



Training to Prevent Heat Injuries and Illnesses at Work

Spring 2022 NIEHS WTP Awardee Meeting and Workshop

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THE CENTER FOR CONSTRUCTION
RESEARCH AND TRAINING¹

Photo credit: Sunbelt Rentals

CPWR is a nonprofit created by North America's Building Trades Unions (NABTU)



[A-Z Index](#)

[Lista de recursos en español](#)



[RESEARCH](#)

[TRAINING](#)

[SERVICE](#)

[NEWS & EVENTS](#)

[ABOUT CPWR](#)

ABOUT CPWR

[Home](#) > [About CPWR](#)



CPWR - The Center for Construction Research and Training is a nonprofit dedicated to reducing occupational injuries, illnesses and fatalities in the construction industry.

Through our research, training, and service programs, we serve the industry nationwide by collaborating with key partners, including workers, contractors, project owners, health and safety professionals, researchers, key government agencies, unions, and associations. Created by NABTU, CPWR is a world leader in construction safety and health research and training.

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After today, you should be able to:



Explain how rising temperatures impact worker health and productivity



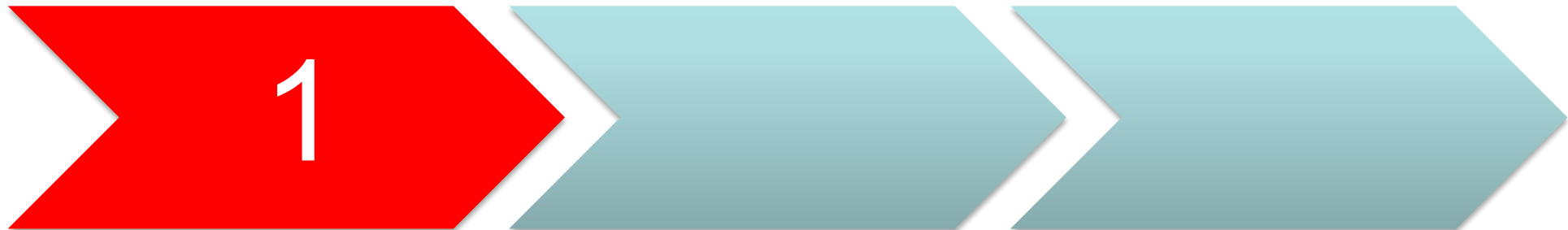
List critical elements of heat illness prevention plans and training



Access resources to use in your training program

Explain how rising temperatures impact worker health and productivity

Learning Objective



Know your audience



WIKIPEDIA
The Free Encyclopedia

[Main page](#)
[Contents](#)
[Current events](#)

Article

Talk

Read

Climate change denial

From Wikipedia, the free encyclopedia

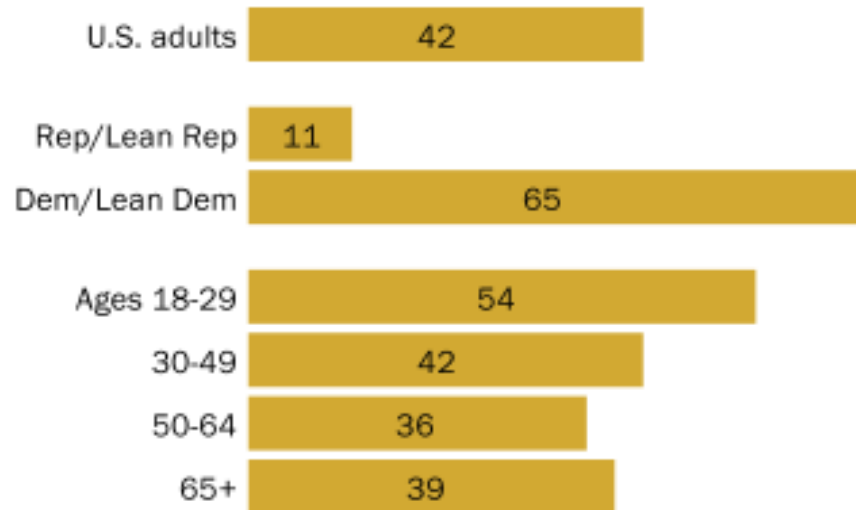
Climate change denial, or **global warming denial**, is [denial](#), dismissal, or unwarranted doubt that contradicts the [scientific consensus on climate change](#), including the extent to which it is [caused by humans](#), its [effects on nature and human society](#), or the potential of [adaptation to global warming](#) by human actions.^{[5][6][7]} Many who deny, dismiss, or hold unwarranted doubt about the

“Today, climate change skepticism is most prominently seen in the United States...”

PEW Research Center published an article last month on Americans' views of climate change

Democrats, younger Americans identify dealing with climate change as a top policy priority

% who say dealing with climate change should be a top priority for the president and Congress to address this year

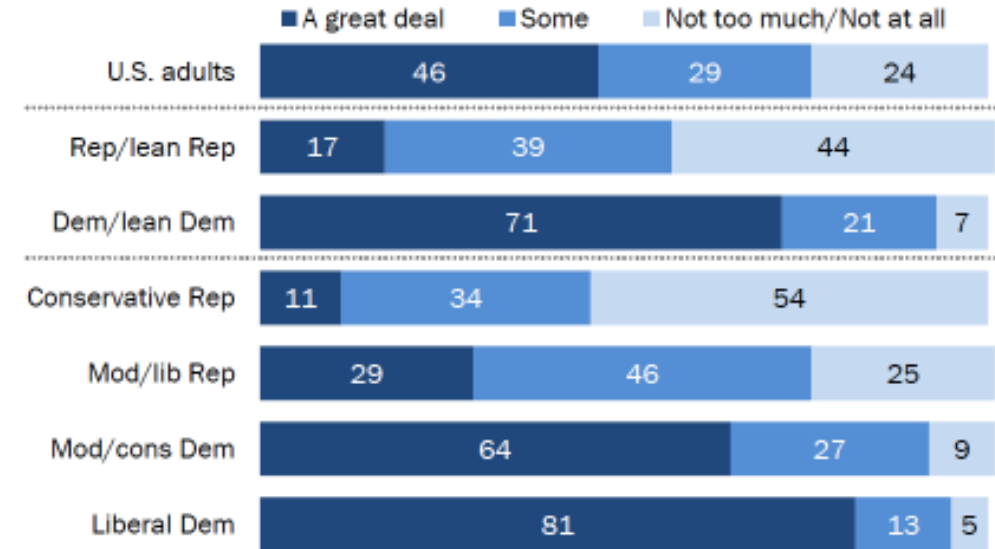


Source: Survey of U.S. adults conducted Jan. 10-17, 2022.

PEW RESEARCH CENTER

46% of Americans say human activity contributes a great deal to climate change, 29% say some

% of U.S. adults who say human activity, such as the burning of fossil fuels, contributes ___ to global climate change



Note: Respondents who did not give an answer are not shown. Republicans and Democrats include independents and others who lean to each of the parties.

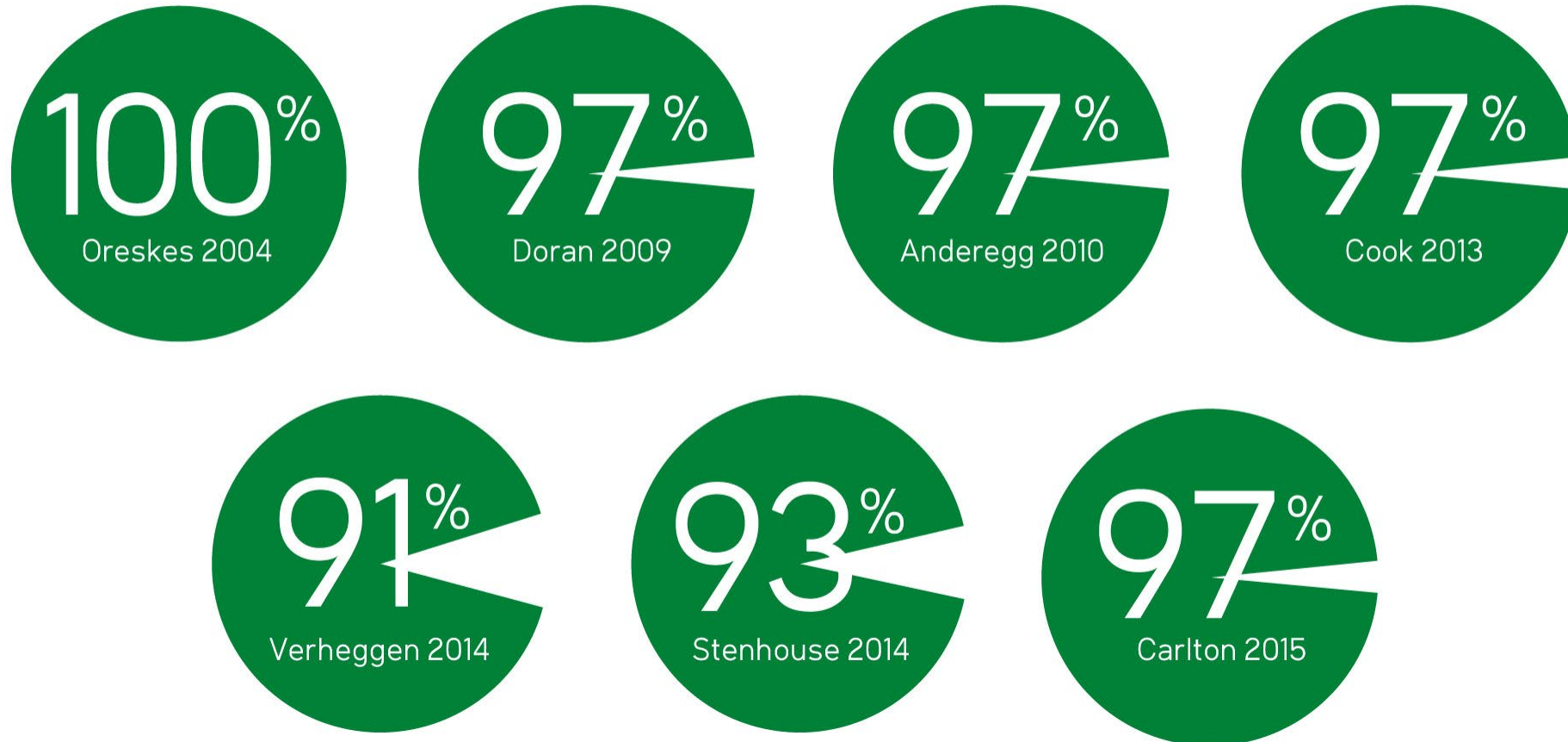
Source: Survey conducted Jan. 24-30, 2022.

"Americans Largely Favor U.S. Taking Steps To Become Carbon Neutral by 2050"

PEW RESEARCH CENTER

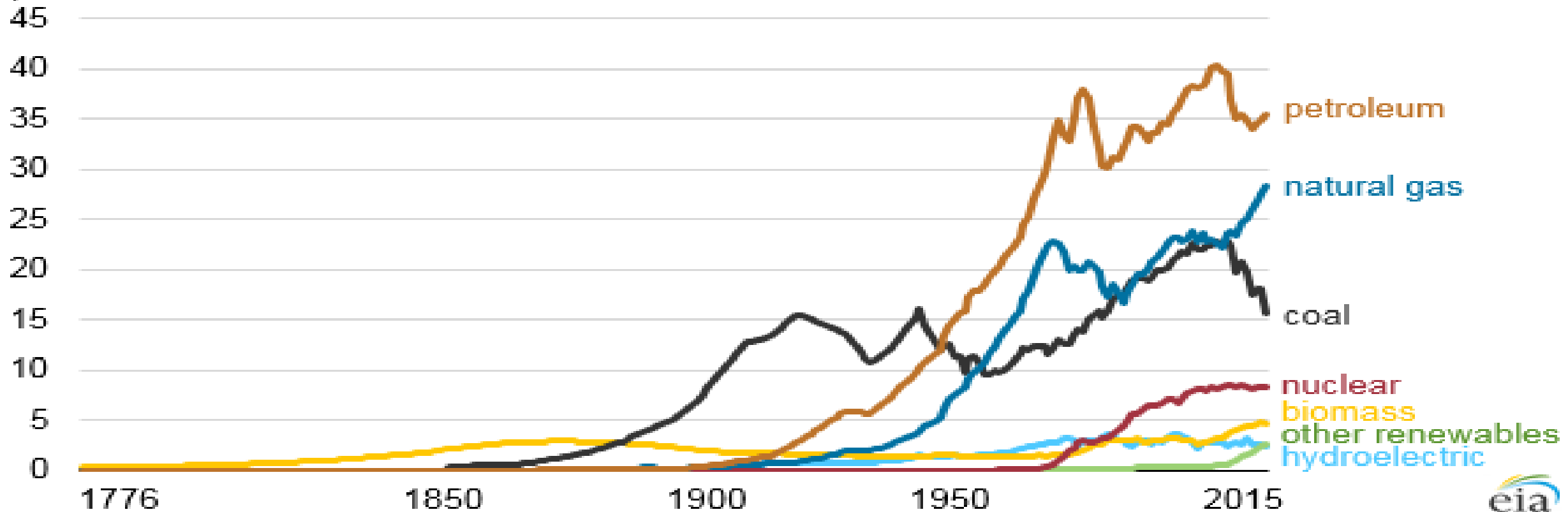
Visual aids are a helpful way to tell a story with facts and scientific data

Studies into scientific agreement on human-caused global warming



Fossil fuel consumption increased dramatically in the industrial era

Energy consumption in the United States (1776-2015)
quadrillion Btu



We know that burning fossil fuels emits CO₂



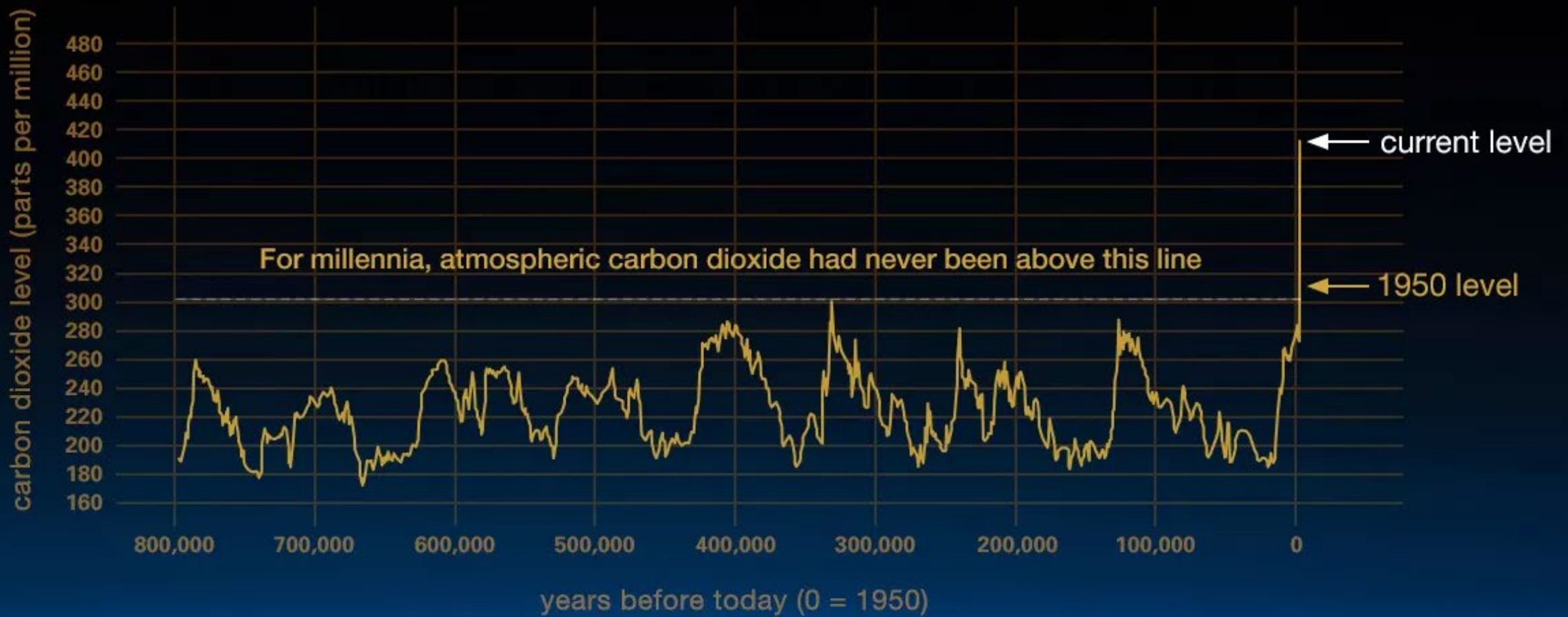
We've known since the 1800s that CO₂ and other gases trap heat

- Heat-trapping nature of CO₂ and other gases demonstrated in mid-19th century
- Their ability to affect transfer of infrared energy through the atmosphere is the basis of many instruments flown by NASA

***“There is no question** that increased levels of greenhouse gases must cause the Earth to warm in response.”*

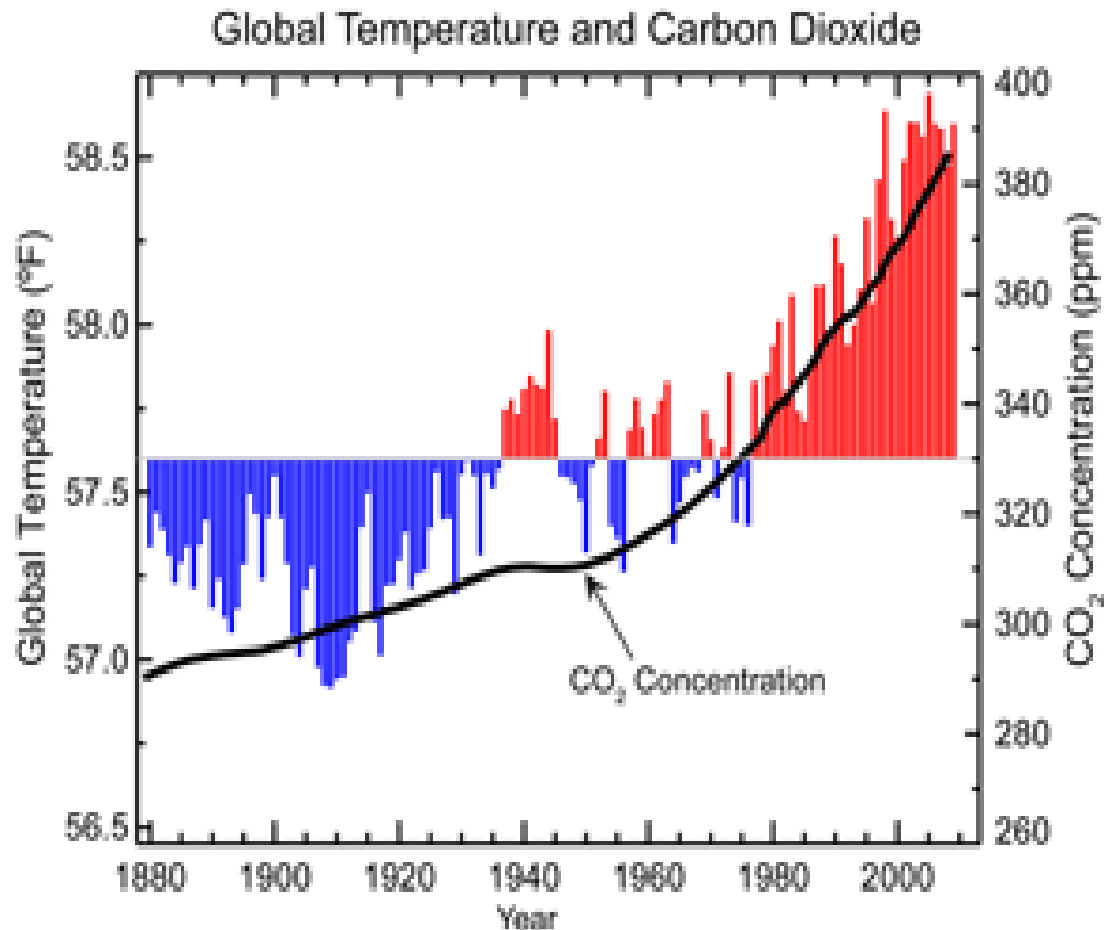


Source: NASA (<https://climate.nasa.gov/evidence/>)



Atmospheric CO₂ is alarmingly high

Global surface temperature is rising



Red = above average

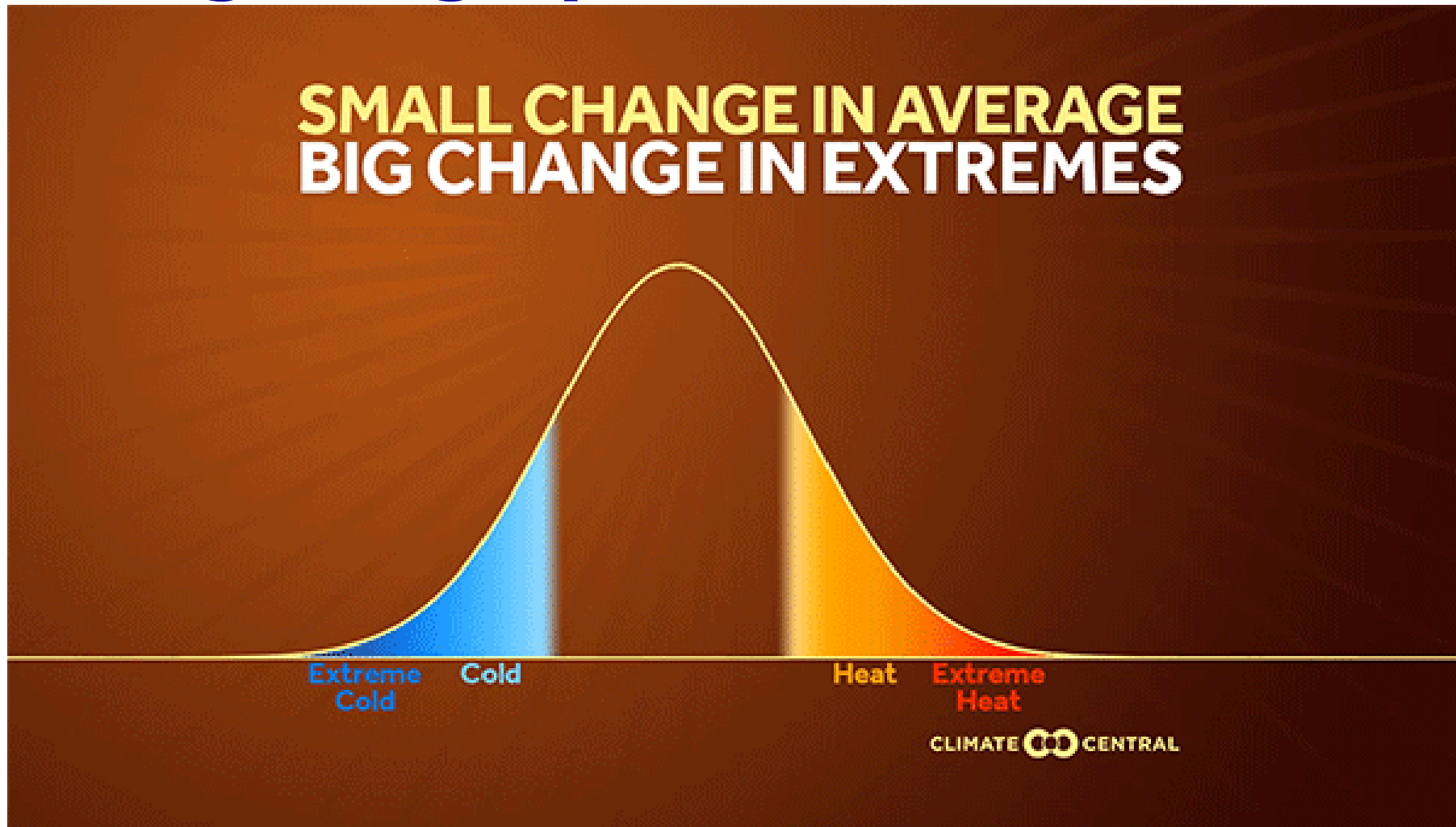
Blue = below average

Black = CO₂

Horizontal Baseline = 1901-2000
average temperature

Source: NOAA Global Climate Change Indicators
<https://www.ncdc.noaa.gov/monitoring-references/faq/indicators.php#warming-climate>

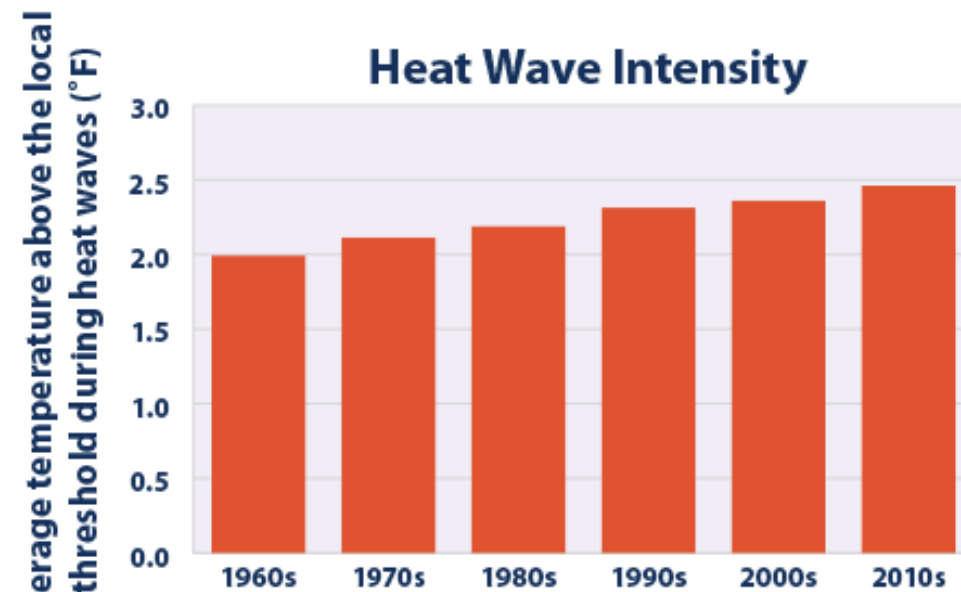
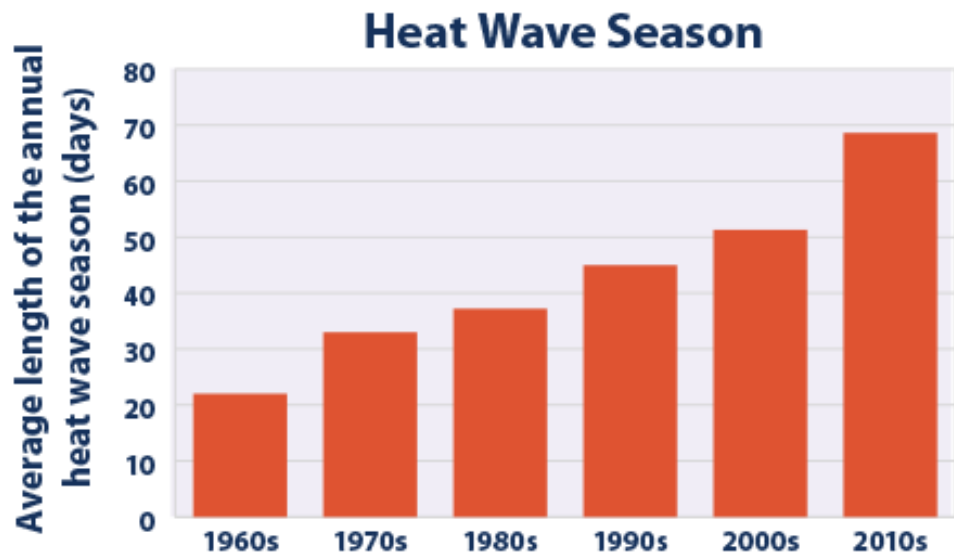
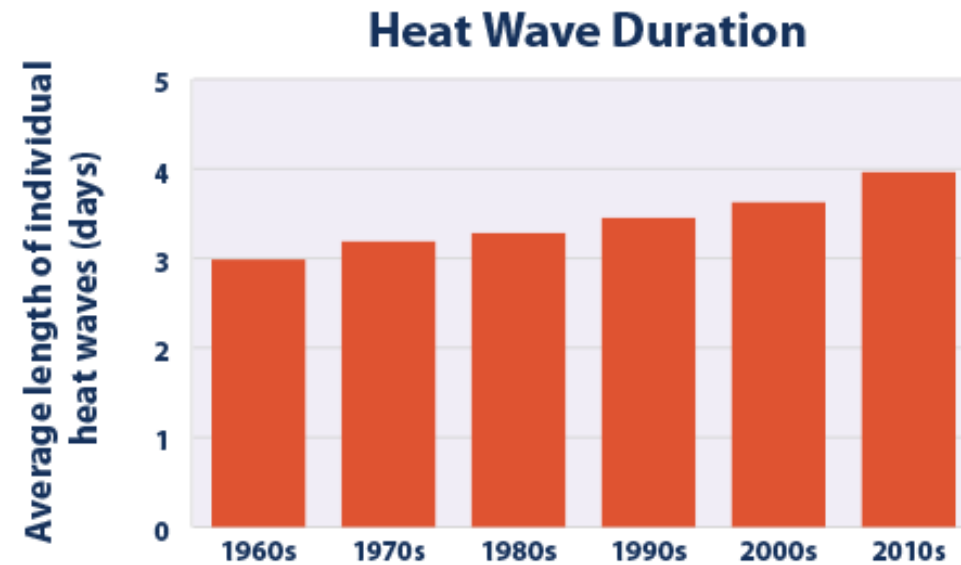
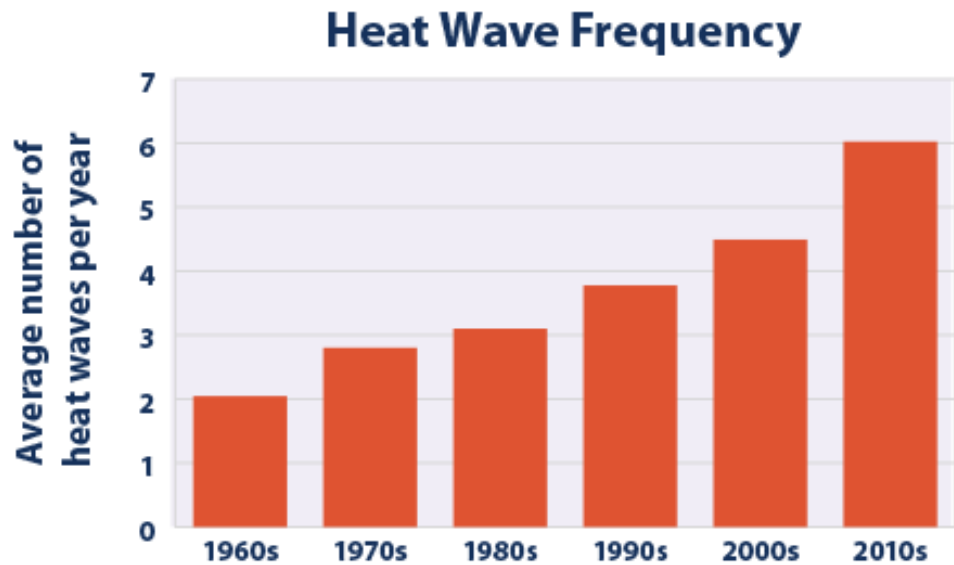
Climate Central has an extreme heat toolkit with great graphics like this one



<https://medialibrary.climatecentral.org/extreme-weather-toolkits/extreme-heat>

Heat Wave Characteristics in the United States by Decade, 1961–2019

Heat waves in the US are getting worse



**20 of the
warmest
years on
record
occurred
since 2000!**



**2016 & 2020 tied for warmest
2021 was 6th warmest**

Source: NASA/GISS

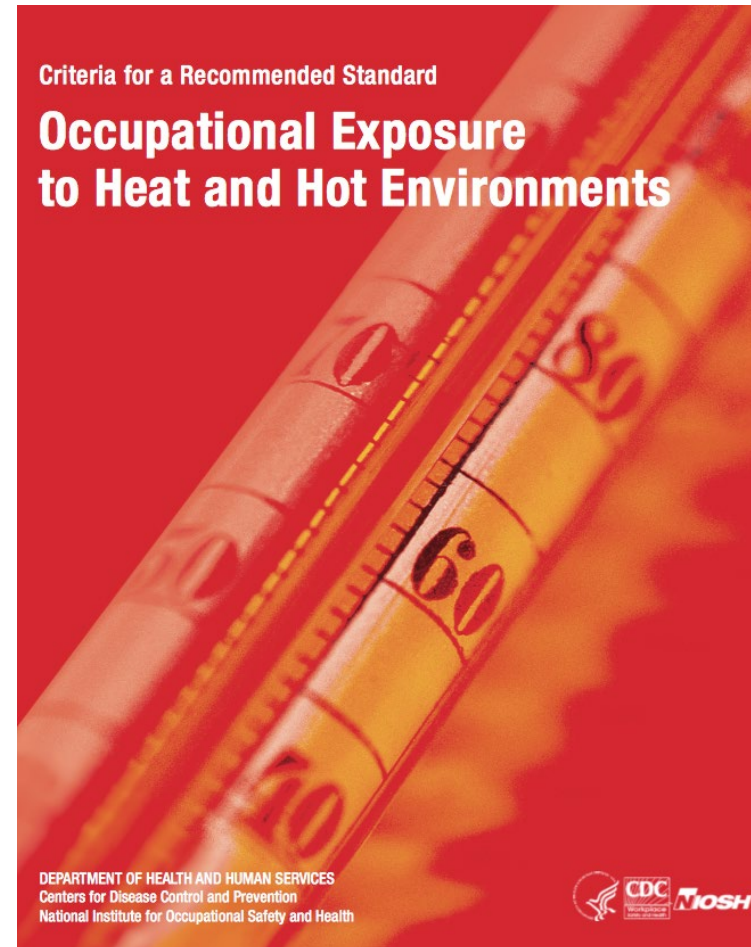
<https://climate.nasa.gov/vital-signs/global-temperature/>

NIOSH published criteria for a recommended standard 50 years ago

1972 First
Published

1986 Revised

2016 Revised



The relationship between climate change and worker health is multifaceted

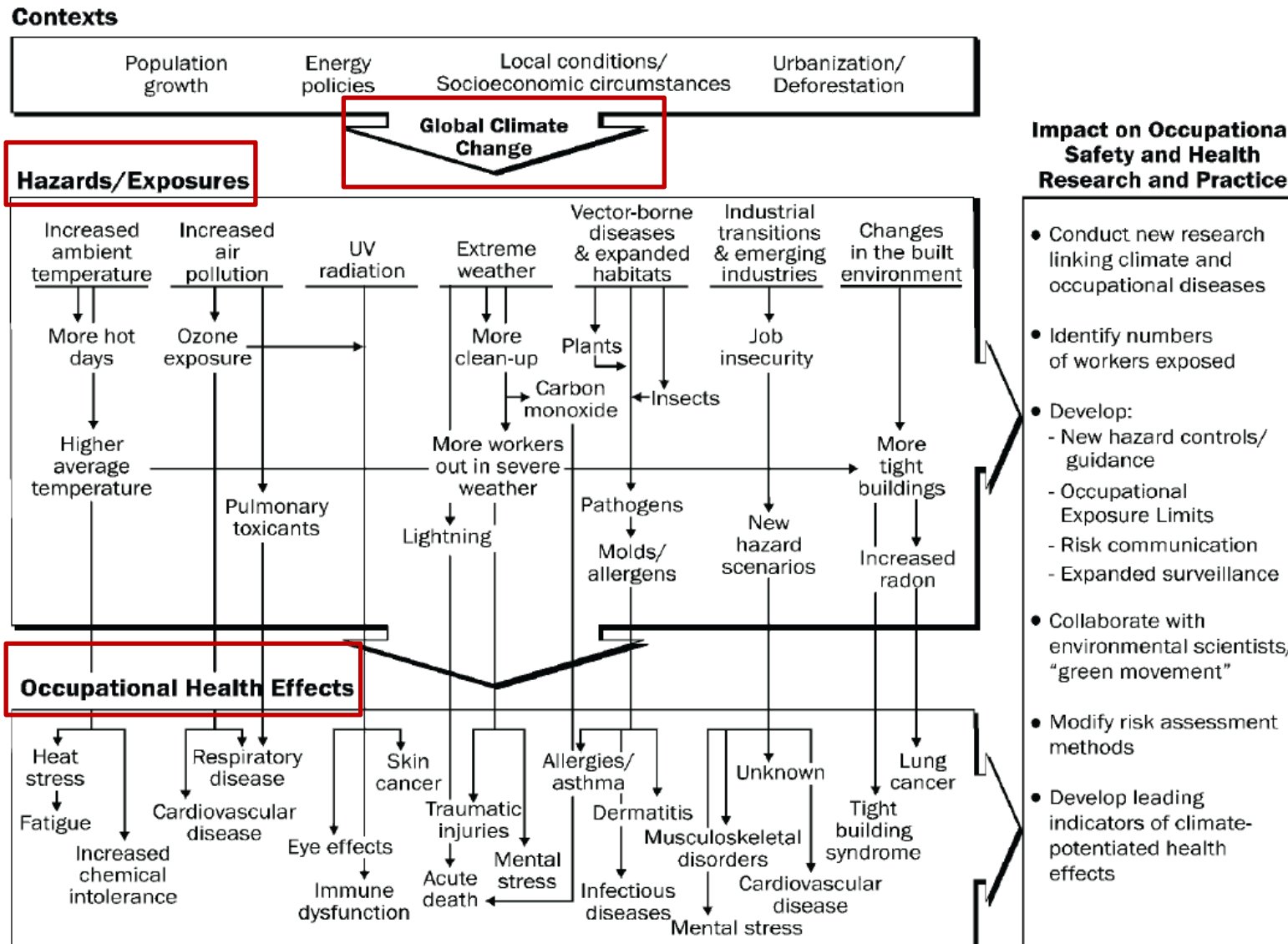


Figure 10-1 Relationship between climate change and occupational safety and health

Adapted from Schulte & Chun (2009)

<https://doi.org/10.1080/15459620903066008>

NIOSH [2016]. NIOSH criteria for a recommended standard: occupational exposure to heat and hot environments. By Jacklitsch B, Williams WJ, Musolin K, Coca A, Kim J-H, Turner N. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication 2016-106.

Examples from the prior slide:

Increased Hazards/Exposures

Temperature



Air pollution



UV radiation



Extreme weather



Insects



Molds/allergens



Occupational Health Effects

Heat stress

CVD & respiratory disease

Skin cancer

Traumatic injuries

Infectious disease

Allergies/asthma

CPWR researchers studied heat-related construction deaths from 1992 to 2016

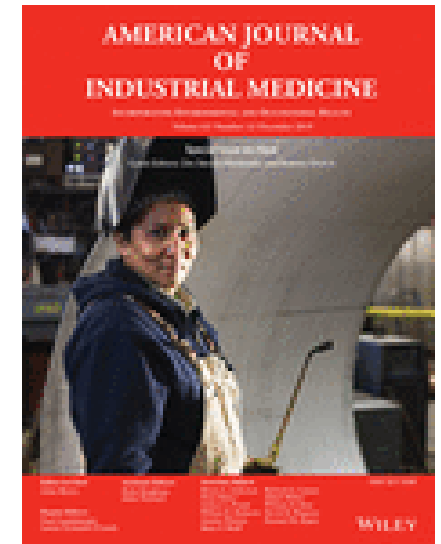
CPWR KEY FINDINGS FROM RESEARCH



Heat-related deaths among construction workers

Heat-related deaths among construction workers in the United States

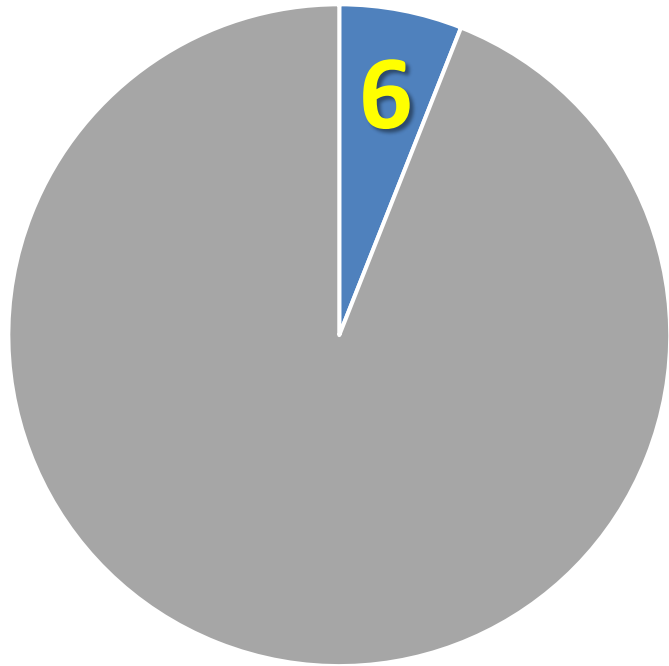
Xiuwen Sue Dong, Gavin H. West, Alfreda Holloway-Beth, Xuanwen Wang, and Rosemary K. Sokas. American Journal of Industrial Medicine, 2019.



Source: Fatal injury data were generated by the CPWR Data Center with restricted access to BLS CFOI micro data. The views expressed here do not necessarily reflect the views of the BLS. Employment data were from the Current Population Survey. Calculations by the authors.

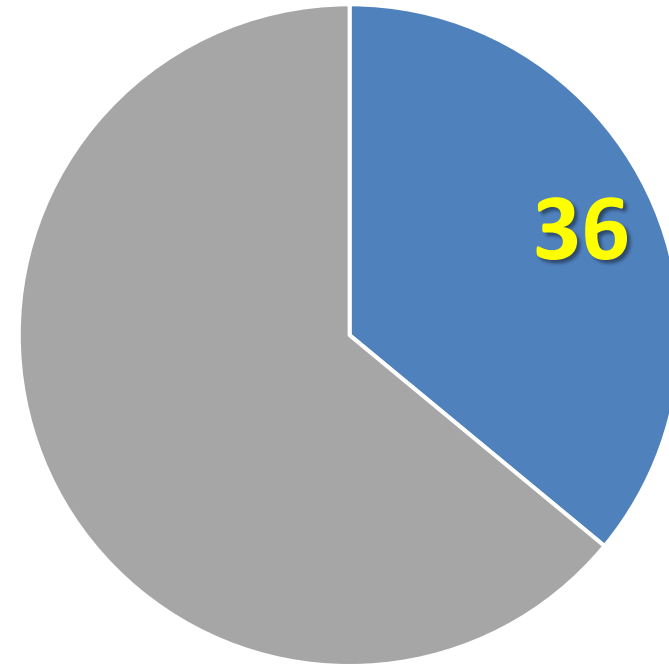
285 construction workers suffered heat-related deaths from 1992 to 2016

Percent of US workforce



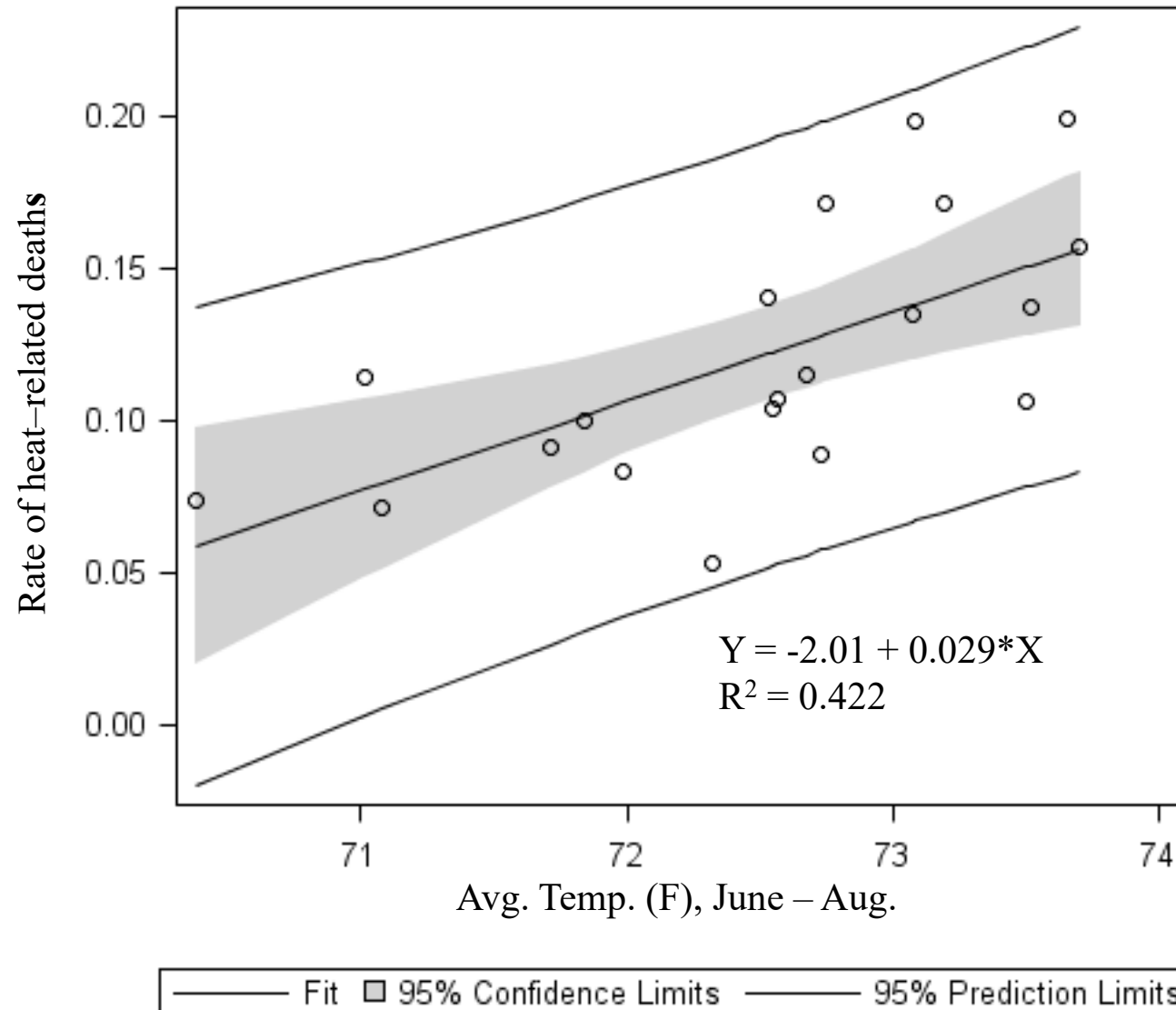
■ construction ■ other

Percent of all heat-related occupational deaths

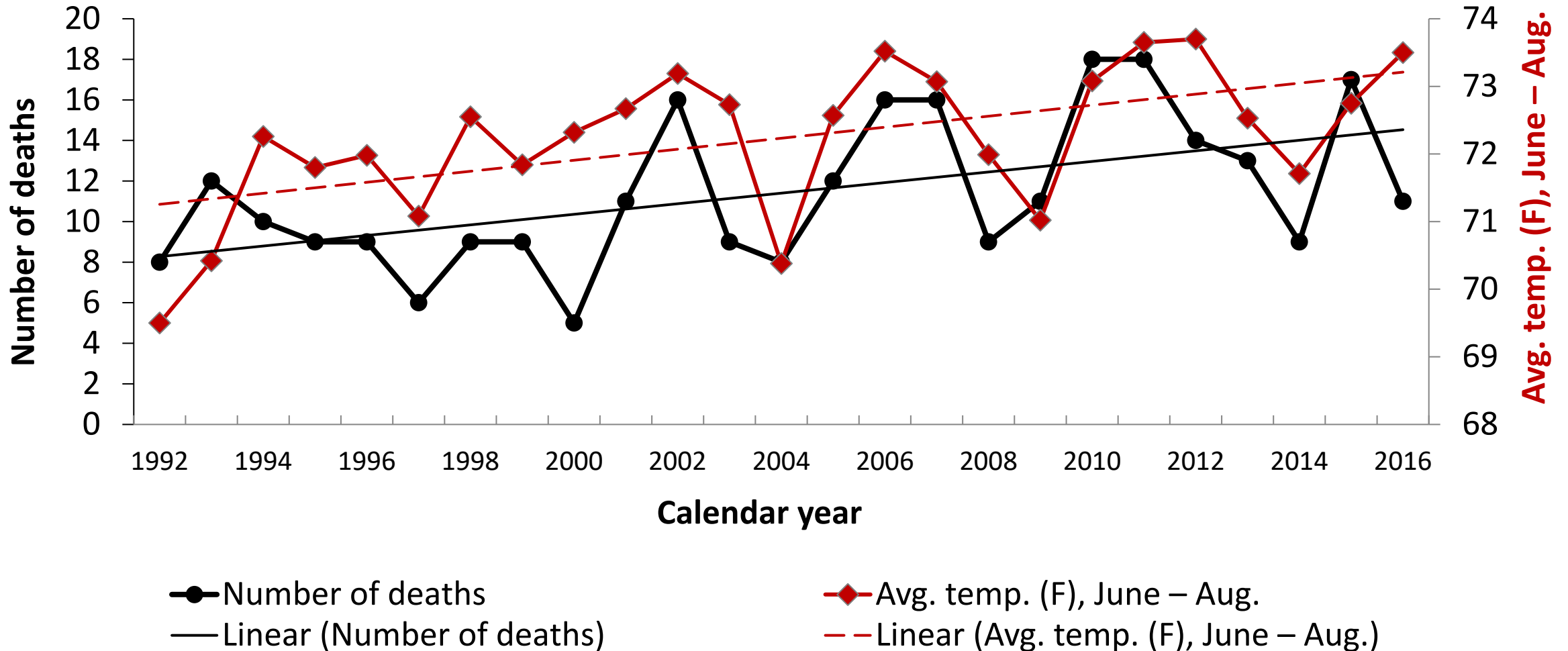


■ construction ■ other

As expected, the study showed that higher temperatures correlated with higher rates of heat-related death



The study showed that temperatures and heat-related construction deaths are trending upward



FOURTH NATIONAL CLIMATE ASSESSMENT

Volume II: Impacts, Risks, and Adaptation in the United States

The National Climate Assessment (NCA) assesses the science of climate change and variability and its impacts across the United States, now and throughout this century.

SUMMARY FINDINGS

REPORT CHAPTERS

OVERVIEW

DOWNLOADS

Higher temperatures threaten worker health and productivity

The most recent National Climate Assessment predicts \$160 billion in lost wages annually in the USA this century

World Health Organization estimates are grim

Between 2030 and 2050 climate change is expected to cause

250 000 ADDITIONAL DEATHS PER YEAR

due to malaria, malnutrition, diarrhoea and heat stress.



World Health
Organization

Heat affects health in many ways



An increased risk of **hospitalization for heart disease**.



Heat exhaustion, which can lead to **heat stroke** if not treated, can cause critical illness, brain injury, and even death.



Worsening **asthma** and **chronic obstructive pulmonary disease (COPD)** as heat increases the production of ground-level ozone.



Dehydration, which can lead to **kidney injury** and blood pressure problems. Some kidney damage can become irreversible with repeated or untreated injury.



Violence, crime, and suicide may increase with temperature, adding to the rates of depression and anxiety already associated with climate change.

Source: DHHS Office of Climate Change and Health Equity

<https://www.hhs.gov/sites/default/files/climate-health-outlook-may-2022.pdf>

Hotter temperatures increase the likelihood of workplace injuries

California workers' comp study

- Hotter temps cause 20,000 injuries per year (e.g., falls)
- A day above 100 °F leads to a 10-15 % increase in same-day injury risk



What might happen if you experienced these heat illness symptoms while working at height or operating machinery?



- Dizziness
- Light-headedness
- Fainting
- Altered mental state
- Confusion
- Muscle cramps
- Seizures

Good to see that this electrician on a platform ladder is safely tied off

List critical elements of heat illness prevention plans and training

Learning Objective



Critical components of a heat safety plan include:

- Risk assessment
- Acclimatization
- Water, rest, shade
- Training
- First aid
- Heat stress controls
- Emergency response



Provision of water, rest, and shade should be a cornerstone of any heat illness safety plan



 **WATER. REST. SHADE.**
The work can't get done without them.

[Home](#) [Educational Resources](#) [Using the Heat Index](#) [Training](#) [Media Resources](#)



Photos by: CAL-OSHA

The 2016 NIOSH criteria document describes the importance of training and what it should include

*“Health and safety **training is important** for employers to provide to workers and their supervisors before they begin working in a hot environment. This **training should include** information about **recognizing symptoms** of heat-related illness; **proper hydration** (e.g., drinking 1 cup [8 oz.] of water or other fluids every 15–20 minutes); care and use of **heat-protective clothing and equipment**; effects of various **[risk] factors** (e.g., drugs, alcohol, obesity, etc.) on heat tolerance; and importance of **acclimatization, reporting symptoms**, and giving or receiving appropriate **first aid**. **Supervisors** also should be provided with appropriate training about how to monitor weather reports and weather advisories.”*

This mnemonic can help to remember important training topics from the prior slide

First Aid

Symptoms

Hydration

Acclimatization

Risk factors

Protective clothing & equipment

Supervisor training

F # 's



Environmental risk factors for heat illness are common in construction

Tools and machinery

Elevated surfaces

Heavy workloads

Simple accommodations

Temporary employment

Direct sunlight

PPE requirements

(Xiang et al., 2013)



Image courtesy: Sunbelt Rentals

Know your audience



“Night work” courtesy DOT

Personal risk factors for heat illness include

Low physical fitness

Heavy Clothing and PPE

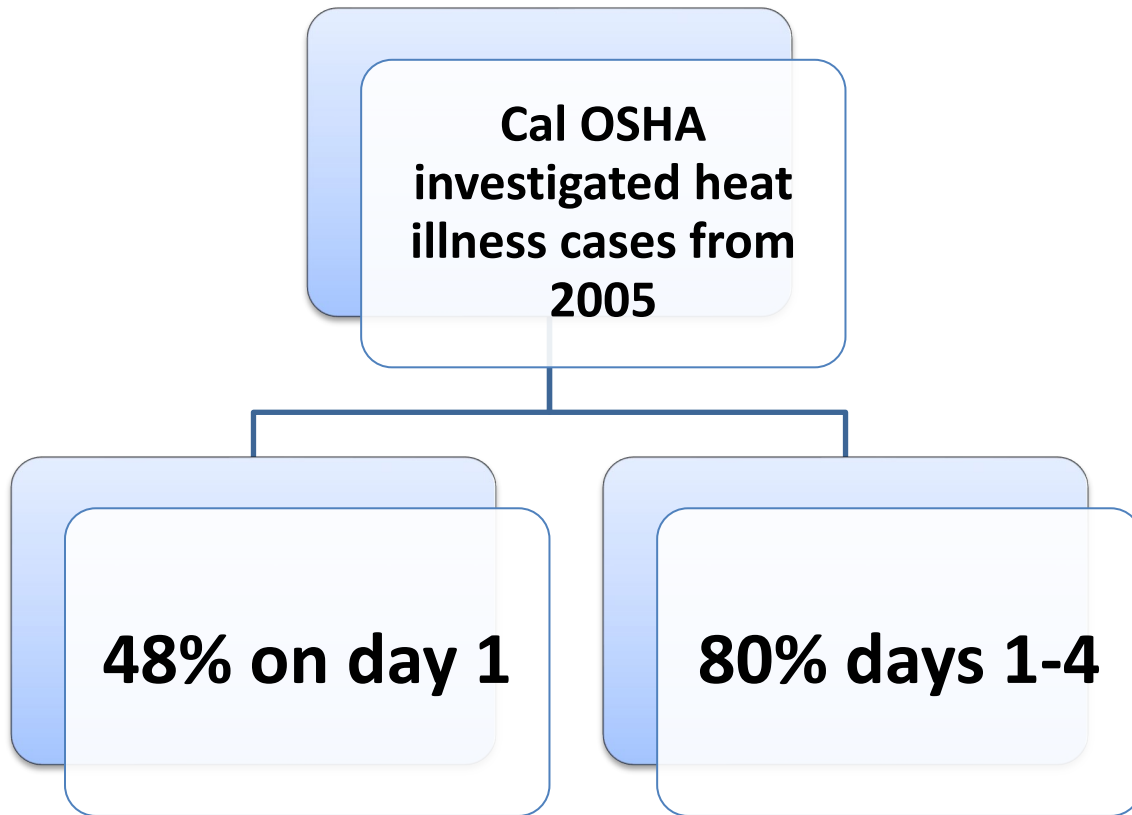
Advanced age

Acclimatization
(lack of recent heat exposure)



[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

New and returning workers are especially vulnerable to heat illness



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The new NIOSH document differentiates classic and exertional heat stroke

Table 4-4. Comparison of classic and exertional heat stroke

Patient characteristics	Classic	Exertional
Age	Young children or elderly	Typically 15–45 years
Health	Chronic illness or debilitation common	Usually healthy
Prevailing weather	Frequent in prolonged	Variable
Sweating	Usually absent	Often present
History of febrile illness	Unusual	Common
Acid–base disturbances	Respiratory alkalosis	Lactic acidosis
Acute renal failure	Fairly rare	Common
Rhabdomyolysis	Seldom severe	Common; may be severe
Hyperuricemia	Modest	Marked
Creatinine: blood urea nitrogen ratio	1:10	Elevated

Sweating Usually absent

Often present

“Re-education is needed in the workplace especially about symptoms. Many workers have incorrectly been taught that as long as they were still sweating they were not in danger of heat stroke.”

Access resources to use in your training program

Learning Objective



Get resources from CPWR, OSHA, and NIOSH in one location:

<https://www.cpwr.com/research/research-to-practice-r2p/r2p-library/other-resources-for-stakeholders/working-in-hot-weather/>

CPWR

CPWR resources and solutions include:

- [Hot Weather](#) Toolbox Talk. Also available in [Spanish](#).
- [Hot Weather](#) Hazard Alert. Also available in [Spanish](#).
- [Skin Cancer](#) Toolbox Talk. Also available in [Spanish](#).
- [Skin Cancer](#) Hazard Alert. Also available in [Spanish](#).
- [Lightning](#) Toolbox Talk. Also available in [Spanish](#).
- [Lightning](#) Hazard Alert. Also available in [Spanish](#).
- [Heat Hazard & Solutions](#)
- [Protect Yourself Against Heat Exposure](#) *New*. Product from the OSHA-CPWR Alliance
- [Protect Yourself from Lightning Infographic](#) *New*.



OSHA

OSHA's [Campaign to Prevent Heat Illness](#) and [Occupational Heat Exposure](#) web pages provide a host of resources for employers and workers, including:

- [Water, Rest, Shade Fact Sheet](#). Also available in [Spanish](#)
- [Water, Rest, Shade](#) Wallet Card. Also available in [Spanish](#)
- [Heat Illness Training Poster](#) Also available in [Spanish](#)
- [The OSHA Heat Illness Prevention Training Guide](#). Also available in [Spanish](#)
- [The OSHA Heat Safety Tool Smartphone App](#) (*updated*)

NIOSH

The NIOSH [Heat Stress](#) page offers additional tools and publications addressing heat stress, including:

- [Protecting Yourself from Heat Stress](#) card
- [Protect Your Workers from Heat Stress](#) infographic
- [Protect Yourself from Heat Stress](#) podcast (4 min.)
- [Heat-Related Illness](#) Poster
- [Evaluation of Occupational Exposure Limits for Heat Stress in Outdoor Workers — United States, 2011–2016](#) MMWR Report

Toolbox talks are one of our most frequently accessed resources

CPWR TOOLBOX TALK
THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

Hot Weather

• Drink water every 15 minutes. Don't wait until you feel thirsty.
• Best in shade or air-conditioning.
• Know the signs of heat stroke; it is a medical emergency.

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THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

CPWR is the Center for Construction Research and Training. All rights reserved. CPWR is the research, training, and service arm of the Construction Trades Dept., AFL-CIO, and works to reduce or eliminate safety and health hazards in construction workplaces across the job. Production of this card was supported by Grant O-408702 from the National Institute for Occupational Safety and Health (NIOSH). The contents are solely the responsibility of the authors and do not necessarily represent the official views of NIOSH.

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OSHA STANDARD: General Duty Clause Section 5(a)(1)

Hot Weather

Certain safety problems are common in a hot environment. Heat on the job can cause dizziness, discomfort and the fogging of safety glasses, all of which can lead to accidents.

Here is an Example
John, a bricklayer, had been outside for 7 straight hours in extremely hot weather. He began to experience nausea and grew very tired. Once his supervisor noticed John was working much slower than usual, he ordered him to take a break, which included resting in shade and drinking water.

Recognizing Heat Illness
Symptoms of heat exhaustion include headaches, dizziness, lightheadedness, fainting, weakness, moist skin, mood changes, such as irritability or confusion, upset stomach and vomiting. Heat stroke is an immediate threat to life. Rapid cooling with ice packs or cold water must begin at once. A victim may sweat a lot, but some may have hot, dry skin and no sweating. Either way, it's an extreme emergency. Call 911 immediately.

Employers should provide shade, rest breaks, and water. What can you do to help avoid exhaustion from heat?

Preventing Injuries from Hot Weather

- Get enough sleep.
- Wear light clothing, and include a shirt that serves as a shield from the sun's rays.
- Whenever outside, wear a loose-fitting long-sleeved shirt and long pants. Hard hats will protect the scalp.
- Avoid alcohol; it is particularly dangerous while working in a hot setting.
- Drink water moderately (about eight ounces every 15 minutes). Plan the day to tackle more strenuous jobs during the cooler morning hours.
- Rest in shaded areas.
- Watch new employees for signs of heat illness because it takes about one week for the body to adjust to the heat.

What Are We Going to Do Today?
What will we do here at the worksite today to prevent being injured in hot weather?

<https://www.cpwr.com/research/research-to-practice-r2p/r2p-library/other-resources-for-stakeholders/working-in-hot-weather/>

CPWR's elcosh covers heat stress too



Electronic Library of Construction
Occupational Safety & Health

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Hazards



Trades



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construction
solutions

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Anyone ever use the OSHA-NIOSH Heat Safety Tool App?

- Real-time heat index and forecast
- Risk levels
- Recommendations
- Info on symptoms, first aid, and more

<https://www.cdc.gov/niosh/topics/heatstress/heatapp.html>



The US military is a good resource for heat stress guidance and training



Photo by FEMA/Mike Moore

Download the

EM 385-1-1, Safety and Health Requirements Manual (2014) here:



https://www.publications.usace.army.mil/portals/76/publications/engineer-manuals/em_385-1-1.pdf

Interactive maps can be used for training activities

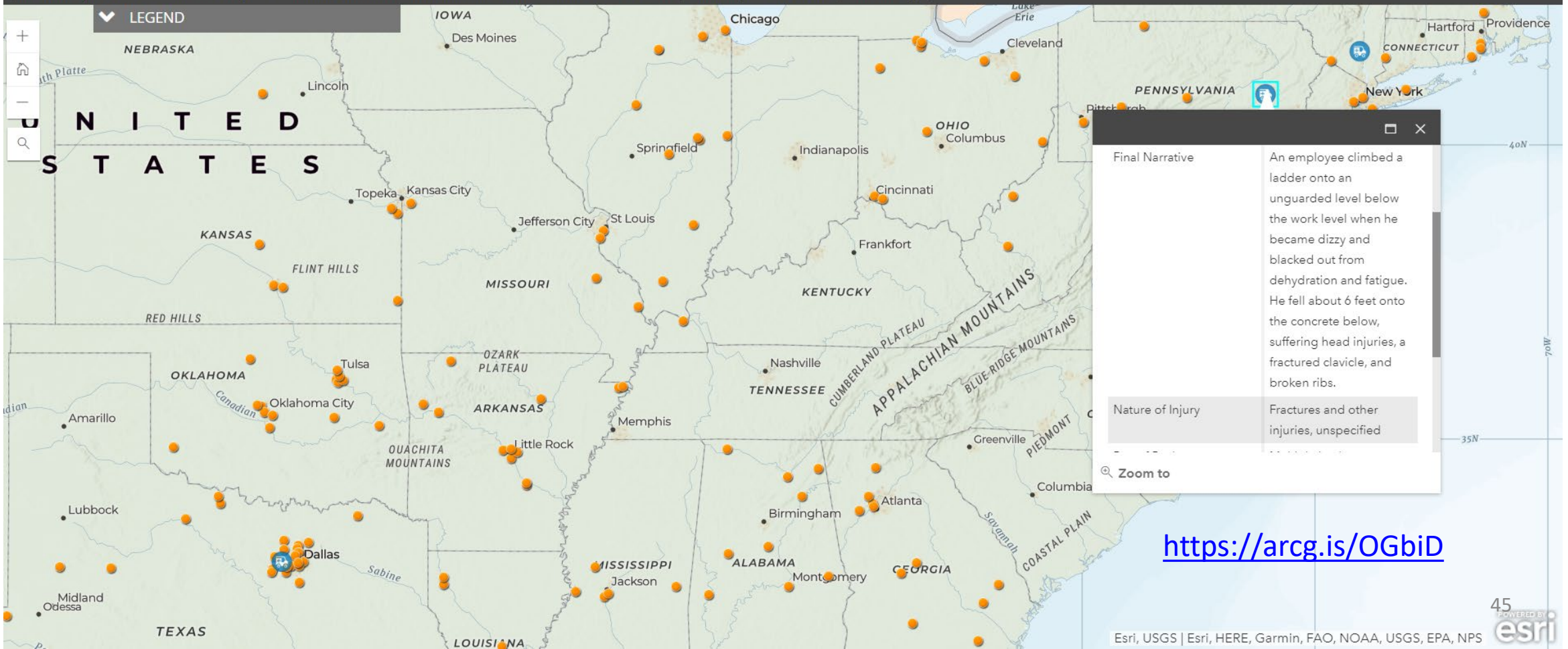


Here's a map I created for a CPWR Trainer Enhancement

OSHA Severe Injury Reports - Non-Fatal Heat Illnesses in Construction

A Story Map   

This map shows a subset of data from OSHA Severe Injury Reports from January 1, 2015 through March 31, 2019. It is important to note that the map only includes severe work-related injuries reported in federal OSHA states and does not reflect injuries in the 28 states with OSHA state plans. Severe injuries are defined as an amputation, inpatient hospitalization, or loss of an eye. For more information about the data source used to create this map, visit <https://www.osha.gov/severeinjury/>



<https://arcg.is/OGbiD>

Let's do a group exercise with an interactive map



1. Open NRDC heat standards map: <https://www.nrdc.org/resources/occupational-heat-safety-standards-united-states>
2. Answer questions **for your state:**
 - How many workers in high-risk industries?
 - Is there an existing heat standard?
 - Standard under development?
 - Active heat standard legislation?

Thanks!

Questions?

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