major flood event. She is currently staying at a shelter set up in a neighboring town. She is breastfeeding her 15-week-old infant, but has noticed her milk supply dropped over the last week. She expresses feeling overwhelmed and does not know if she will have transportation to make the infant's 4-month well-child check next week.

Mother

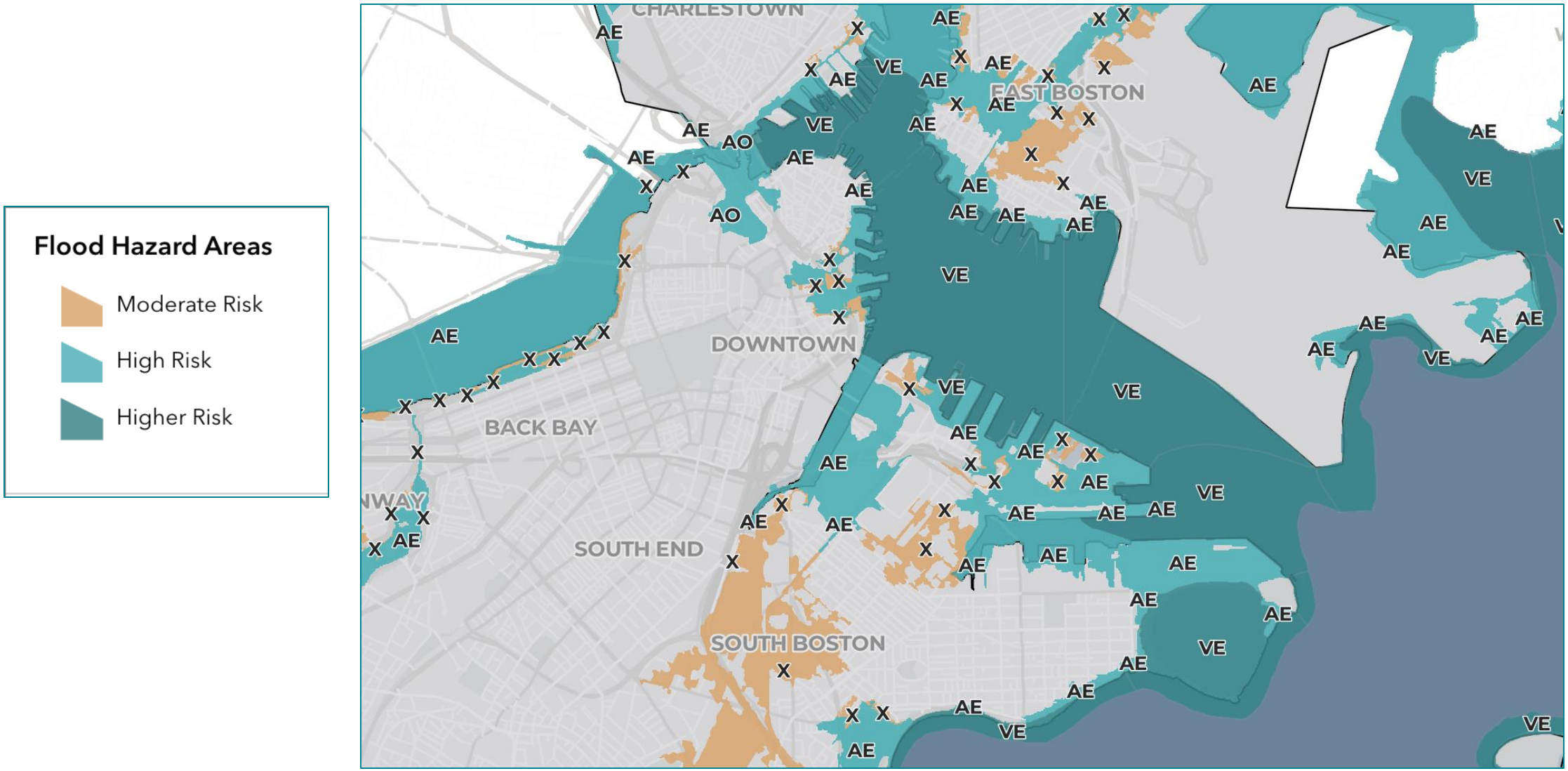
- Mental health
- Nutrition
- Access to clean water

Infant

- Disruptions in health care
- Nutrition and growth
- Exposure to infectious diseases

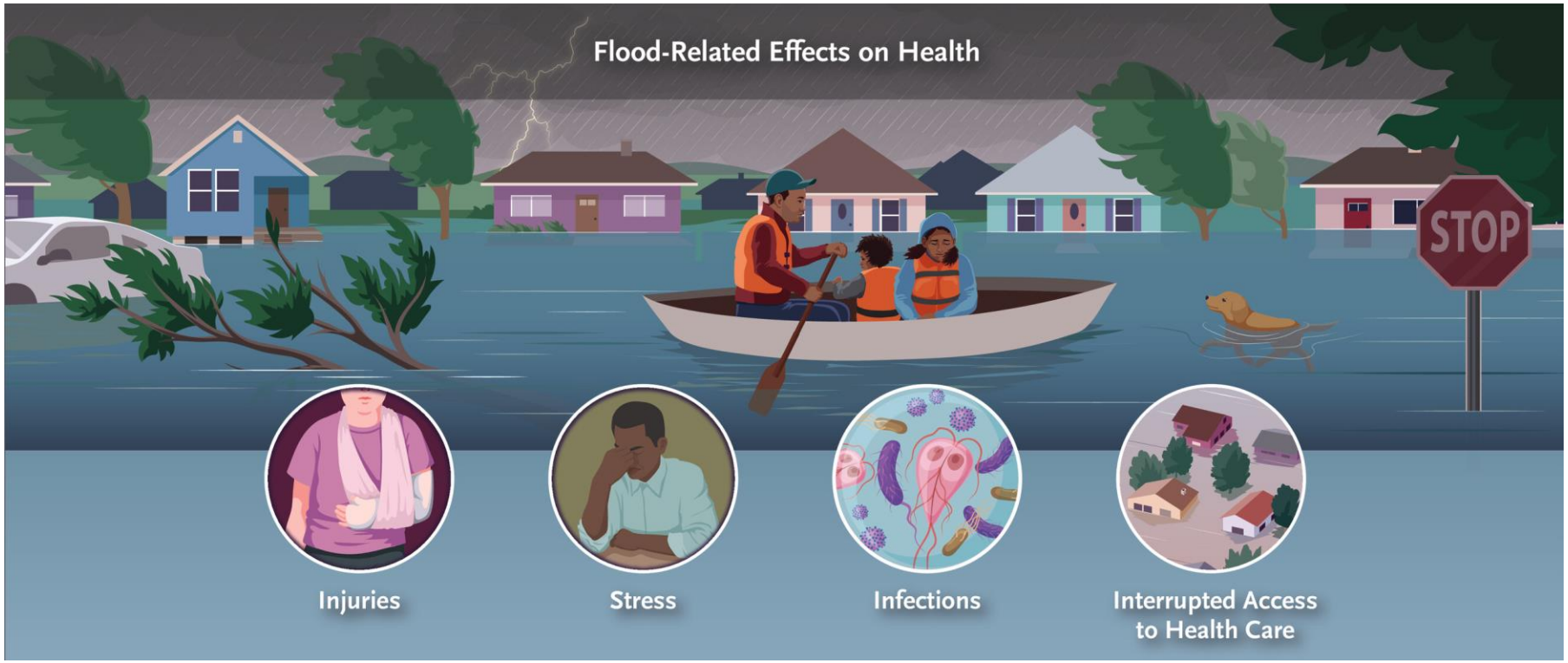
Clinic

- Access to care
- Health care maintenance
- Disruptions in medications



City of Boston. Knowing Your Flood Risk. https://www.boston.gov/departments/emergency-management/knowing-your-flood-risk#:~:text=Boston%20is%20among%20the%20most,not%20limited%20to%20coastal%20areas.

Floods Have Substantial Health Effects, Both in the Immediate – and Long-Term



Wu, Y., Wen, B., Gasevic, D., Patz, J. A., Haines, A., Ebi, K. L., Murray, V., Li, S., & Guo, Y. (2024). *Climate change, floods, and human health. The New England Journal of Medicine, 391*(20), 1949–1958.

A major flood event has disrupted operations at your clinic.

A 30-year-old woman calls the nursing triage line as she was displaced from her home four days ago during a major flood event. She is currently staying at a shelter set up in a neighboring town. She is breastfeeding her 15-week-old infant, but has noticed her milk supply dropped over the last week. She expresses feeling overwhelmed and does not know if she will have transportation to make the infant's 4-month well-child check next week.

Before an Event

- Know your evacuation zone and route, sign up for emergency alerts.
- Monitor weather forecast.

Prepare

- Put together a disaster supply kit (medications, bottles, etc.).
- Plan for medical needs.
- Learn how to access care.

During/After Event

- Do not wade in flood waters.
- Avoid mold exposures.
- Ensure drinking water is safe.

Extreme heat is driving increased urgent care visits at your clinic.

A 67-year-old man presents with light-headedness and weakness that started after his morning walk. His medical history includes hypertension managed by lisinopril and type 2 diabetes managed by metformin. His building does not have a central cooling system. The heat index today is 102 degrees Fahrenheit.

Extreme heat is driving increased urgent care visits at your clinic.

A 67-year-old man presents with light-headedness and weakness that started after his morning walk. His medical history includes hypertension managed by lisinopril and type 2 diabetes managed by metformin. His building does not have a central cooling system. The heat index today is 102 degrees Fahrenheit.

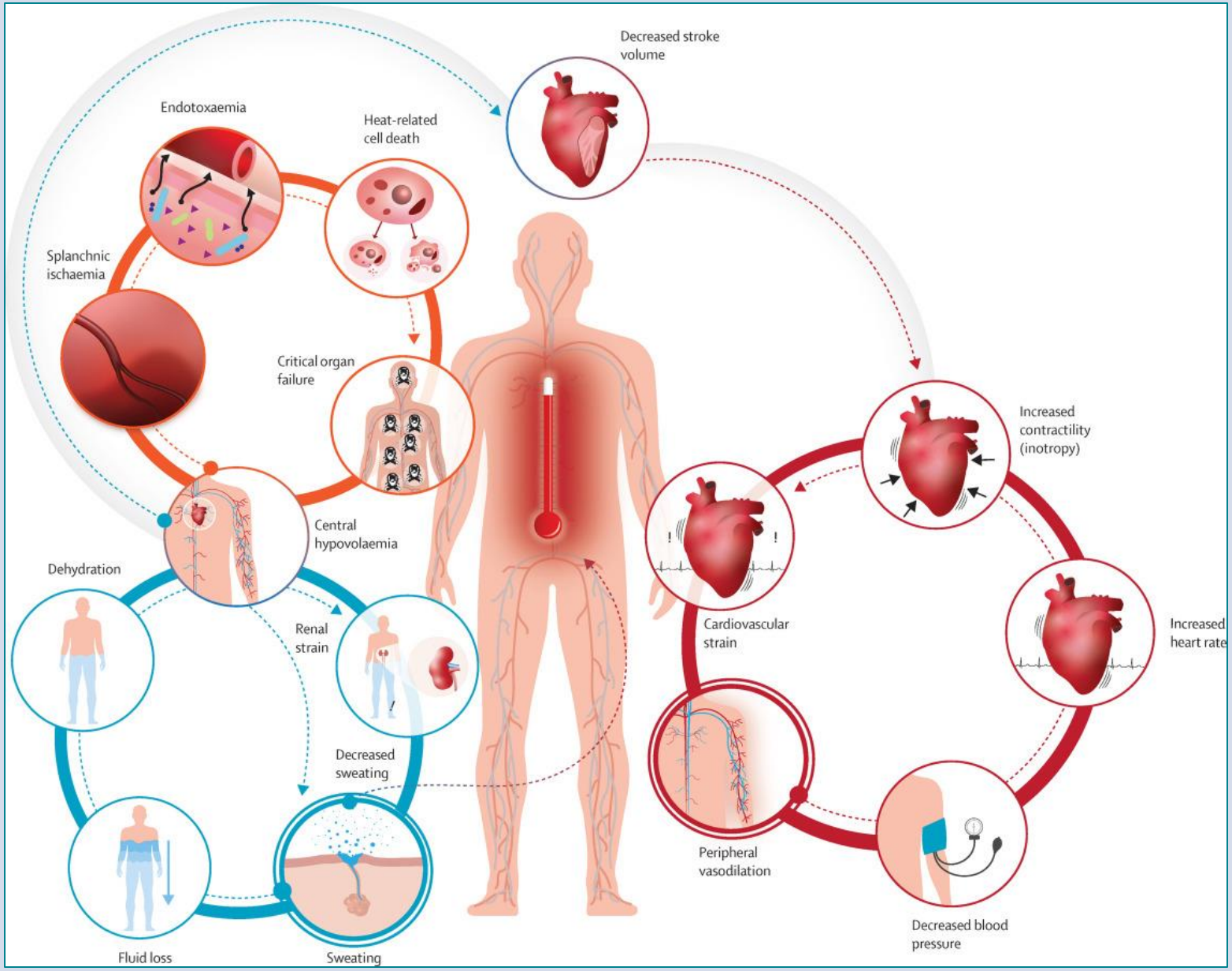
Clinical Risks

- Heat-related illness
- Underlying medical conditions
- Medications

Non-Clinical Risks

- Neighborhood temperature
- Access to cooling

Physiological Effects of Extreme Heat on the Body

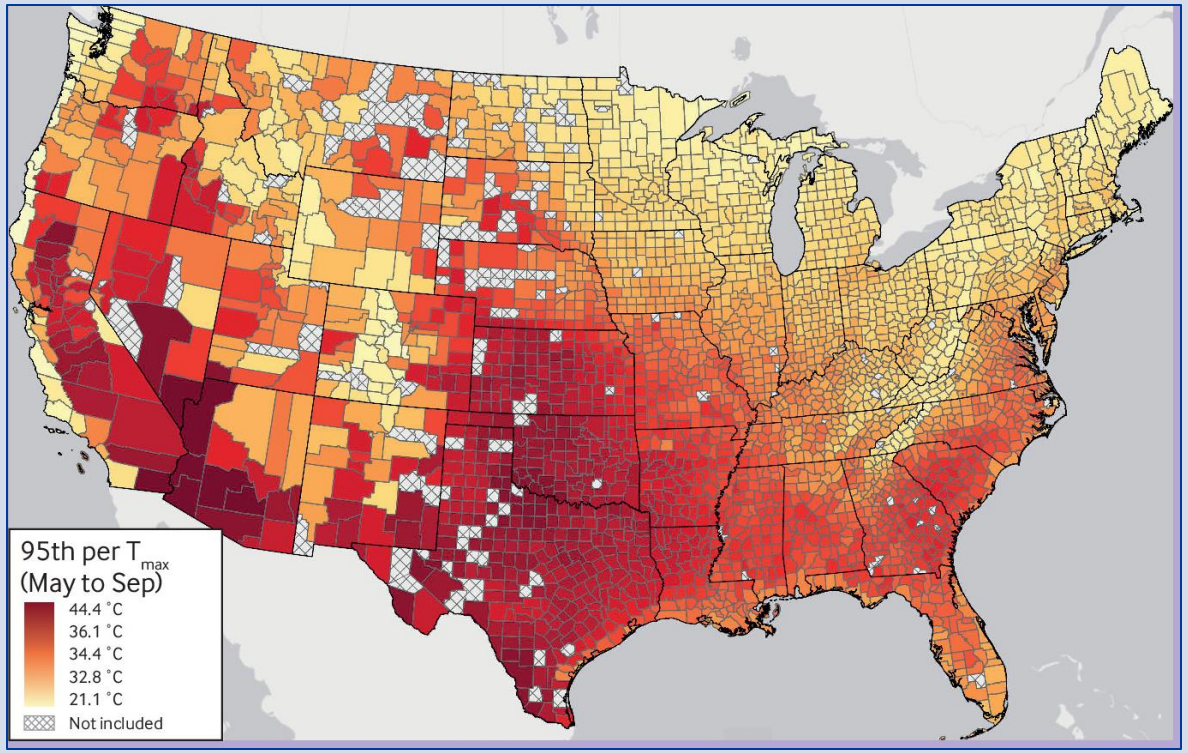


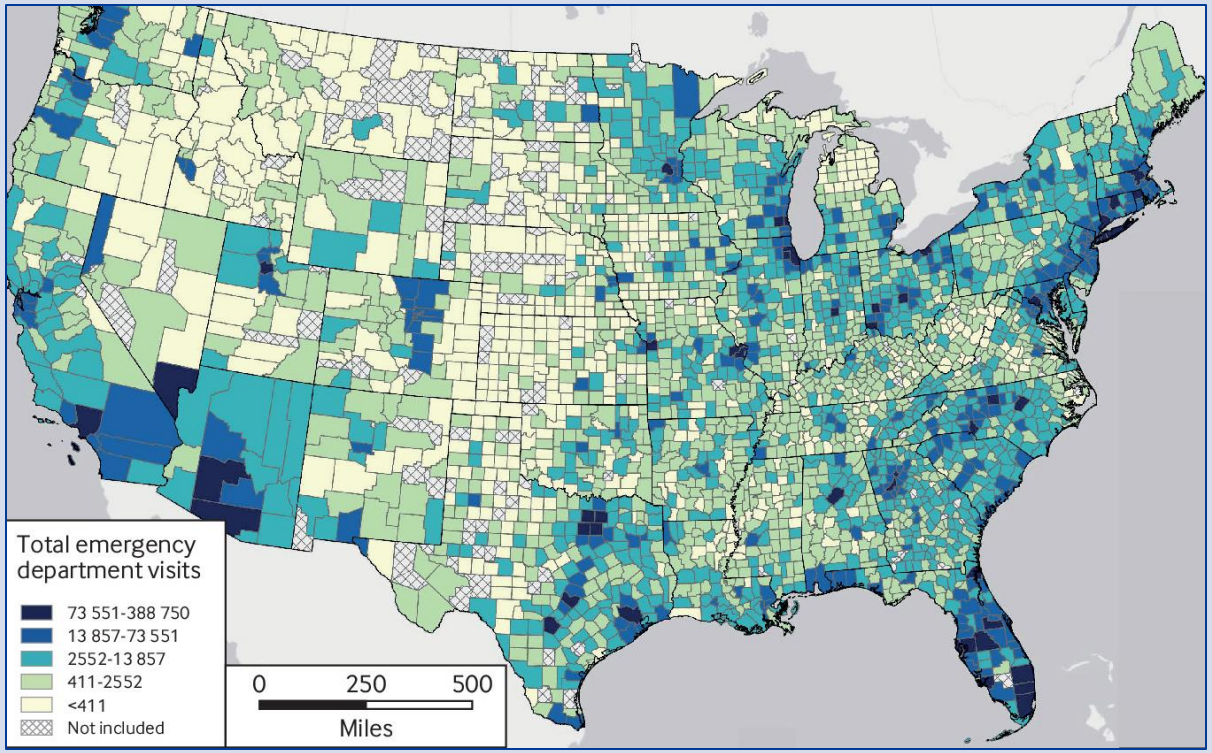
Ebi, K. L., Lewis, N. D., Corvalan, C., & editors (2021). *Hot weather and heat extremes: health risks*. *The Lancet, 398*(10301), 698–708.

95th percentile of local warm-season temperatures

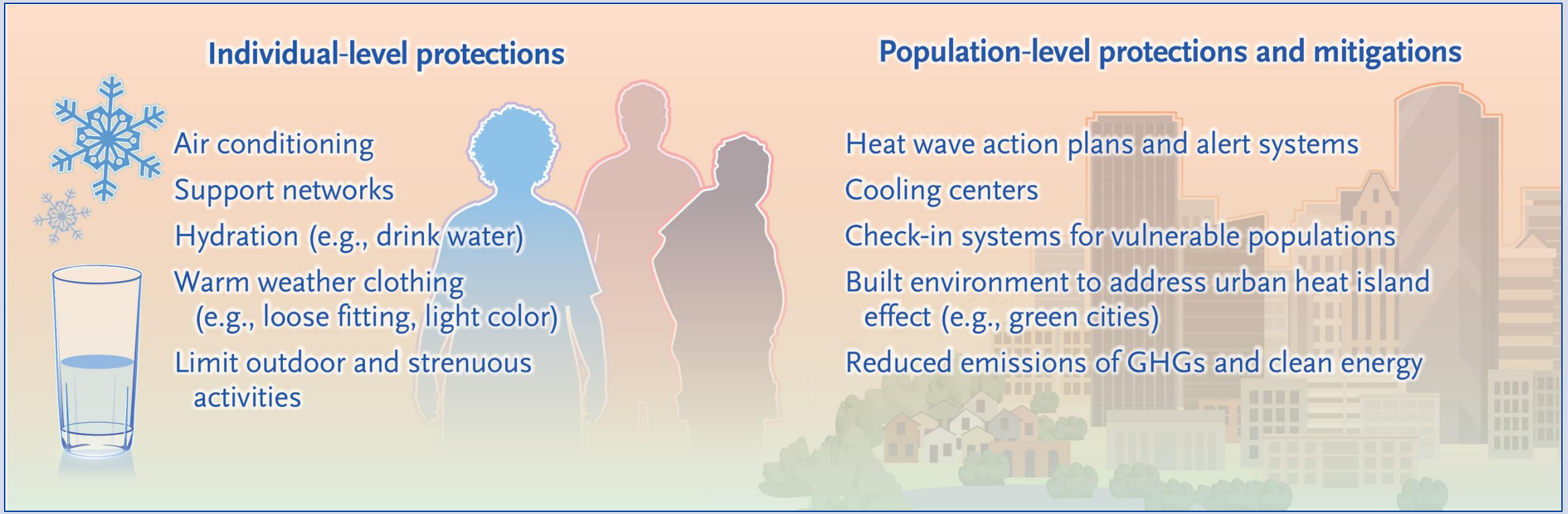
→

7.8% increase in relative risk of an emergency department visit for any cause



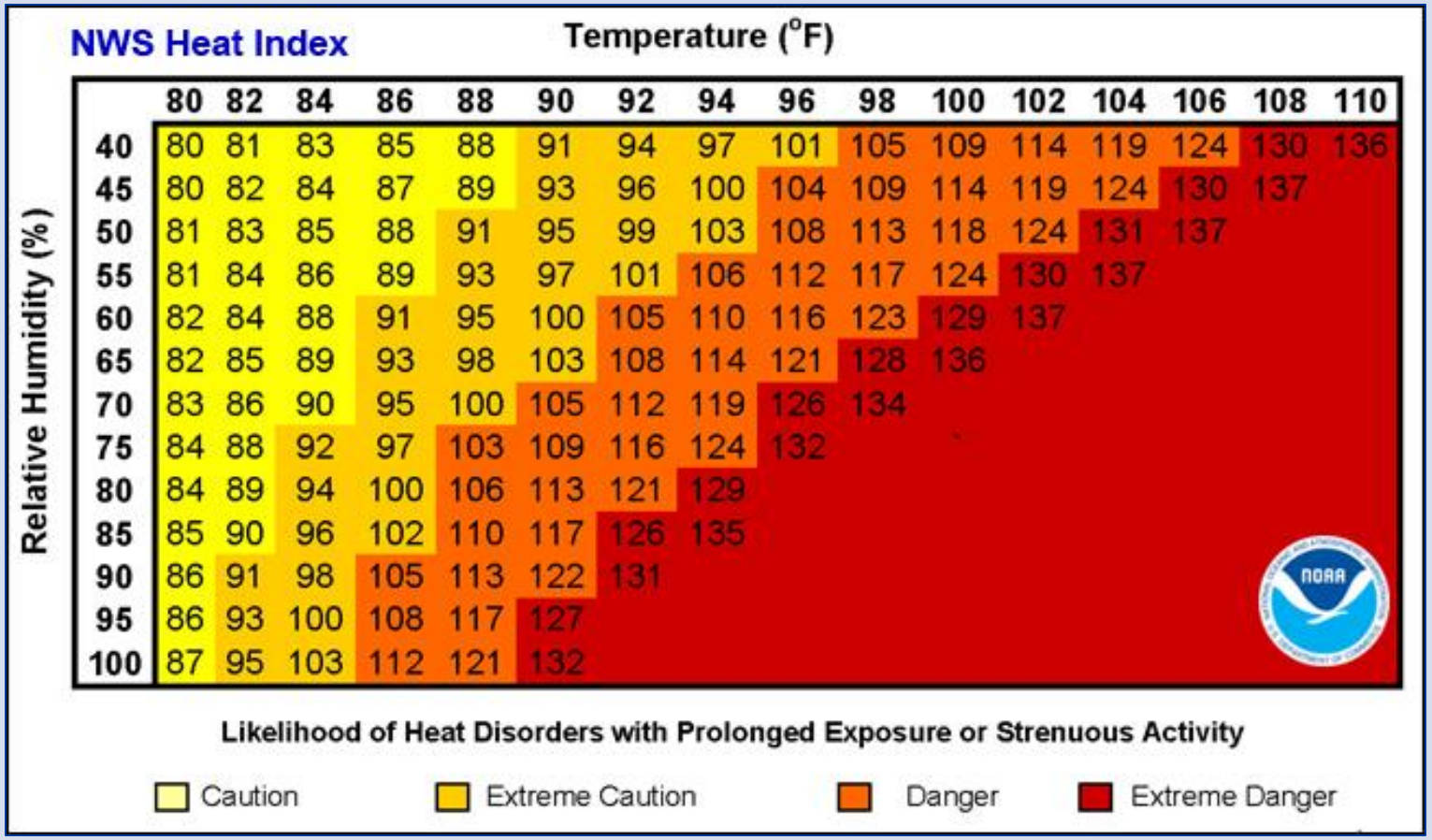


Sun, S., Weinberger, K. R., Nori-Sarma, A., Spangler, K. R., Sun, Y., Dominici, F., & Wellenius, G. A. (2021). Ambient heat and risks of emergency department visits among adults in the United States: Time stratified case crossover study. *BMJ, 375*, e065653.



GHGs = greenhouse gases

Bell, M. L., Gasparrini, A., & Benjamin, G. C. (2024). *Climate change, extreme heat, and health*. *The New England Journal of Medicine, 390*(19), 1793–1801.



National Weather Service: Heat Index Calculator

National Weather Service (2023) *Meteorological Conversions and Calculations*

Table 2. Medications and Drugs with Potential to Increase Risk of Heat-Related Illness.*

Agent	Mechanism[27]
Alcohol	May reduce alertness and affect judgment and perception of heat; exacerbates dehydration and affects vasodilation and cardiac contractility
Amphetamines	May increase metabolic heat production
Anticholinergics	May decrease sweat production
Antihistamines	May cause peripheral vasoconstriction, limiting radiative cooling
Antipsychotics	Interferes with hypothalamic thermoregulation
Benzodiazepines	May reduce alertness and affect judgment and perception of heat
Beta-blockers	Decreases heart rate and contractility
Calcium-channel blockers	Decreases cardiac contractility and compromises vascular compensatory mechanisms
Diuretics	May increase risk of dehydration and hypovolemia
Illicit drugs (e.g., cocaine, heroin, phencyclidine, and MDMA)	May increase metabolic heat production and reduce alertness and judgment
Laxatives	May increase risk of dehydration and hypovolemia
Lithium	May reduce alertness and affect judgment and perception of heat and lead to nephrogenic diabetes insipidus; levels may rise to dangerous levels and cause kidney injury in the context of dehydration
Serotonin-reuptake inhibitors	May interfere with hypothalamic thermoregulation
Thyroid agonists	May increase metabolic heat production
Tricyclic antidepressants	May cause peripheral vasoconstriction, thereby limiting radiative cooling, and may affect central thermoregulation
Weight-loss supplements that may increase metabolic rate (e.g., carnitine and green tea extract)	May increase metabolic heat production

* This list of medications (based on information from Pryor et al.[28]) and mechanisms is not comprehensive. MDMA denotes 3,4-methylenedioxymethamphetamine.

Mass General Brigham
Mass General for Children

When it comes to these threats, what can I do in my practice?

Coalition Building

Clinical Practice

Medical Education

Health System Sustainability

Research

Risk Screening

- Weather-informed screening questions
- Resources to address common concerns
  - Food insecurity
  - Water quality
  - Energy insecurity
  - Disaster preparedness

Disaster Preparation

- Emergency planning for extreme weather events
- Contingency plans for cold-chain dependent medications and electricity-dependent devices
- Updated emergency information forms
- Essential healthcare information (e.g., medications, technology settings, special supplies, etc.)
- Plans to access care in emergencies

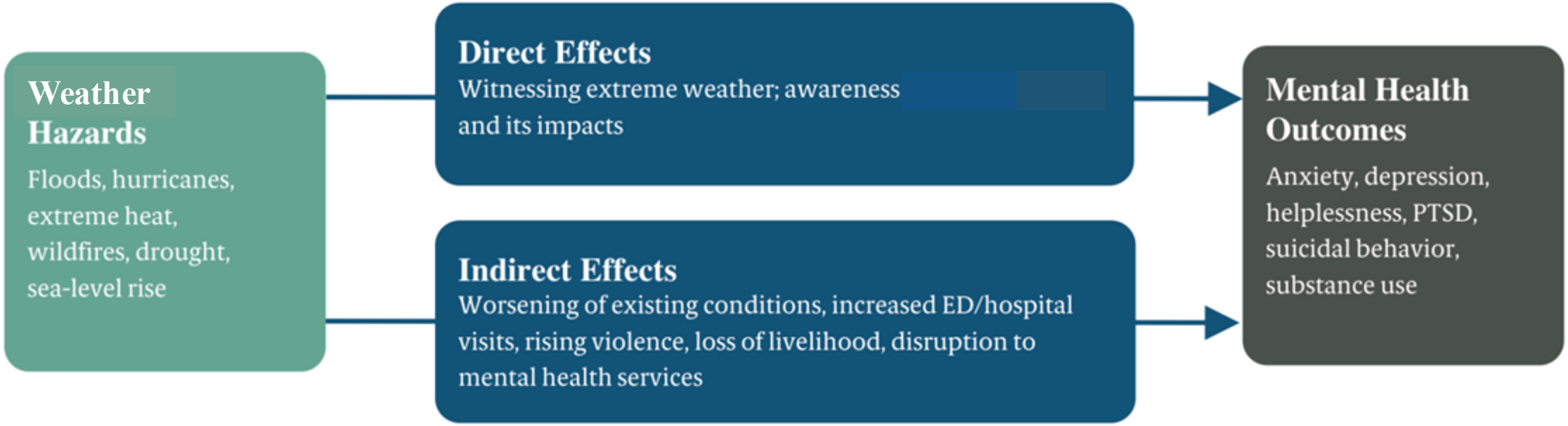
Medication Considerations

- Appropriate medication storage and use
- Optimal storage temperature for maximal efficacy
- Medications that increase risk of illness

Philipsborn, R. P., Cowenhoven, J., Bole, A., Balk, S. J., & Bernstein, A. M. (2021). *A pediatrician's guide to climate change-informed primary care*. *Current Problems in Pediatric and Adolescent Health Care, 51*(2), Article 101027.


Individual Level
Systems Level
Local, Regional, National, Global

The Connection Between Extreme Weather and Mental Health

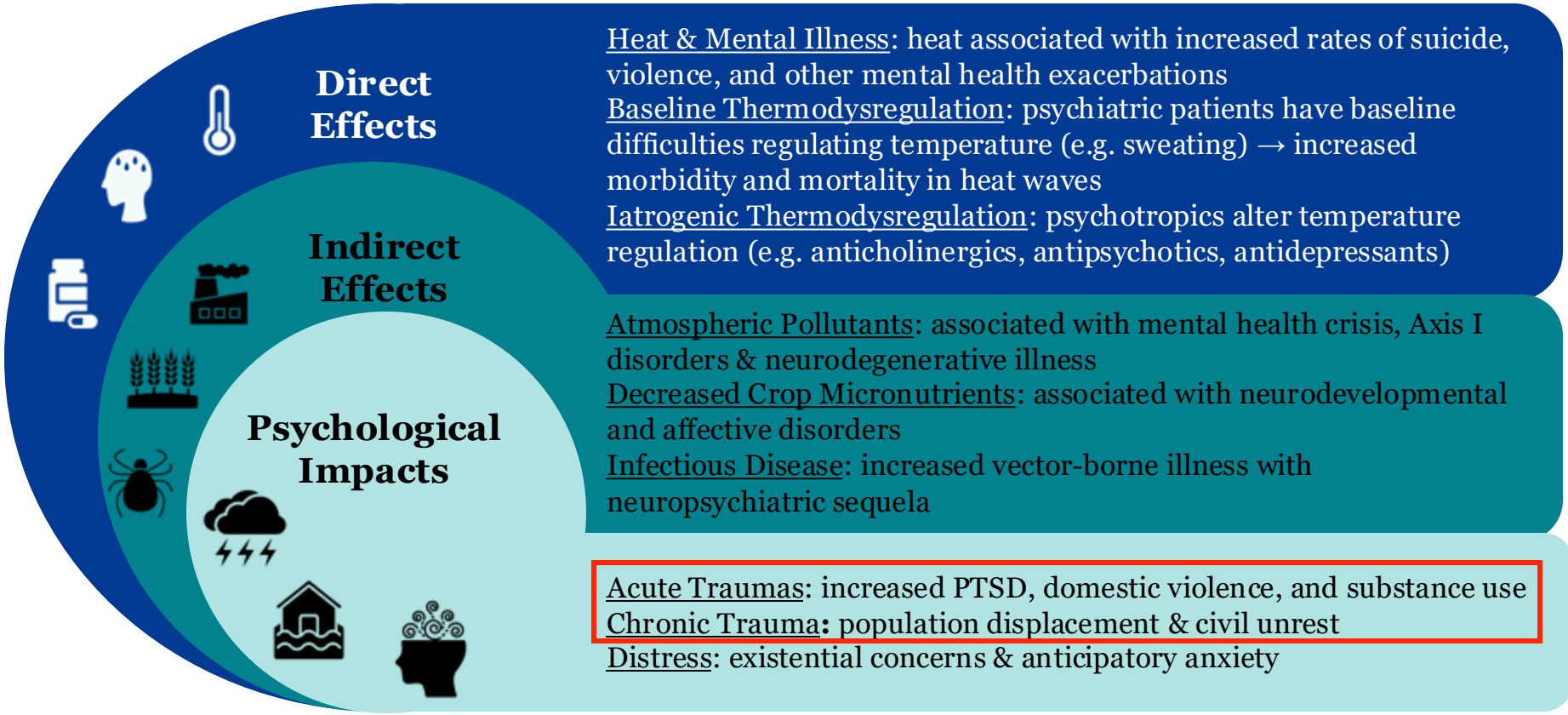


Data: Adapted in part from World Health Organization, *Mental Health and Climate Change: Policy Brief* (WHO, June 3, 2022).

Source: Emily Hough and Nathaniel Counts, "How Climate Change Affects Our Mental Health, and What We Can Do About It" (explainer), Commonwealth Fund, Mar. 29, 2023. https://doi.org/10.26099/rk6r-ne98

ED = emergency department
PTSD = post-traumatic stress disorder

Psychological Impacts



Heat & Mental Illness: heat associated with increased rates of suicide, violence, and other mental health exacerbations
Baseline Thermodysregulation: psychiatric patients have baseline difficulties regulating temperature (e.g. sweating) → increased morbidity and mortality in heat waves
Iatrogenic Thermodysregulation: psychotropics alter temperature regulation (e.g. anticholinergics, antipsychotics, antidepressants)

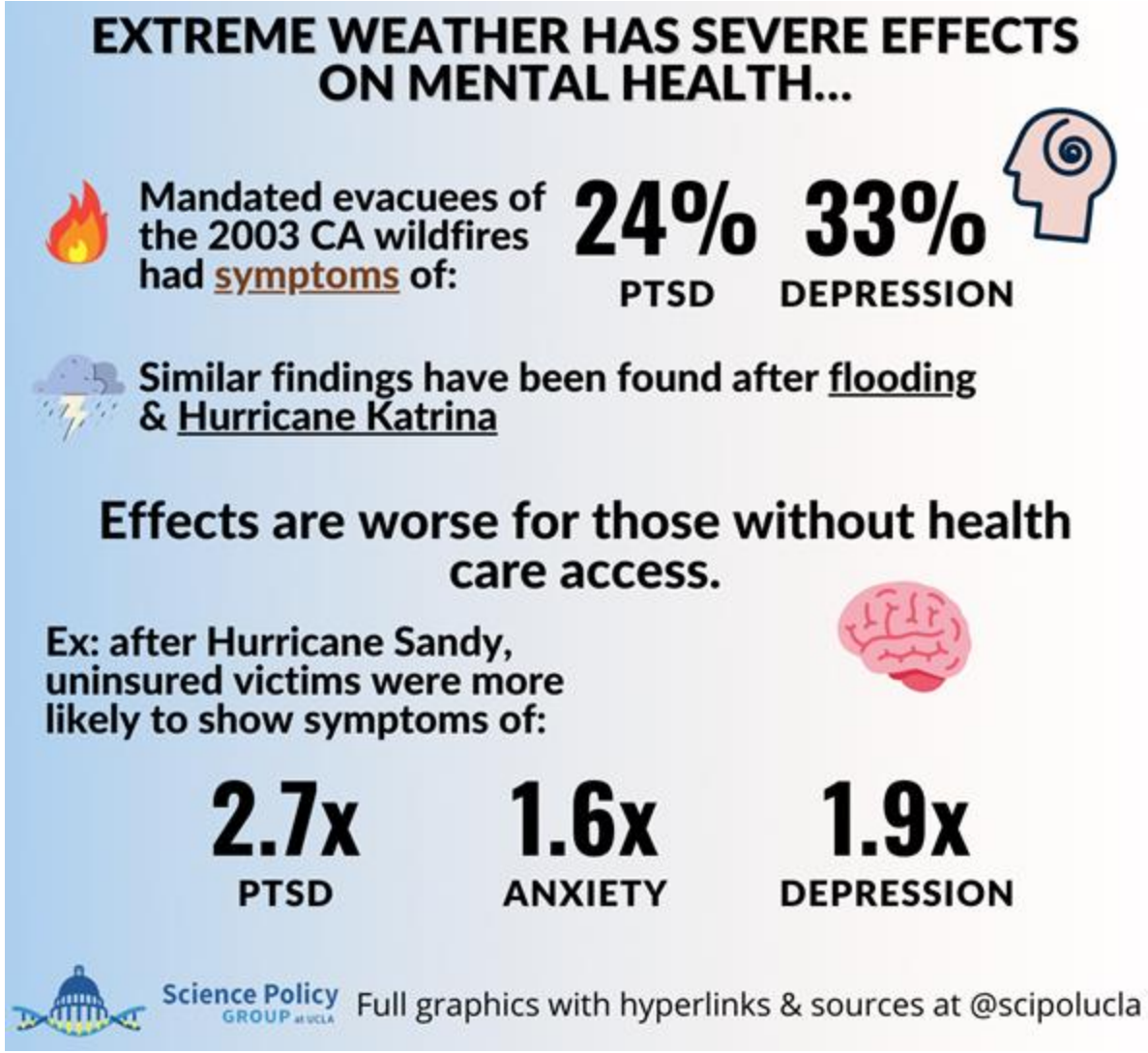
Atmospheric Pollutants: associated with mental health crisis, Axis I disorders & neurodegenerative illness
Decreased Crop Micronutrients: associated with neurodevelopmental and affective disorders
Infectious Disease: increased vector-borne illness with neuropsychiatric sequela

Acute Traumas: increased PTSD, domestic violence, and substance use
Chronic Trauma: population displacement & civil unrest
Distress: existential concerns & anticipatory anxiety

PTSD = post-traumatic stress disorder

https://www.apa.org/monitor/2024/06/heat-affects-mental-health

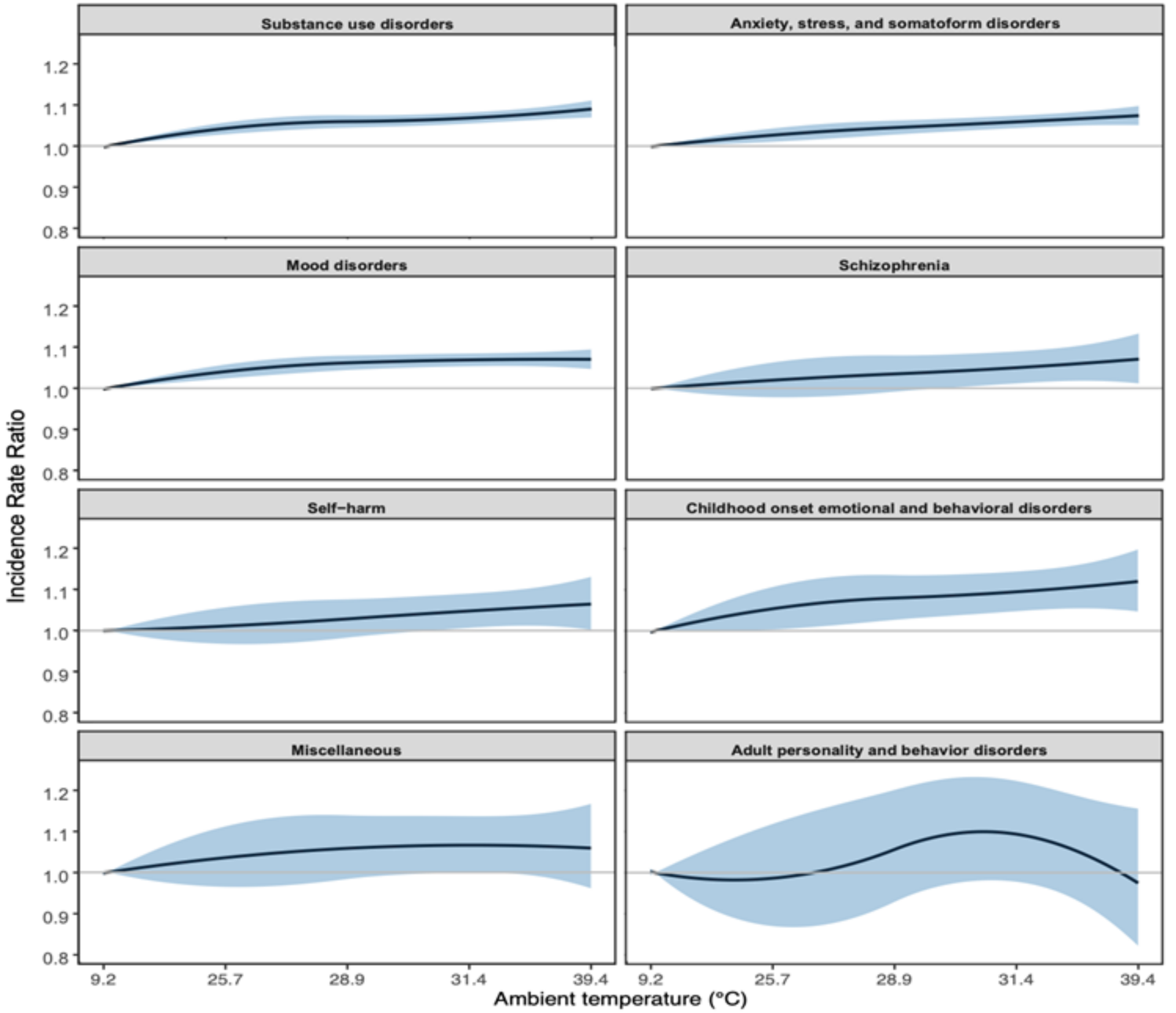
Extreme Weather-Related Disasters



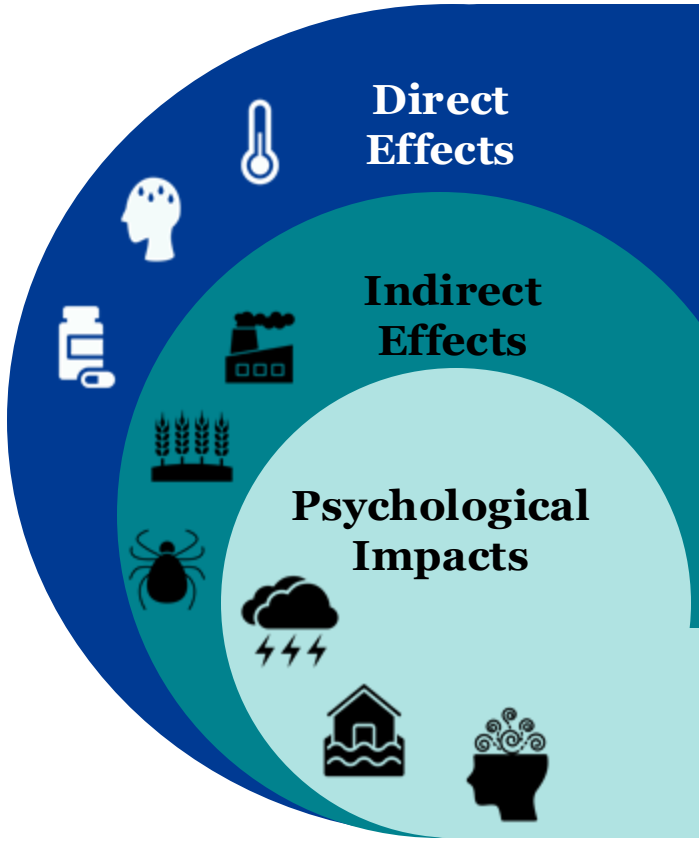
3-40% children experience PTSD after natural disaster.

Direct Impacts of Heat

- Heat Index and emergency room admissions by mental health diagnosis
- National data 2010-2019
- All diagnoses increase admission with heat



Nori-Sarma, A., et al (2022). Association between ambient heat and risk of emergency department visits for mental health among US adults, 2010 to 2019. JAMA psychiatry, 79(4), 341-349.



Heat & Mental Illness: heat associated with increased rates of suicide, violence, and other mental health exacerbations
Baseline Thermodysregulation: psychiatric patients have baseline difficulties regulating temperature (e.g. sweating) → increased morbidity and mortality in heat waves
Iatrogenic Thermodysregulation: psychotropics alter temperature regulation (e.g. anticholinergics, antipsychotics, antidepressants)

Atmospheric Pollutants: associated with mental health crisis, Axis I disorders & neurodegenerative illness
Decreased Crop Micronutrients: associated with neurodevelopmental and affective disorders
Infectious Disease: increased vector-borne illness with neuropsychiatric sequela

Acute Traumas: increased PTSD, domestic violence, and substance use
Chronic Trauma: population displacement & civil unrest
Distress: existential concerns & anticipatory anxiety

Youth Impacts: Direct

- Heat waves most common extreme weather exposure in youth
- 10-year period, on average 3 disasters & 64 disaster days

Two post-disaster risk trajectories:

- *Chronic symptoms*: ~4–23%
- *Recovery (initial distress → improvement)*: ~7–27%

Most children show adaptability: ~45–79% maintain low posttraumatic stress symptoms

Most symptoms → **nonclinical range in 3 to 4 months**

Hoffman et al, 2025; Auchincloss et al, 2024; Uppalapati et al 2023

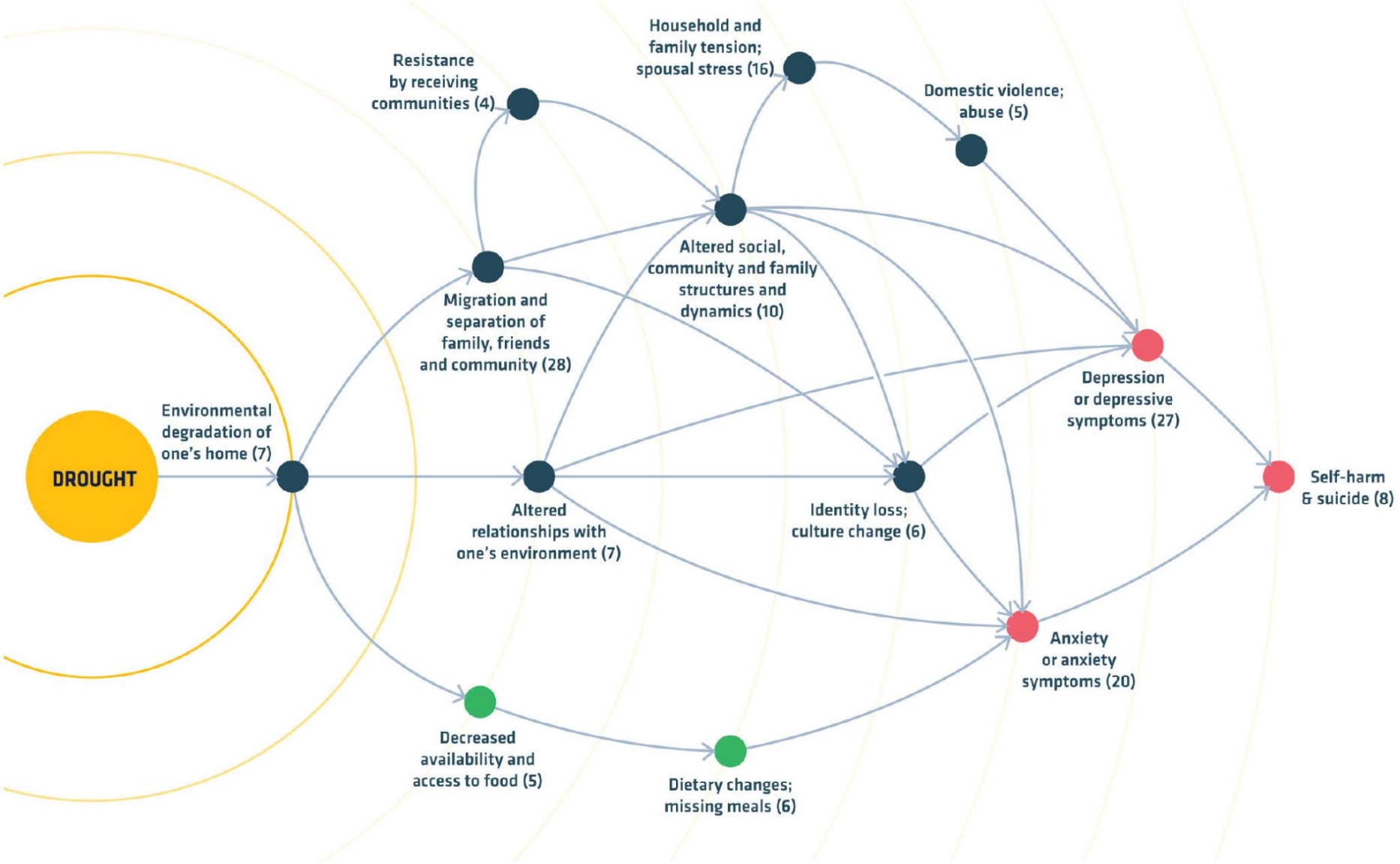
Youth Impacts: Indirect

- **80% of youth** versus **54% of adults** report being worried
- **5% of Gen-Z/Millennials** versus **3% of adults** > cut off on GAD and PHQ for eco-anxiety/depression modified scale
- **School survey 6-12th grade**:
    - 10% impaired, 45% never/rarely coping

GAD = generalized anxiety disorder
PHQ = patient health questionnaire

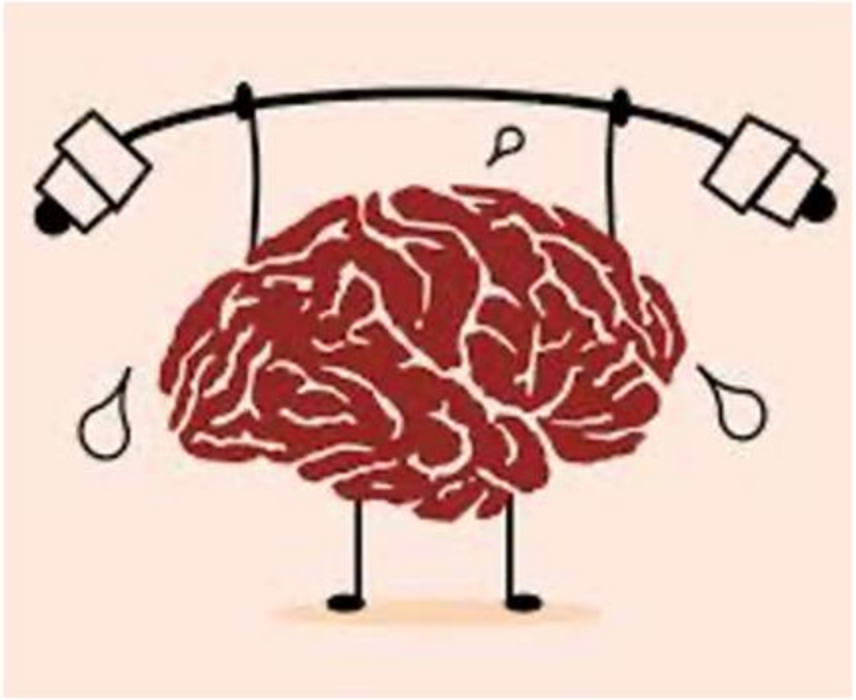
Lewandowski et al, 2024; Auchincloss et al, 2024; Uppalapati et al 2023

Indirect Pathways: Drought & Risk Behaviors



Vergunst, F., Berry, H. L., Minor, K., & Chadi, N. (2023). Climate change and substance-use behaviors: a risk-pathways framework. Perspectives on Psychological Science, 18(4), 936-954.

Building Supports



Disaster Preparedness

aware therapy

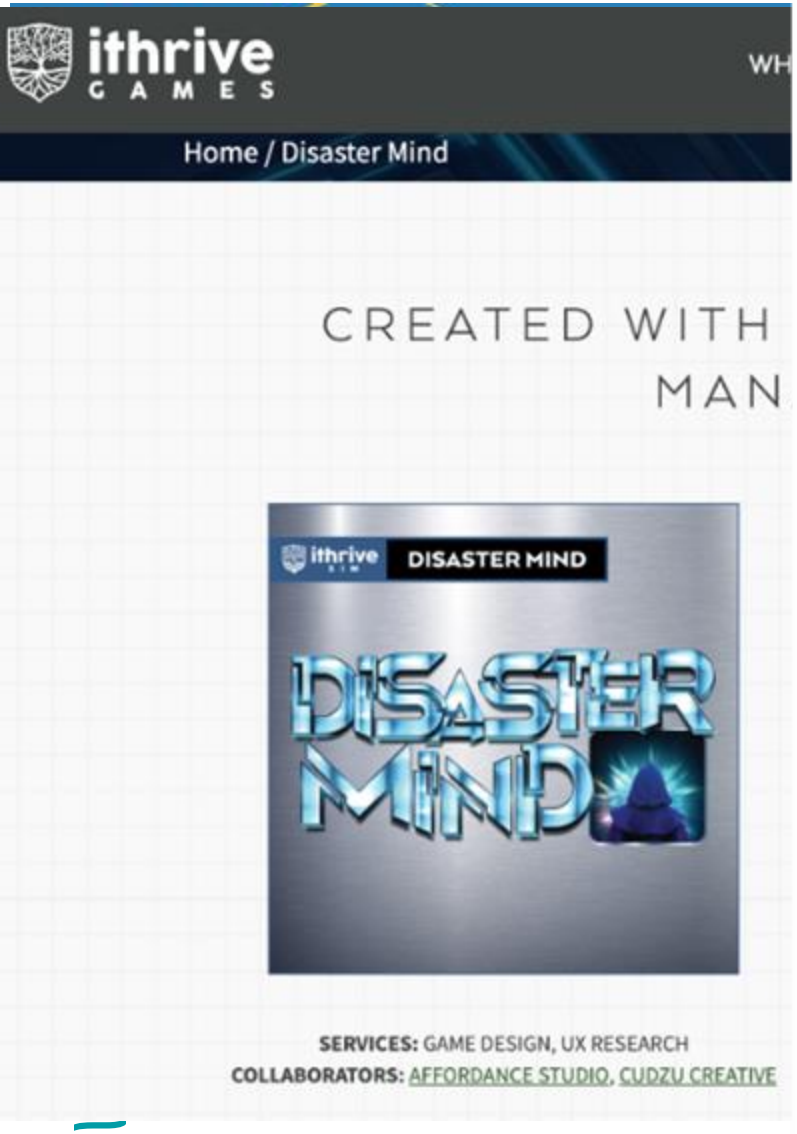
Nature Engagement

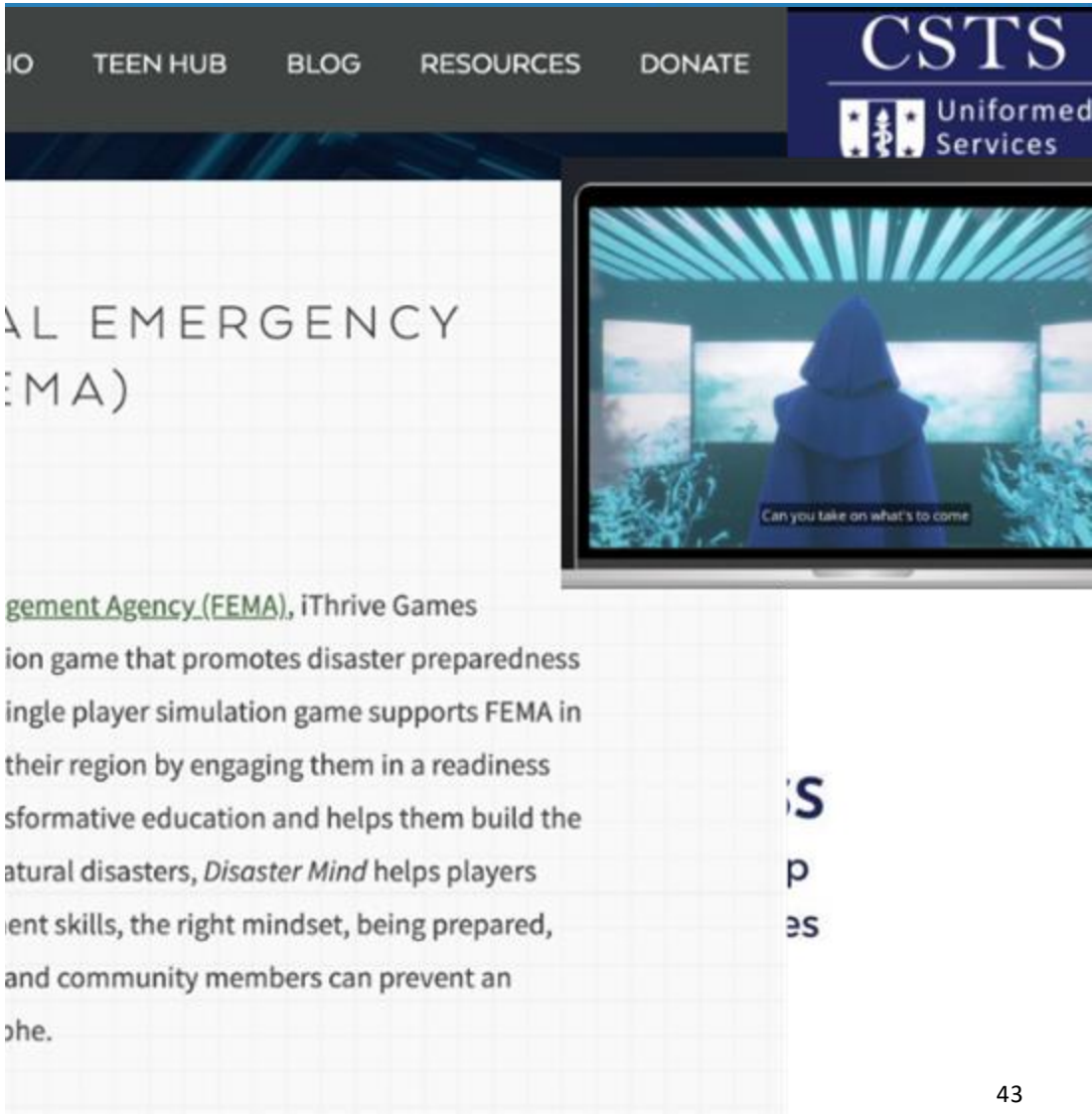
Role for Activism

Café

Parent Resources

Disaster Psychological Supports

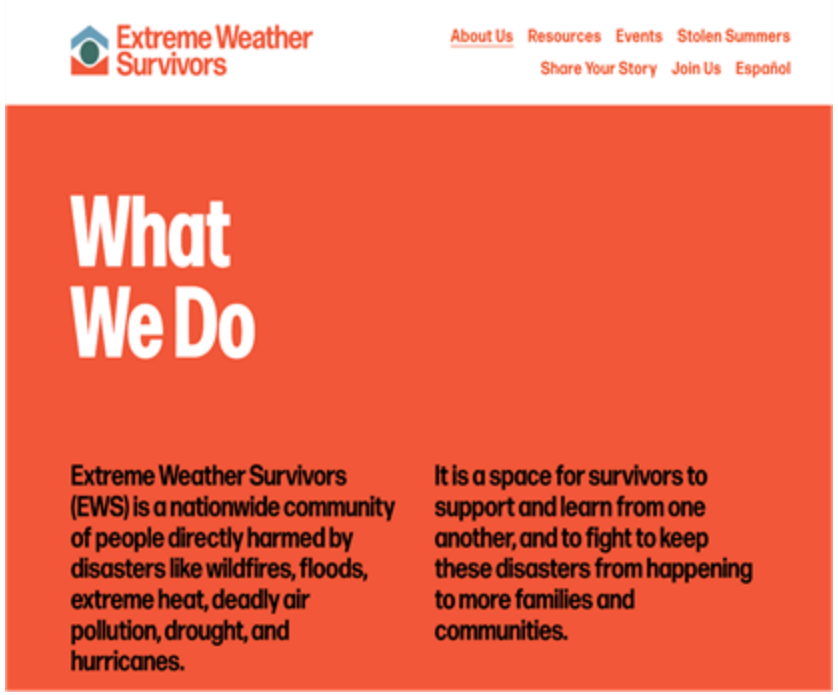




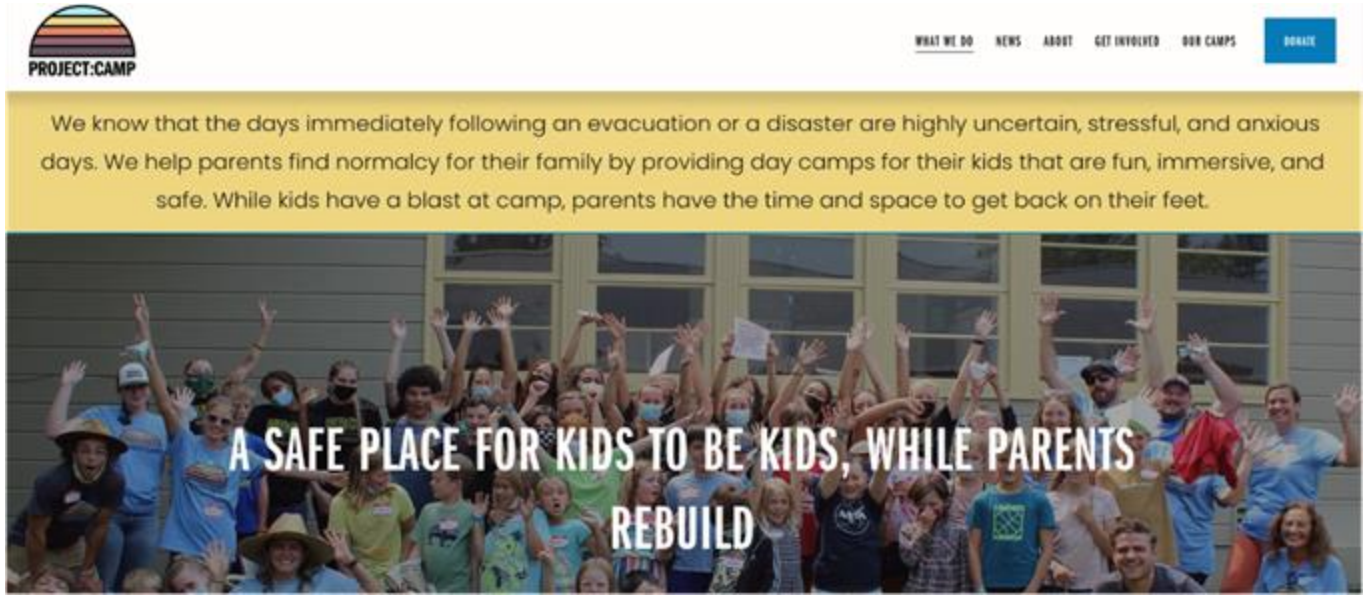
Support

Disaster & Therapy
- PTSD
- Depression/Anxiety
- Future Existential Fears

Community groups
- Grief Support
- Extreme weather survivors
- Café groups
- Restoration Programs



GOOD GRIEF NETWORK



Harvard Chan C-CHANGE Youth Summit

- 60 teens from across globe
- Review of environment & mental health
- Extreme weather emotions discussion
- Mindfulness nature walk

Emotions Wheel

Nature engagement: Protect what we love

Psychological Benefits

Cognitive Function

- Reduces mental fatigue
- Improves academic performance
- Improves productivity
- Promotes attentional restoration
- Improves ability to perform tasks

Psychological Wellness

- Increases self-esteem
- Improves mood
- Reduces stress
- Reduces anger/frustration
- Reduces anxiety
- Improves behavior

Mental Illness

- Contact with nature improves
  - depression
  - anxiety
  - mood disorders
  - PTSD
  - addiction recovery

Parenting through Extreme Weather

- 82% of parents say kids need to know
- 49% have talked to their kids
- Many 5/6th graders know
- Challenges for parents:
  - Developmental age
  - Not knowing the facts
  - Controversial topic
  - Shouldn't I protect them from fears?
  - Managing own anxieties and guilt
  - Don't know the solutions to cope

https://www.capita.org/thinkofthechildren

Mass General Brigham

Addressing Public Health Risks for Health Center Patients After Natural Disasters

Harleen Marwah, MD MS
hmarwah@mgh.harvard.edu

James McKowen, Ph.D.
jmckowen@mgh.harvard.edu

HRSA Disclaimer

This project was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under cooperative agreement number U30CS22742, National Training and Technical Assistance Partner (NTTAP), for $625,000.00 with 0% of the total NTTAP project financed with non-federal sources. This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS, or the U.S. Government