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Extreme Heat and Unprotected Workers

Public Citizen Petitions OSHA to Protect the Millions of Workers Who Labor in Dangerous Temperatures

Acknowledgments

This report was written by Michael Tanglis, Senior Researcher for Public Citizen's Congress Watch division, and Shanna Devine, Worker Health and Safety Advocate for Congress Watch. David Arkush, Managing Director of Public Citizen's Climate Program, provided expertise. The report was edited by Lisa Gilbert, Vice President of Legislative Affairs for Congress Watch, and Congress Watch Research Director Taylor Lincoln. Communication Workers of America and Student Action with Farmworkers provided valuable help in identifying worker experiences with heat stress.

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Public Citizen's Congress Watch
215 Pennsylvania Ave. S.E.
Washington, D.C. 20003
P: 202-546-4996
<http://www.citizen.org>

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Introduction

This century has witnessed extraordinary increases in temperature. Seventeen of the 18 hottest years on record have occurred since 2001. If the current trajectory continues – and there is every reason to expect it will – temperatures in the United States are going to be searing. By 2100, summers in Boston will resemble today’s summers in Miami Beach. St. Paul, Minn., will feel like Mesquite, Texas. Las Vegas will become the new Riyadh, Saudi Arabia.

The human body is a sensitive instrument. It needs to maintain an internal temperature of 98.6 Fahrenheit and can tolerate only small deviations from this temperature.¹ Warm temperatures and physical activity can raise the body’s temperature, and put an individual at risk of severe harm. Over the past 30 years, heat has been the leading cause of weather fatalities, according to the National Weather Service.²

Those who perform manual labor in hot outdoors conditions, such as agricultural and construction workers, are particularly at risk because they are subjected both to high levels of ambient heat and rising metabolic heat, which results from physical exertion.

The Occupational Safety and Health Administration (OSHA) is responsible “to assure so far as possible every working man and woman in the Nation safe and healthful working conditions.”³ Implicit within this charge is that OSHA must ensure that employees are not laboring under risks of bodily harm or death from excessive heat.

But workers are laboring under these risks, and OSHA has long been on notice.

In 1972, the National Institute for Occupational Safety and Health (NIOSH) recommended a standard requiring employers to protect their workers from heat stress. An OSHA advisory committee reviewed the recommendation and agreed with it.⁴

But OSHA failed to create a heat stress standard in response. Nor did it do so in response to two subsequent NIOSH recommendations, in 1986 and 2016. Nor did it do so in response to a petition filed by Public Citizen and allies at the end of the blistering summer of 2011.⁵

In the meantime, the toll has risen. According to figures compiled by the federal government, exposure to excessive environmental heat killed 783 U.S. workers and seriously injured 69,374 workers from 1992 through 2016.

¹ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH OCCUPATIONAL, EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zlabnA>.

² *Weather Fatalities*, NATIONAL WEATHER SERVICE (viewed on July 13, 2017), <http://www.nws.noaa.gov/om/hazstats.shtml>

³ The Occupational Safety and Health Act, 29 U.S.C. § 651(2)(b) (1970).

⁴ Petition by Public Citizen *et al.* to OSHA for heat stress standard (Sept. 1, 2011), <https://bit.ly/2KGG1WG>.

⁵ *Id.*

For a long list of reasons outlined in this report, those figures greatly understate reality. OSHA acknowledged in response to Public Citizen's 2011 petition that heat-induced "deaths are most likely underreported, and therefore the true mortality rate is likely higher."⁶ But OSHA declined to create a protective standard at that time in part because it deemed the risk to workers to be no greater than "significant" and not meeting the threshold of "grave" to justify an emergency standard.⁷

Subsequently, OSHA staff members have researched employer practices regarding heat, and their findings have reinforced the urgency for instituting protections. In one study, they investigated the circumstances surrounding 84 cases in which the agency had issued citations for unsafe heat conditions under the agency's broad "general duty" clause. This portion of OSHA's authorizing statute permits the agency to issue penalties for unsafe conditions even if no specific standard is violated. The general duty clause carries a much higher burden of evidence than specific standards, and often is used in response to tragedies rather than to prevent them.

Twenty-three of these 84 cases reviewed in the study involved worker deaths.⁸ Remarkably, 17 of the 23 fatalities occurred in the employee's first *three days* on the job, signifying the tremendous risk employees face when they are newly thrust into a high-heat environments. The same OSHA researchers found that only one of the 84 employers had a program in place to help new employees acclimatize to hot conditions. Only a handful of employers had policies to adjust work loads to account for fluctuations in the heat index. One-fifth failed to provide adequate access to water.⁹

Three states – California, Minnesota and Washington – have established their own heat stress standards.

A look at enforcement relating to California's law illustrates need for OSHA to create a heat-specific standard versus relying on its general duty clause. California completed 7,082 inspections resulting in at least one heat standard violation between 2013 and 2017. During that same timeframe, federal OSHA conducted only 142 inspections nationwide resulting in at least one heat-related citation under the general duty clause. This means that California conducted 50 times more inspections resulting in a violation for unsafe heat exposure practices than OSHA did nationwide between 2013 and 2017.

Public Citizen analyzed the weather for July 2017 for more than 2,000 of the nation's 3,142 counties for which reliable temperature data could be obtained to determine the number of workers toiling in extreme heat. These counties account for about 80 percent of the employed population. Extreme

⁶ Letter from David Michaels, assistant secretary for Occupational Safety and Health, to Sidney Wolfe, director of Public Citizen's Health Research Group (July 7, 2012), <http://bit.ly/2KFB8wZ>.

⁷ *Id.*

⁸ Sheila Arbury, Matthew Lindsley and Michael Hodgson, *A Critical Review of OSHA Heat Enforcement Cases: Lessons Learned*. 58 JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE 359-363 (April 2016), <http://bit.ly/2NooKA6>.

⁹ *Id.*

heat was defined as days in which a locale's high temperature exceeded the 90th percentile for the locale's historical summer high. This analysis revealed:

- Of the 2,009 counties analyzed, 1,336 experienced extreme heat in the course of July 2017.
- An average of 1.1 million workers in the agriculture or construction industries worked in extreme heat every day that month.
- On July 21, 2017, 2.7 million workers in these industries worked in extreme heat.
- OSHA concluded that extreme heat was a contributing factor in the deaths of at least six workers during July 2017.

Separately, Public Citizen compared weather conditions for the recent July Fourth holiday week in a slightly smaller number of counties against the same extreme weather threshold. This analysis showed that:

- An average of 2.2 million workers in the agriculture or construction industries worked in extreme heat each day during the recent July Fourth holiday week.
- Nearly 5.1 million workers in these industries experienced extreme heat at least one day during the week of July Fourth.

The worst is yet to come.

The group Climate Central has projected for 133 cities the number of days that the National Weather Service deems "dangerous" will occur in the coming decades. Dangerous days are those in which the heat index –derived by combining heat and humidity – exceeds 104 degrees. The number of dangerous heat days that the 133 cities will experience, on average, will increase from 20 a year in 2000 to 58 in 2050. By 2050, McAllen, Texas, will experience 179 dangerous heat days. This means that those who work outdoors around McAllen, Texas, will spend nearly half the year working in unsafe conditions unless measures are taken to protect them.

Public Citizen and more than 130 co-petitioners are asking that OSHA develop a standard that would establish maximum heat load thresholds, require employers to undertake measures that would prevent employees' heat load from exceeding those thresholds, and institute other safeguards. The elements of the petition are listed here:

1. Provide mandatory rest breaks with increased frequency in times of extreme heat and significant exertion.
2. Provide access to shaded and otherwise cool conditions for employees to rest during breaks.
3. Provide personal protective equipment, such as water-cooled and air-cooled garments.
4. Make provisions for adequate hydration.

5. Implement heat acclimatization plans to help new workers safely adjust to hot conditions.
6. Regularly monitor both the environmental heat load and employees' metabolic heat loads during hot conditions.
7. Medically monitor at-risk employees.
8. Notify employees of heat stress hazards.
9. Institute a heat-alert plan outlining procedures to follow when heat waves are forecast.
10. Train workers on heat stress risks and preventive measures.
11. Maintain and report records relating to this standard.
12. Institute whistleblower protection programs to ensure that employees who witness violations of the heat stress safety standard are free to speak up.

Many of these elements were noted as missing in citation reports that OSHA has issued to employers under the general duty clause for putting their workers at risk of heat-stress. That is to say, OSHA's investigators recognize that these protections are necessary to protect workers in hot conditions.

But research into the very cases that led to these citations revealed that employers often fail to furnish these protections – whether due to ignorance or wanton recklessness.

It's time to close the door on both of these possibilities. OSHA must develop a standard requiring employers to protect their workers from unsafe heat.

I. Millions of Workers Across the Country Labored in Extreme Heat in July 2017

In this section, we analyze the number of workers who labored under extreme heat conditions in July 2017 across the United States. We do this by comparing a threshold for extreme heat to the actual conditions experienced in the 64 percent of U.S. counties for which we were able to obtain reliable temperature data. (Note: our methodology does not take into account additional risk factors, such as rising metabolic heat due to exertion.)

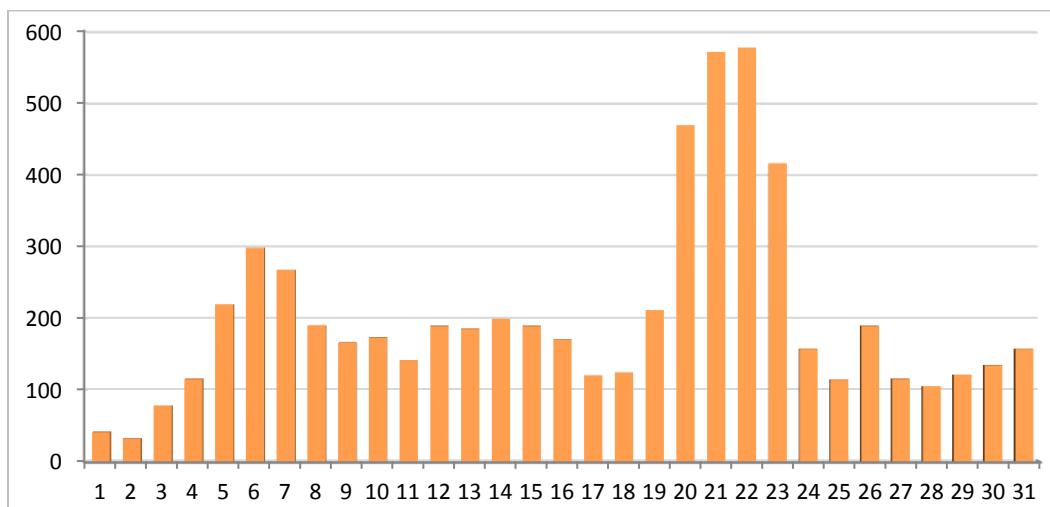
We then cross-reference the counties experiencing extreme heat against the number of workers by county.¹⁰ A day was deemed to cross the extreme heat threshold if its maximum temperature exceeded the 90th percentile of the county's historical June through August average. For close to half of the counties analyzed, the extreme heat threshold was 95 degrees or warmer. For 20 percent of the counties, the extreme heat threshold was 99 degrees or warmer. For many counties across the South and Southwest, the extreme heat threshold was 100 degrees or more.

In total, the dataset covers more than 118 million workers, accounting for 80 percent of the employed workforce. [See methodology at end of Section II for more explanation]

An Average of 1.1 Million Agriculture and Construction Workers Worked in Extreme Conditions Each Day in July 2017

An average of 201 counties experienced extreme heat each day in July 2017. A total of 1,336 counties out of 2,009 counties experienced extreme heat at least once that month. The hottest days during this period were July 21 and July 22. More than 570 U.S. counties experienced extreme heat on either or both of these days. [Figure 1]

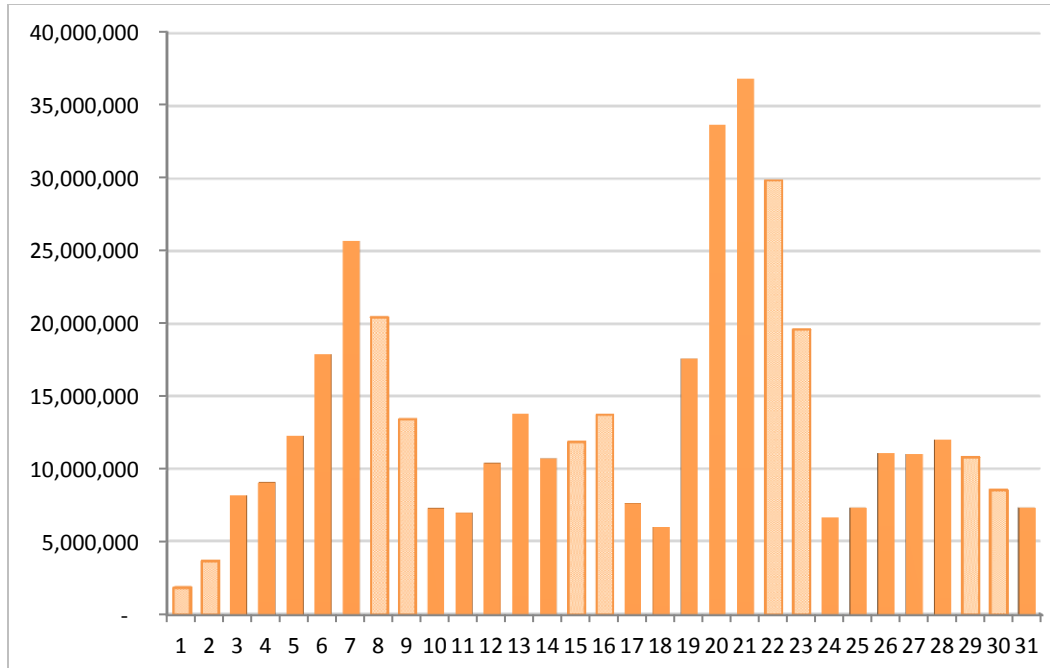
Figure 1 - Number of Counties Experiencing Extreme Heat July 2017, by Date



¹⁰ *Climate Change and Health, Extreme Heat*, NATURAL RESOURCES DEFENSE COUNCIL (2017), <https://on.nrdc.org/2L6Mfiv>.

An average of 13.3 million people reported to work in extreme heat each day in July 2017. On July 21, close to 37 million workers in the reported to work in extreme heat conditions. [Figure 2]

Figure 2 - Number of Workers Experiencing Extreme Heat July 2017, by Date (Weekends Shaded)



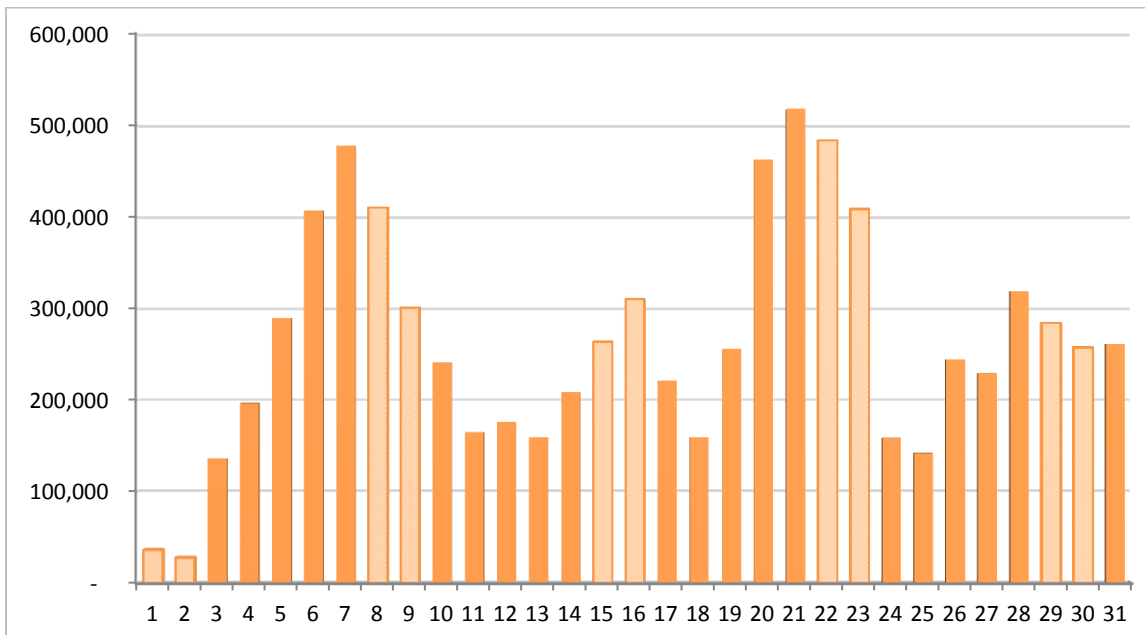
Many people reporting to work on days of extreme would of course work indoors. But many work outdoors, as well. Public Citizen ran the same analysis focusing on the two broad industries that include some of the most vulnerable workers because they often work outdoors: 1) the agriculture, forestry, fishing and hunting, and mining industries,¹¹ and 2) the construction industry.

According to the most recent Census data, there were more than 2.8 million workers employed in the agriculture, forestry, fishing and hunting, and mining industries, and more than 9.2 million workers in the construction industry in 2016. Our dataset covers about 80 percent of the workers in both industries.

In July 2017, an average of 265,000 workers in the agriculture, forestry, fishing and hunting, and mining industries worked each day in extreme heat. On July 21, 2017, more than 518,000 workers in these industries went to work in extreme heat – amounting to 23 percent of workers in the industry analyzed in this report. [Figure 3]

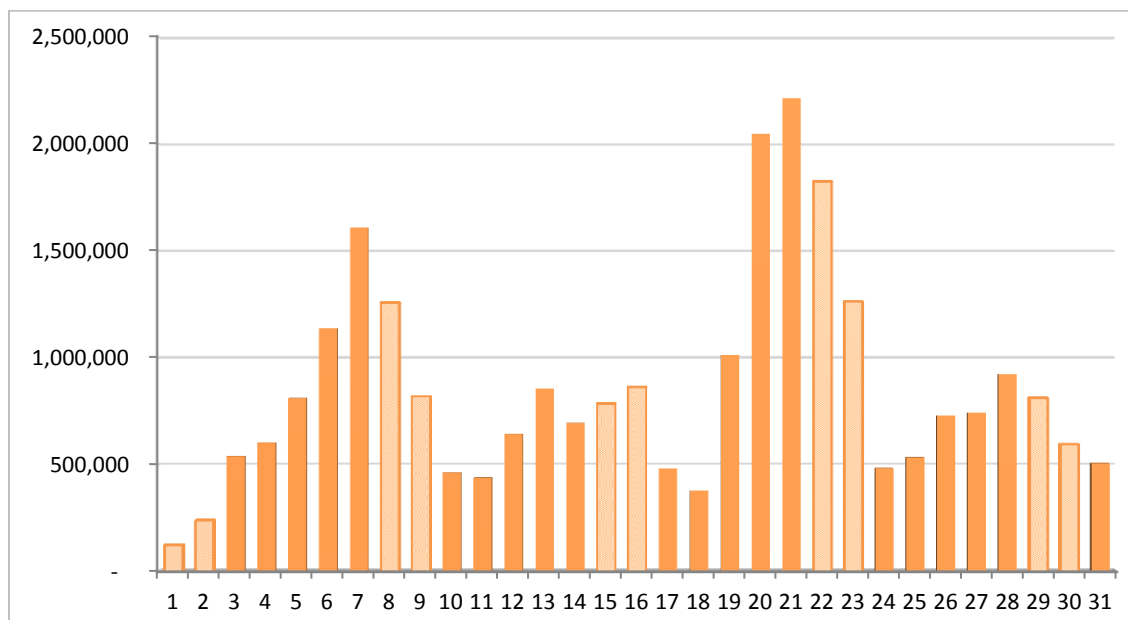
¹¹ Census Data include these industries in one group.

Figure 3 - Number of Agriculture, Forestry, Fishing and Hunting, and Mining Workers Experiencing Extreme Heat July 2017, by Date (Weekends Shaded)



In July 2017, an average of 851,000 workers in the construction industry worked each day in extreme heat. On July 21, 2017, 2.2 million construction workers across the country went to work in extreme heat, accounting for 30 percent of workers in the industry analyzed in this report. [Figure 4]

Figure 4 - Number of Construction Workers Experiencing Extreme Heat July 2017, by Date (Weekends Shaded)



At Least Six Workers Died Due to Extreme Heat in July 2017

OSHA fatality specifically mentioned heat as a contributing factor in its summaries of six worker fatalities in July 2017.¹²

- **July 1, 2017** – After missing work due to sickness, a storage yard worker in Nueces County, Texas, was trying to make up hours working on a Saturday.¹³ After falling ill, the worker suffered a heat stroke and died. The maximum temperature reported in the county that day was 92 degrees.
- **July 7, 2017** – An employee collapsed while working on a lawn in San Bernardino County, Calif.¹⁴ The employee later died at the hospital due to “the exposure to heat.”¹⁵ San Bernardino experienced a maximum temperature of 91 degrees that day.
- **July 7, 2017** – A worker laying bricks in Cleveland County, Okla., died from a “heat-related illness” while working outside.¹⁶ According to NOAA data, temperatures got as high as 94 degrees that day.
- **July 8, 2017** – An oil and gas worker in Winkler County, Texas, died from heat exposure as he was pressure washing pipes.¹⁷ Winkler County reported a high of 91 degrees that day.
- **July 11, 2017** – A mail carrier in Jefferson County, W.V., collapsed and died on the porch of a mail customer. The temperature was in the 80s that day. An autopsy found that the worker had an enlarged heart as well as artery blockages. The OSHA inspection notes that because the worker was “working in a high temperature and humidity zone,” and was “unacclimatized,” to the conditions after three weeks off, the worker was at risk for a heat-related injury.¹⁸
- **July 18, 2017** – A worker installing an air conditioning duct in Calcasieu Parish, La., collapsed and died after becoming overheated at the job site.¹⁹ Temperatures reached 90 degrees that day in the county.

¹² *Fatality Inspection Data, Reports of Fatalities for CY17-18*, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, <http://bit.ly/2Nb72iw>.

¹³ *Inspection Detail, Inspection: 1244295.015 - Highway Barricades & Services LLC*, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, <http://bit.ly/2ufscEX>.

¹⁴ *Inspection Detail, Inspection: 1246124.015 - Multi-Family Property Services, Inc.*, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, <http://bit.ly/2Nb2qsg>. Note: This inspection is not closed as of July 12, 2018.

¹⁵ *Id.*

¹⁶ *Inspection Detail, Inspection: 1254765.015 - Jorge Serrano Aguilar*, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, <http://bit.ly/2utPzKa>. Note: This inspection is not closed as of July 12, 2018.

¹⁷ *Inspection Detail, Inspection: 1245413.015 - Wade's Inspection Services, Inc.*, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, <http://bit.ly/2L8X7cl>.

¹⁸ *Inspection Detail, Inspection: 1246012.015 - U.S. Postal Service*, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, <http://bit.ly/2L29ieq>.

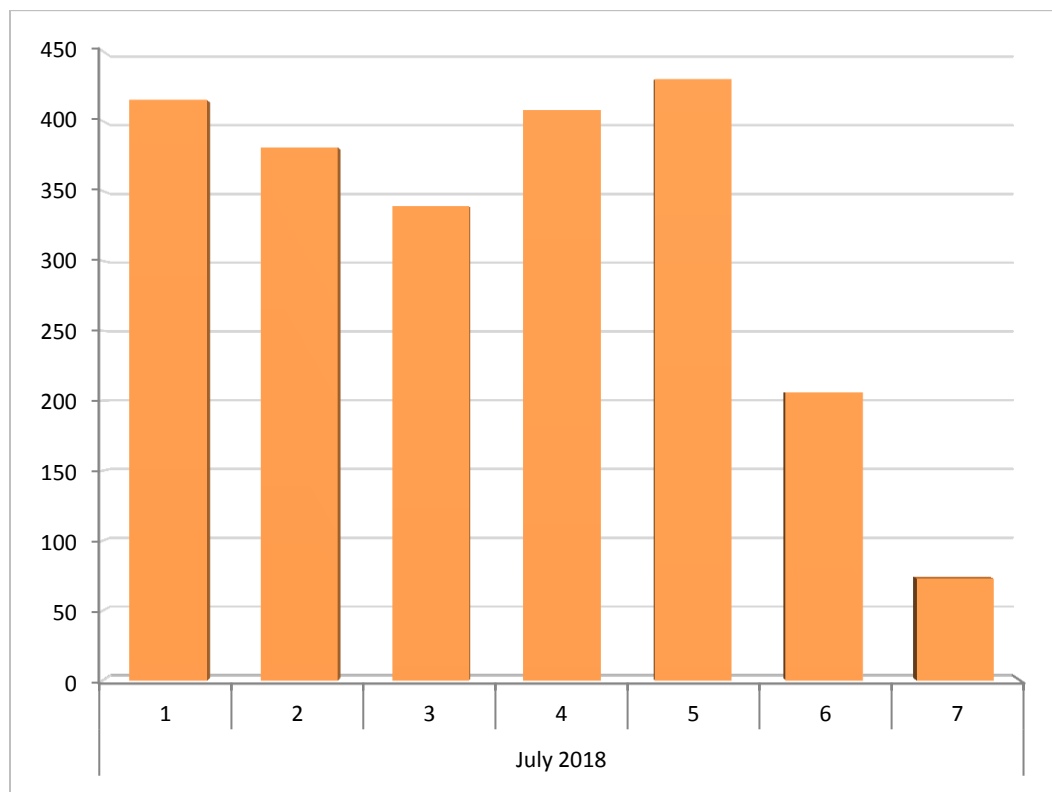
¹⁹ *Inspection Detail, Inspection: 1248555.015 - Ace Air Conditioning Of Louisiana LLC*, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, <http://bit.ly/2KQ7LZR>.

II. Extreme Heat Conditions for Tens of Millions of Workers During the 2018 July Fourth Week

During July Fourth 2018 holiday week, just two weeks prior to the publication of this report, heat records were set around the world.²⁰ Public Citizen ran the same analysis for the week surrounding the holiday (July 1, 2018 through July 7, 2018) as was done for all of July 2017 in the previous section.

During the July Fourth week an average of 322 counties a day experienced extreme heat. On July 5, 2018, 430 counties experienced extreme heat – the most of any day that week. A total of 850 counties experienced at least one extreme heat day. [Figure 5]

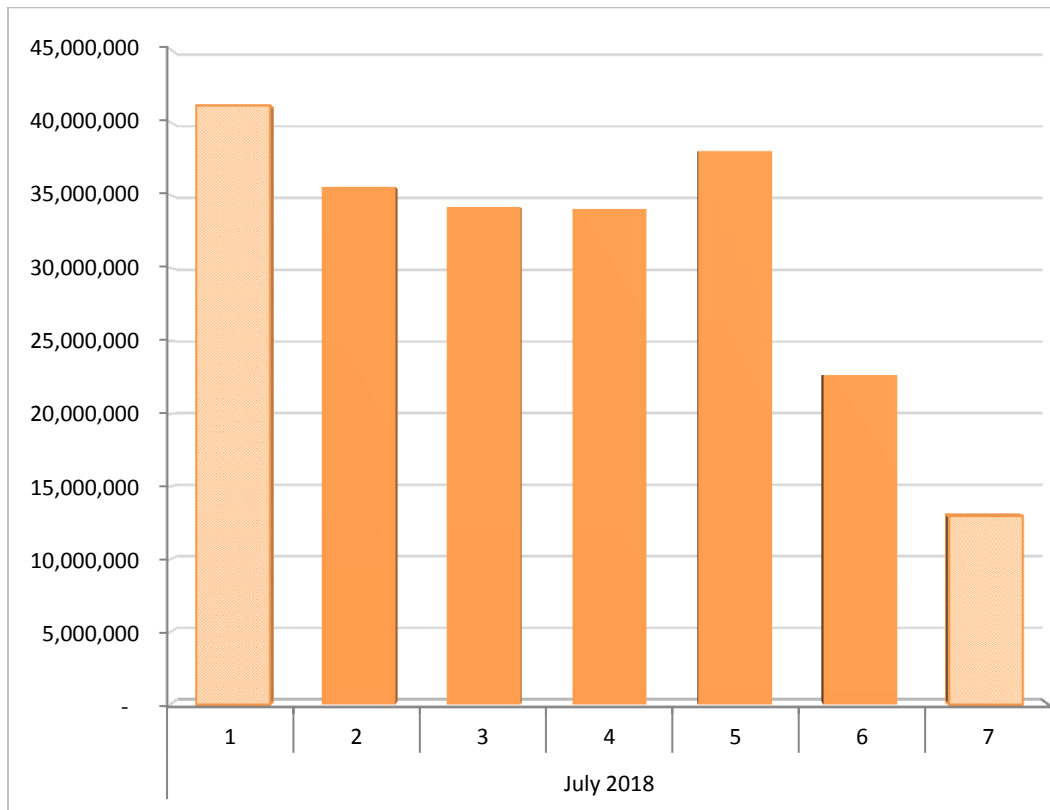
Figure 5 - Number of Counties Experiencing Extreme Heat, By Date, July 1 to 7, 2018



An average of 31.2 million workers experienced extreme heat each day during the July Fourth week. A total of 69.6 million workers experienced at least one extreme heat day that week. For workers fortunate enough to receive July 4 off, the return back to work on Wednesday July 5 was particularly unpleasant, as 38 million workers headed back to work in extreme heat. [Figure 6]

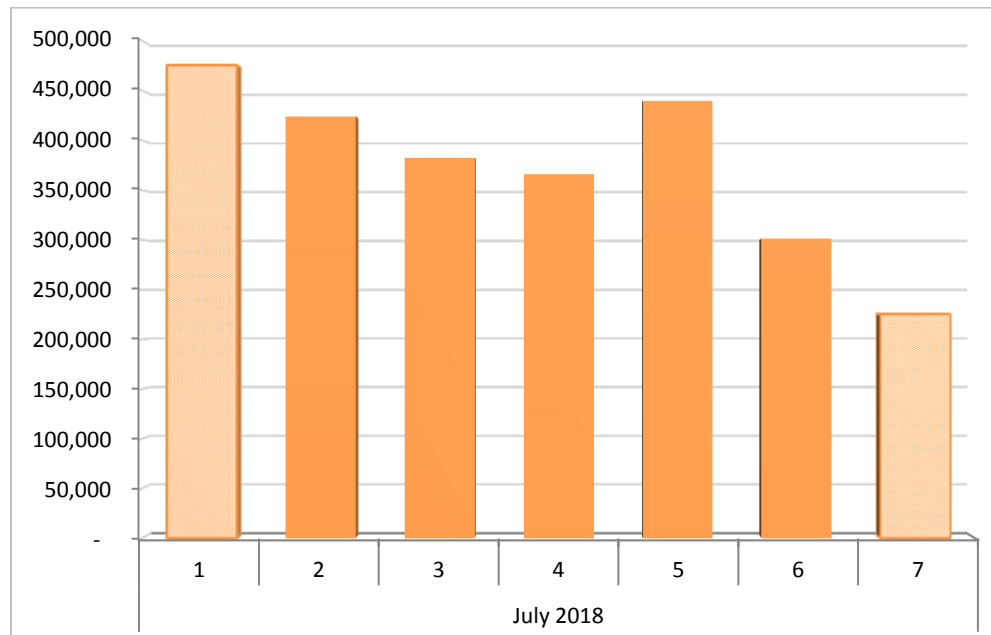
²⁰ Jason Samenow, *Red-Hot Planet: All-Time Heat Records Have Been Set All Over the World During the Past Week*, THE WASHINGTON POST (July 5, 2018), <https://wapo.st/2zAm5Ao>.

Figure 6 - Number of Workers – In all Industries – Experiencing Extreme Heat By Date, July 1 to 7, 2018 (Weekends Shaded)



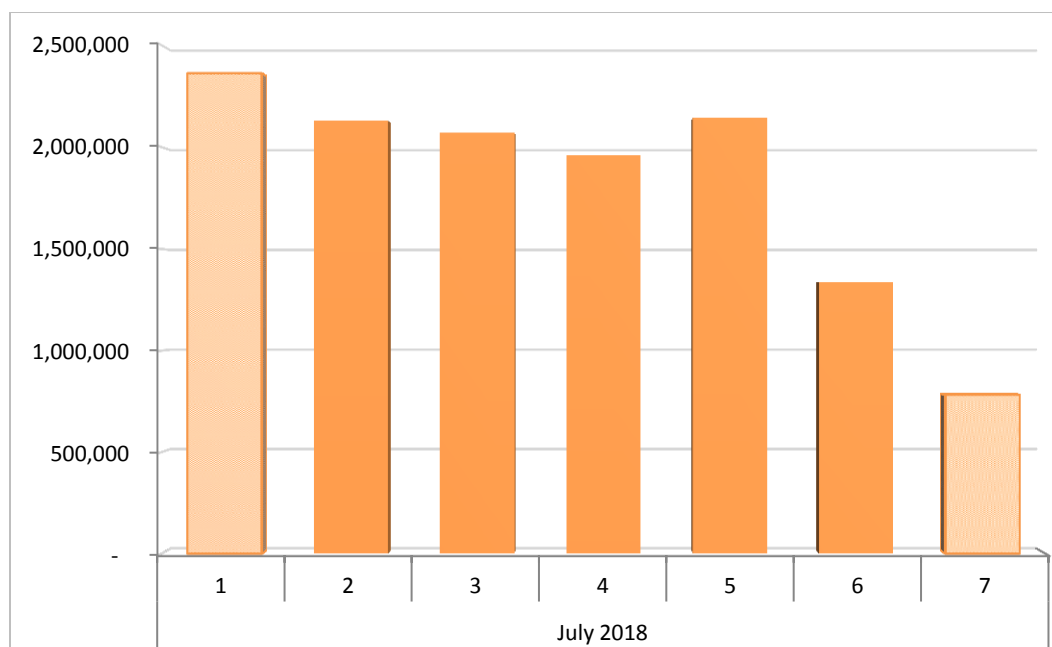
An average of 374,000 workers in the agriculture, forestry, fishing and hunting, and mining industries experienced extreme heat each day during the July Fourth week. A total of 985,000 agriculture workers experienced at least one extreme heat day that week. On July 5, 2018, close to 440,000 workers in these industries worked in extreme heat. [Figure 7]

Figure 7 - Number of Agriculture, Forestry, Fishing and Hunting, and Mining Workers Experiencing Extreme Heat, By Date, July 1 to 7, 2018 (Weekends Shaded)



An average of 1.8 million workers a day in the construction industry experienced extreme heat during the July Fourth week. A total of 4.1 million construction workers experienced at least one extreme heat day that week. On July 5, 2017, 2.1 million construction workers across the country worked in extreme heat. [Figure 8]

Figure 8 - Number of Construction Workers Experiencing Extreme Heat, By Date, July 1 to 7, 2018



Methodology

Public Citizen created a dataset that included the daily maximum temperature readings for more than 2,000 U.S. counties to determine how many workers on a given day in each county experienced “extreme heat” in July 2017. The dataset was created using three main data sources.

Temperature:

Public Citizen downloaded all daily maximum temperature data for July 2017 from the National Oceanic and Atmospheric Administration (NOAA) Global Historical Climatology Network (GHCN).²¹ Daily maximum temperature data was available for 83 percent of all counties.

Extreme Heat:

Public Citizen used 90th percentile “extreme heat” threshold for more than 2,000 U.S. counties from Natural Resources Defense Council (NRDC). The dataset underlies the 2017 NRDC report, *Climate Change and Health, Extreme Heat*.²² The dataset provides the 90th percentile of maximum temperatures based on June 1 to August 31 temperatures for each location from 1961 to 1990.²³

For close to half of the counties analyzed, the extreme heat threshold used was 95 degrees or warmer. For 20 percent of the counties, the extreme heat threshold was 99 degrees or warmer. For many counties across the south and south west, the extreme heat threshold was 100 degrees or more.

Census Employment Data:

County level Census employment data²⁴ was also added to determine how many workers in each county experienced extreme heat on a given day.

²¹ *Climate Data Online Search*, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, <http://bit.ly/2NKWBTR>.

²² *Climate Change and Health: Extreme Heat*, NATURAL RESOURCES DEFENSE COUNCIL (2017), <https://on.nrdc.org/2L6Mfiv>.

²³ *Climate Change and Health: Extreme Heat Methods*, NATURAL RESOURCES DEFENSE COUNCIL (2017), <https://on.nrdc.org/2L2HE0P>.

²⁴ *American FactFinder, DP03 Selected Economic Characteristics 2012-2016 American Community Survey 5-Year Estimates*, UNITED STATES CENSUS BUREAU, <http://bit.ly/2Lb8Smg>.

III. Climate Change Will Make an Already Bad Situation Worse

For every region in the United States, the most recent decade was warmer than any previous decade on record.²⁵ Seventeen of the 18 hottest years on record have occurred since 2001.²⁶ The most recent year, 2017, was the second-hottest year on record, surpassed only by 2016.²⁷

Climate change will make hot temperatures and heat waves more frequent and more intense in the coming decades.²⁸ Just how warm future summers in the United States will be largely depends on the action, or lack of action, taken to reduce greenhouse gas emissions.

In May 2014, the U.S. Global Change Research Program (USGCRP) released its third National Climate Assessment. The USGCRP was created by Congress in 1990 “to assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.”²⁹ The report found that “the global warming of the past 50 years is primarily due to human activities.”³⁰ The report also said that over the next few decades, most areas of the United States will experience roughly 2 degrees to 4 degrees Fahrenheit of warming.³¹ How great the warming will be in the more distant future – like over the next century – largely depends on what is done to reduce greenhouse gas emissions.

The USGCRP ran multiple models to predict warming across the United States. The USGCRP predicts that by 2100 the United States will warm by roughly 3 degrees to 5 degrees if one assumes a “substantial reductions in emissions.”³² If one assumes higher greenhouse gas emissions in the future, temperatures in the U.S. could rise by 5 or 10 degrees by the end of the century.³³

The four different emissions scenarios analyzed by USGCRP appear below. The scenarios range from “rapid reductions in emissions” (RCP 2.6) to “continued increases in emissions” (RCP 8.0). [Figure 9]

²⁵ Jerry M. Melillo, Terese (T.C.) Richmond, and Gary W. Yohe, Eds., *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. GLOBAL CHANGE RESEARCH PROGRAM (May 2014), <http://bit.ly/2lgXCV1> and *Observed U.S. Temperature Change, Figure 2.7*, U.S. GLOBAL CHANGE RESEARCH PROGRAM (Aug. 3, 2113), <http://bit.ly/2LbVIL1>.

²⁶ Henry Fountain, Jugal K. Patel and Nadja Popovich, *2017 Was One of the Hottest Years on Record. And That Was Without El Niño*, THE NEW YORK TIMES (Jan. 18, 2018), <https://nyti.ms/2uneZJM>.

²⁷ *It's Official: 2017 Was the Second Hottest Year on Record*. YALE ENVIRONMENT 360 (Jan. 4, 2018), <http://bit.ly/2KSx6JM>.

²⁸ Jerry M. Melillo, Terese (T.C.) Richmond, and Gary W. Yohe, Eds., *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. GLOBAL CHANGE RESEARCH PROGRAM (May 2014), <http://bit.ly/2lgXCV1> and Cora Roelofs, *Without Warning: Worker Deaths From Heat 2014-2016*, CR RESEARCH/CONSULTING (May 23, 2018), <http://bit.ly/2sC9cj6>.

²⁹ *About USGCRP*, THE U.S. GLOBAL CHANGE RESEARCH PROGRAM (viewed on July 13, 2018), <http://bit.ly/2IkUtyL>.

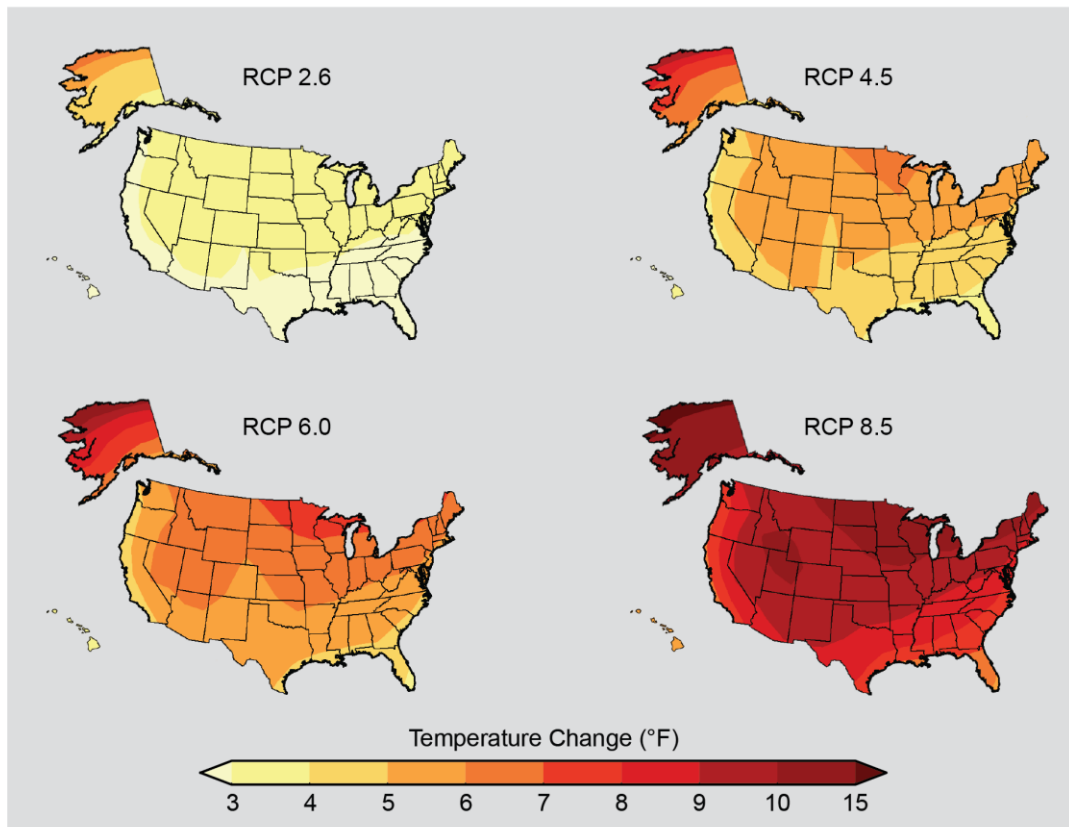
³⁰ Jerry M. Melillo, Terese (T.C.) Richmond, and Gary W. Yohe, Eds., *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. GLOBAL CHANGE RESEARCH PROGRAM (May 2014), <http://bit.ly/2KVDLvt>.

³¹ *Id.*

³² *Id.*

³³ *Id.*

**Figure 9 – U.S. Temperature Change Estimates by 2100
Based on Four Different Emissions Scenarios**



Source: U.S. Global Change Research Program³⁴

No matter what emissions scenario plays out, the fact remains the same: Much of the United States – along with the entire world – is going to be much hotter in the future.

Three Quarters of the World's Population Could Face 20 Deadly Heat Days a Year by 2100

A June 2017 study by researchers at the University of Hawaii at Manoa found that by 2100 almost three-quarters of the world's population could face deadly heatwaves.³⁵ The study, titled “Global Risk of Deadly Heat,” reviewed the climatic conditions – the temperature and humidity levels – that have caused death in the past to determine which conditions can be defined as the “deadly threshold.”³⁶

The three-quarters-of-the-population prediction relies on the assumption that greenhouse gas emissions will continue to increase through 2100. But even under a more optimistic prediction –

³⁴ *Id.*

³⁵ Camilo Mora, *Global Risk of Deadly Heat*, 7 NATURE CLIMATE CHANGE 501-506 (June 19, 2017), <https://go.nature.com/2uyNyfQ>.

³⁶ *Id.*

one that assumes “drastic reductions” in greenhouse gas emissions – the study estimates that close to half of the world’s population will experience at least 20 days of deadly heat each year by 2100.

The study concludes: “An increasing threat to human life from excess heat now seems almost inevitable, but will be greatly aggravated if greenhouse gases are not considerably reduced.”³⁷

The main author of that 2017 study, University of Hawaii at Manoa Professor Camilio Mora, made a blunt prediction to *The Washington Post*: “We will become prisoners in our homes.”³⁸

The non-profit group Climate Central, which researches the impact of climate change on the public,³⁹ released a report in 2014 that predicted what summers in 2100 will be like across 1,001 different U.S. cities by comparing the projected future temperatures to current summers in some of the world’s warmest places. Climate Central’s predictions rely on the assumption that current emissions trends will continue.⁴⁰

By 2100, summers in Boston, Mass., will be like summers now in North Miami Beach. Summers in St. Paul, Minn., will feel like summers do now in Mesquite, Texas. Summers in Detroit will be like summers now in Cedar Hill, Texas.⁴¹

Places that are already hot will experience blistering temperatures. Summers in Phoenix, Ariz., in 2100 will feel like summers do now in Kuwait City. Summers in Las Vegas will feel like summers do now in Riyadh, Saudi Arabia. And summers in Scottsdale, Ariz., in 2100 will feel like summers do now in Abu Dhabi, United Arab Emirates.⁴²

Warming From Climate Change Puts Millions of Workers at Risk

Professor Mora’s prediction that we will become prisoners in our homes is horrifying, but for the millions of workers who work outdoors, the reality will be even worse. Being confined to the indoors is simply not an option for them. Outdoor work – as well as indoor work done without proper air conditioning or other climate control – will become increasingly dangerous and deadly. And in some cases, work will simply become impossible.

Climate Central in 2016 matched forecasts to U.S. cities in order to figure out how many dangerous days will occur by location. To do so, Climate Central used forecasts of temperature and humidity levels to figure out how many days will feel greater than 104 degrees by 2030 and 2050. “Feels like” heat calculations, known as the heat index, use temperature and humidity data to calculate what it

³⁷ *Id.*

³⁸ Chelsea Harvey, A third of the world’s people already face deadly heat waves. It could be nearly three-quarters by 2100, *The Washington Post* (June 19, 2017), <https://wapo.st/2L8sHug>.

³⁹ Climate Central web page (viewed on July 13, 2018), <http://www.climatecentral.org/what-we-do>.

⁴⁰ *1,001 Blistering Summers*, CLIMATE CENTRAL (Aug. 1, 2014), <http://bit.ly/2KRr1pH>.

⁴¹ *Id.*

⁴² *U.S. Faces Dramatic Rise in Extreme Heat, Humidity*, CLIMATE CENTRAL (July 13, 2016), <http://bit.ly/2KUI9L5>.

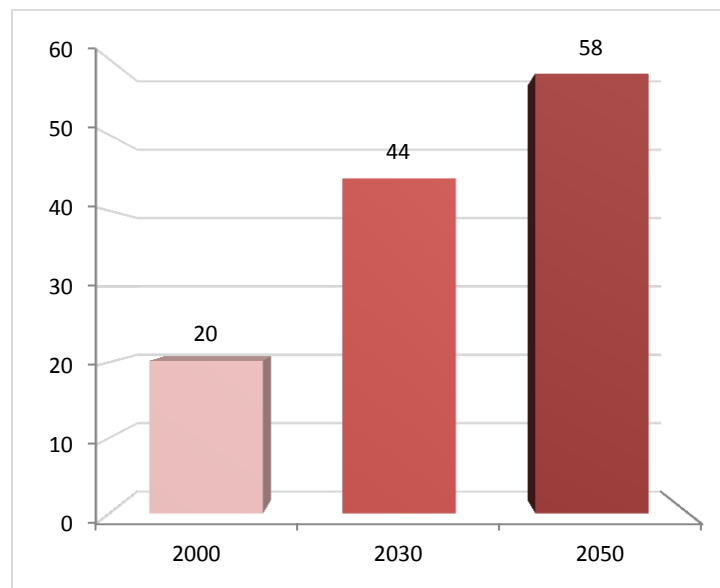
feels like when one goes outside. For example, according to the National Weather Service's heat index, if it is 92 degrees and relative humidity is 60 percent, it actually feels like it is 105 degrees.⁴³

The National Weather Service deems a heat index level of above 104 degrees "dangerous." Under these conditions, "sunstroke, muscle cramps, and/or heat exhaustion" is likely, and heatstroke is "possible with prolonged exposure and/or physical activity."⁴⁴

Public Citizen obtained Climate Central's dangerous days data for 133 cities and matched Census employment data to the dataset. As of the most recent U.S. Census data, these cities have more than 25 million employed workers. For the year 2000, Public Citizen used Census employment data from that year. For the 2030 and 2050 estimates, 2016 Census employment data was used. The use of 2016 population data yields a conservative estimate of affected people, as the populations of those cities will likely increase from 2016 levels.

On average, the 133 cities experienced 20 dangerous heat days in 2000. By 2050, the Climate Central model forecasts that the average will increase to 58 days. [Figure 10]

Figure 10 – Average Number of Dangerous Heat Days For 133 U.S. Cities



By 2050, McAllen, Texas, is predicted to have the most dangerous heat days with 179.⁴⁵ In 2000, McAllen experienced 126 dangerous days.

Many of the 25 million workers in the 133 cities work outdoors, meaning they work many days each year in dangerous heat. In order to build a metric that tracks both days and workers together,

⁴³ Heat Index, National Weather Service (viewed on July 13, 2018), <https://www.weather.gov/safety/heat-index>.

⁴⁴ Heat Index, NATIONAL WEATHER SERVICE (viewed on July 16, 2018), <http://bit.ly/2Lm6dmk>.

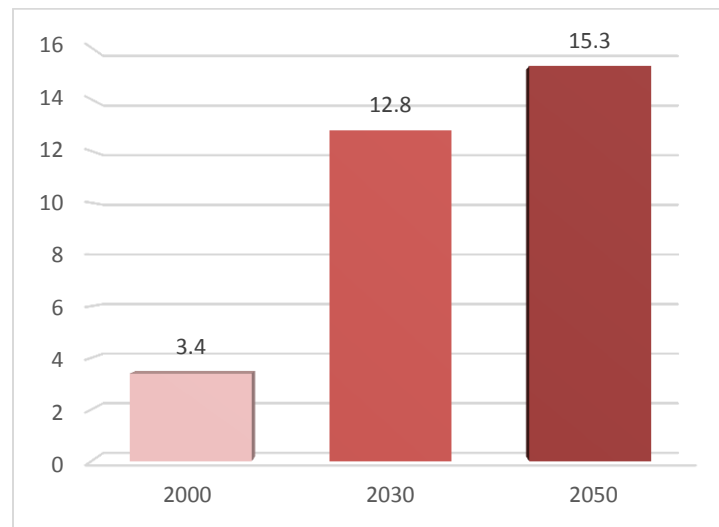
⁴⁵ U.S. Faces Dramatic Rise in Extreme Heat, Humidity, CLIMATE CENTRAL (July 13, 2016), <http://bit.ly/2KUI9L5>.

Public Citizen multiplied the number of dangerous heat days in each city by the number of workers. The result can be defined as “worker-days” in dangerous heat. We then calculated the number of worker-days in dangerous heat for two high exertion occupations that perform a significant share of their work outdoors: agriculture and construction.

The dangerous worker-days metric multiplies the number of workers in these occupations by the number of days a given city experienced dangerous heat (*i.e.*, if a city has 1,000 construction workers and experiences 5 dangerous heat days, the result would be 5,000 dangerous worker-days for construction workers.).

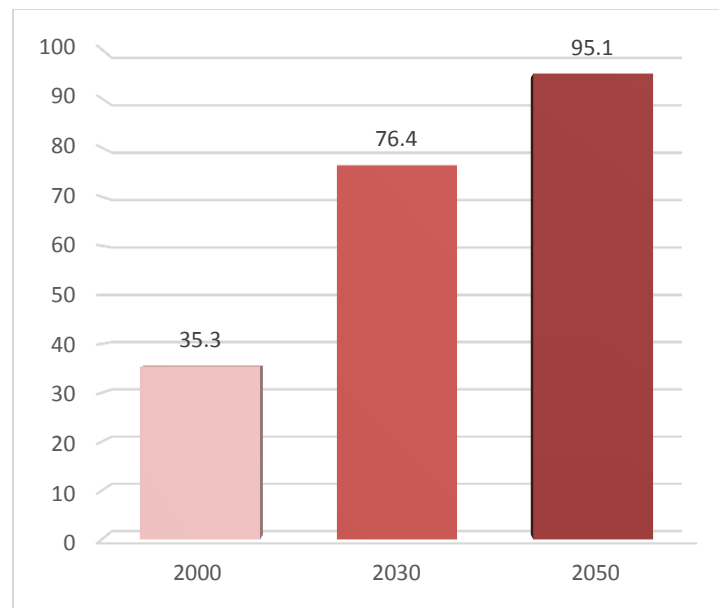
By combining the Climate Central’s projections with Census data for the number of agriculture and construction workers in each city (using the conservative 2016 estimate for the number of workers in 2030 and 2050), we concluded that agriculture workers in these cities experienced 3.4 million worker-days in dangerous heat in 2000. That is to say that on 3.4 million occasions in that year, an agriculture worker reported to work during a day in which the heat index reached dangerous levels. By 2030, that figure is projected to explode to 12.8 million worker-days, and by 2050, 15.3 million worker-days. [Figure 11]

Figure 11 – Total Number of Worker Days in Dangerous Heat, Agriculture Workers, 133 U.S. Cities (in millions of workers-days)



The numbers are even more staggering among construction workers. While construction workers in these 133 cities faced 35.3 million worker-days in dangerous heat in 2000, that number will soar to 76.4 million in 2030 and 95.1 million in 2050. [Figure 12]

Figure 12 – Total Number of Worker Days in Dangerous Heat, Construction Workers, 133 U.S. Cities (in millions of workers-days)

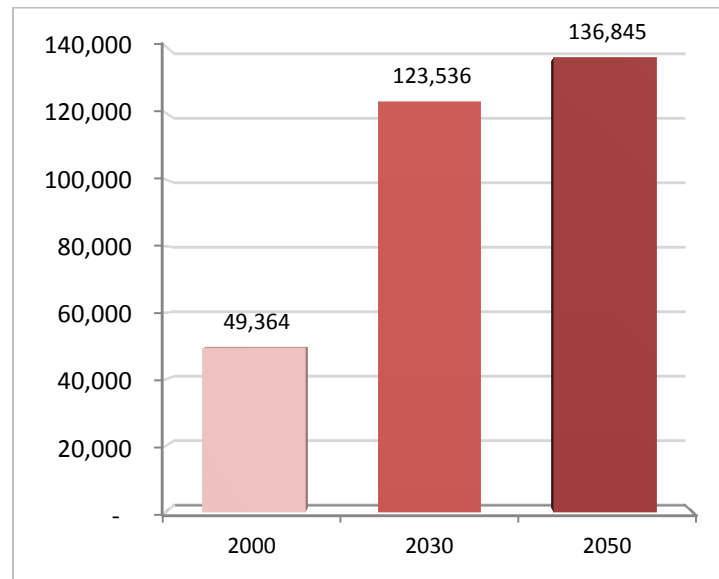


One can also examine the data through a different lens that counts each worker facing certain conditions. Public Citizen calculated how many workers would experience 30 dangerous heat days (roughly a month's worth) and 91 dangerous heat days (a quarter of a year's worth), comparing 2000 to 2030 and 2050. The data show that very large numbers of American workers will be spending at least a month – and many a quarter of the year or more – working in dangerous heat.

By 2050, More than 1 Million Agriculture and Construction Workers Will Experience 30 Days or More of Dangerous Heat Days a Year

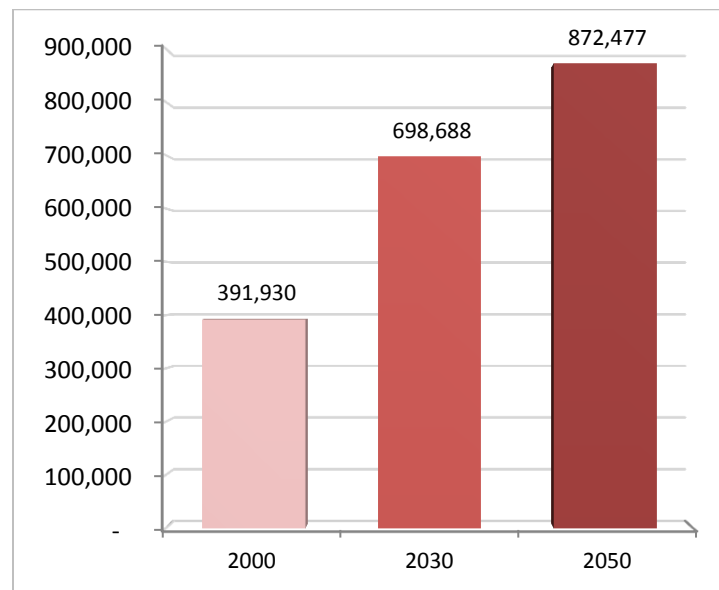
According to Climate Central, 26 of the 133 U.S. cities experienced at least 30 dangerous heat days in 2000. By 2050, that number of cities is expected to jump to 83 – more than 60 percent of the cities in the dataset. That means by 2050, more than 136,000 agriculture workers in these cities will be reporting to work in dangerous conditions at least 30 days a year. [Figure 13]

Figure 13 – Number of Workers Spending 30 Days or More a Year in Dangerous Heat, Agriculture Workers, 133 U.S. Cities



Meanwhile, more than 872,000 construction workers will be working in dangerous heat at least 30 days a year. [Figure 14]

Figure 14 – Number of Workers Spending 30 Days or More a Year in Dangerous Heat, Construction Workers, 133 U.S. Cities



By 2050, More than 600,000 Agriculture and Construction Workers Will Work at Least One-Fourth of the Year in Dangerous Heat Conditions

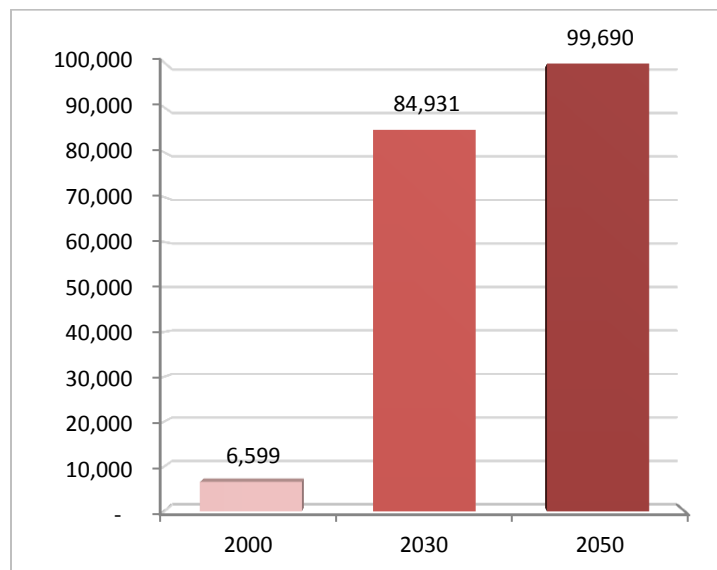
In 2000, six of cities analyzed by Climate Central experienced more than 91 dangerous heat days – amounting to roughly a quarter of the entire year. By 2050, that number is projected to jump to 35 cities.

The 35 cities that will be subjected to dangerous heat days for as much as a quarter of the year by 2050 are from “warmer” states so to speak. That said, workers in cities historically less subject to high temperatures will also be at great risk of heat-related illnesses and fatalities.

Fargo, N.D., which is not generally considered one of the nation’s hot-spots, projects to have 21 dangerous heat days by 2050 – a 600 percent increase from 2000, in which it had just three.⁴⁶ Similar increases are forecast for both Minneapolis and Detroit.⁴⁷ Cincinnati is predicted to experience 41 dangerous heat days by 2050 – up from six in 2000.⁴⁸ And Indianapolis projects to experience as many as 39 dangerous heat days by 2050, up from the three the city experienced in 2000.⁴⁹

Nearly 100,000 agriculture workers will spend a quarter of the year in dangerous conditions by 2050 as well as more than a half-million construction workers. [Figures 15 and 16]

Figure 15 – Number of Agriculture Workers Spending a Quarter of the Year or More in Dangerous Heat 133 U.S. Cities



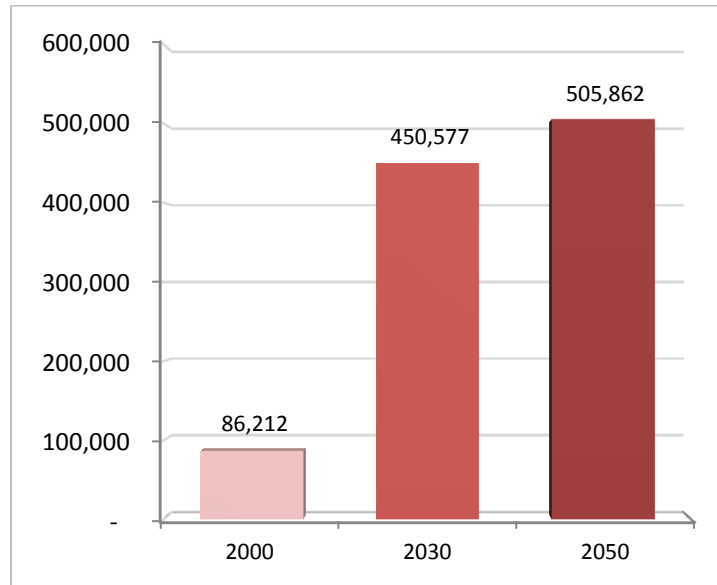
⁴⁶ *U.S. Faces Dramatic Rise in Extreme Heat, Humidity*, CLIMATE CENTRAL (July 13, 2016), <http://bit.ly/2KUI9L5>.

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ *Id.*

Figure 16 – Number of Agricultural Workers Spending a Quarter of the Year or More in Dangerous Heat, 133 U.S. Cities



IV. The Case for a Federal Heat Stress Standard

The Occupational Safety and Health Act of 1970 declared it a national policy “to assure so far as possible every working man and woman in the Nation safe and healthful working conditions.”⁵⁰

That mandate clearly applies to protecting workers against hazardous heat. But the federal government lacks a standard to protect workers from dangerous heat, even though the federal agency in charge of researching worker safety issues, the National Institute for Occupational Safety and Health, recommended heat stress protections more than 45 years ago.

In response to NIOSH’s 1972 recommendations, OSHA appointed a committee that subsequently recommended a heat standard to OSHA. But OSHA did not act.⁵¹ Since then, NIOSH has issued two additional recommendations for a heat stress standard, in 1986 and 2016, upon which OSHA also has not acted.⁵²

The preceding section of this report documents the dire future weather conditions that scientists are projecting, and it estimates the rising numbers of workers who will be subject to dangerous weather conditions.

Those projections should impress upon OSHA the urgency to develop a safety standard to protect workers. But even if temperatures were not expected to rise, overwhelming evidence would point to the need for a heat stress safety standard based on current hazards.

Heat Stress Has Killed at Least Hundreds of Workers and Injured Tens of Thousands Since the Early 1990s

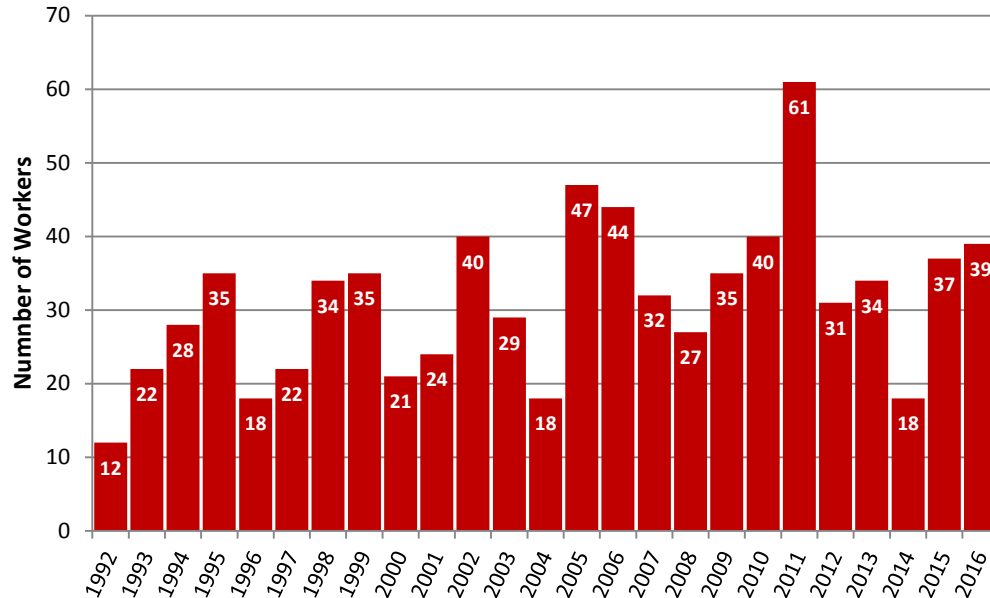
According to data compiled from the Bureau of Labor Statistics (BLS), exposure to excessive environmental heat stress killed 783 U.S. workers and seriously injured 69,374 workers from 1992 through 2016 [Figures 17 and 18].⁵³

⁵⁰ The Occupational Safety and Health Act, 29 U.S.C. § 651(2)(b) (1970).

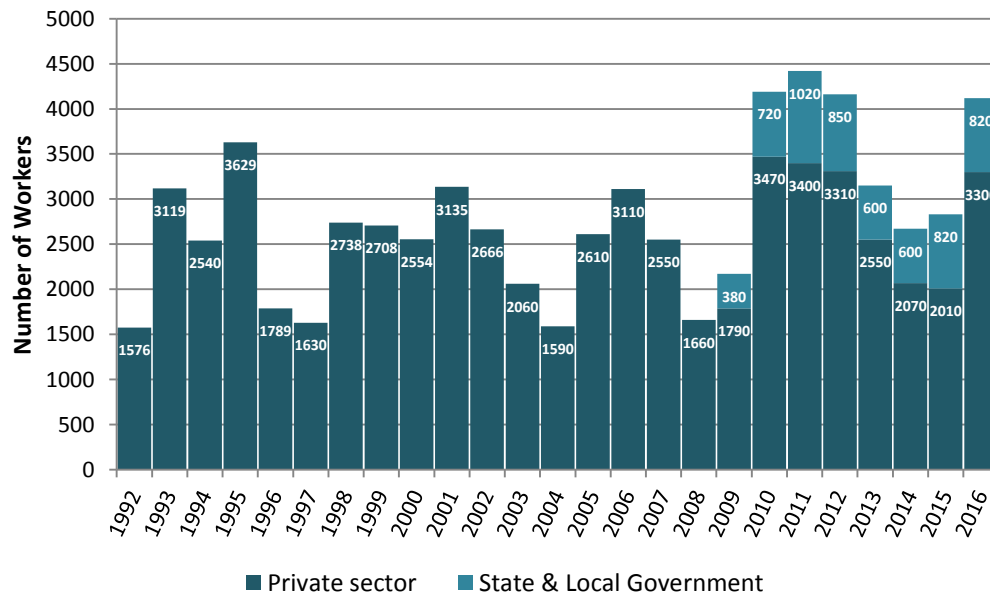
⁵¹ Petition by Public Citizen *et al.* to OSHA for heat stress standard (Sept. 1, 2011), <https://bit.ly/2KGG1WG>.

⁵² *Id.*

⁵³ *Occupational Injuries/Illnesses and Fatal Injuries Profiles*, BUREAU OF LABOR STATISTICS (viewed on March 6, 2018), <https://data.bls.gov/gqt/InitialPage>. Serious injuries are defined as those resulting in at least one day away from work.

Figure 17 – Reports of U.S. Workers Killed by Heat Stress

Source: Bureau of Labor Statistics.

Figure 18 – Reports of Serious Injuries to U.S. Workers From Heat Stress

Source: BLS database of injuries resulting in at least one day away from work..

Casualty Numbers From Heat Stress Are Greatly Understated

By themselves, these casualty figures are more than enough to indicate that OSHA should take action to protect workers from dangerous heat. But these statistics vastly understate the actual number of injuries and fatalities for several reasons. Among them:

1. For injury counts, the BLS relies on records obtained from OSHA that do not include self-employed people, household workers, or workers for federal government agencies⁵⁴ Most critically, small farms with fewer than 11 workers also are exempted, and so the BLS data do not capture heat-related events for a significant number of agricultural workers.
2. Records of injuries are based on self-reports by employers, employees, and company doctors. As the Government Accountability Office (GAO) concluded in 2009, employers are likely to underreport because they do not want to increase their workers' compensation costs or jeopardize their standing as safe workplaces for potential contracts.⁵⁵
3. Many employees do not report injuries due to fear of retaliation, including the potential to lose their jobs. Of occupational health practitioners surveyed by the GAO, 67 percent reported observing worker fear of disciplinary action for reporting an injury or illness.⁵⁶ In addition, many employers have adopted incentive programs that reward workers when there are few recordable injuries and illnesses in the workplace. These programs can discourage reporting. More than 75 percent of health practitioners said they believed workers sometimes avoid reporting injuries and illnesses because of incentive programs.⁵⁷
4. Health care practitioners retained by employers have an incentive to provide treatments or diagnoses at levels that do not trigger reporting requirements. More than one-third of practitioners said they had been asked by their employers to limit treatment to bring an injury or illness below the threshold for recording, even though such treatment was not sufficient to properly treat the injury or illness.⁵⁸
5. Finally, heat stress injuries are likely prone to even higher rates of under-reporting than injuries among the general population of workers. This true because the industries at highest risk of heat stress injuries and deaths are agriculture and construction, both of which rely heavily on vulnerable workers. The workers are less likely to report injuries

⁵⁴ *Injuries, Illnesses, and Fatalities; Frequently Asked Questions*, BUREAU OF LABOR STATISTICS (viewed on Accessed March 13, 2018), <http://bit.ly/2mh49RP>.

⁵⁵ GOVERNMENT ACCOUNTABILITY OFFICE, *WORKPLACE SAFETY AND HEALTH: ENHANCING OSHA'S RECORDS AUDIT PROCESS COULD IMPROVE THE ACCURACY OF WORKER INJURY AND ILLNESS DATA* (October 2009). <http://www.gao.gov/new.items/d1010.pdf>.

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.*

themselves due to some of the aforementioned factors, including fear of retaliation or the threat of deportation.⁵⁹

6. Heat stress injuries are also likely to be undercounted because heat is not always recognized as a cause of heat-induced injuries or deaths because many of the symptoms – such as rash, sweating, headache, and fatigue – are non-specific and overlap with other, more common diagnoses. Indeed, one recent study of OSHA heat enforcement actions in 2012 and 2013 found that in five of the 23 cases (21.7 percent) in which there was a fatality, medical examiners attributed the cause to a cardiac event without considering whether heat triggered or contributed to the event.⁶⁰

OSHA's Response to 2011 Petition Acknowledged That Fatalities From Heat Stress Were Underreported

In its response to the heat stress petition submitted by Public Citizen and others in 2011, OSHA acknowledged that heat-induced “deaths are most likely underreported, and therefore the true mortality rate is likely higher.”⁶¹

But OSHA rejected that petition in part because the agency concluded that harms from heat stress did not meet the necessary risk level to justify the issuance of an emergency standard. “The mortality rate reported [from heat stress] does not exceed those of other hazards OSHA has deemed to be ‘significant’ (*e.g.*, benzene) and therefore, would likely not meet the legal requirement of ‘grave,’” OSHA assistant secretary of Labor David Michaels wrote.⁶²

OSHA also said that most health effects from heat stress were temporary. Even if so, the health consequences the agency described were not ones that workers should have to endure. “The majority of workers with adverse health effects from heat exposure experience dehydration, cramps, exhaustion, and other effects and are able to recover fairly quickly when the appropriate measures are taken,” Michaels wrote.⁶³

OSHA's Reliance on the General Duty Clause as a Substitute for a Specific Standard Is Insufficient

In addition to enforcing standards that address specific risks, OSHA is required under the Occupational Safety and Health Act to enforce a requirement that an employer shall furnish a

⁵⁹ IMMIGRANT WORKERS AT RISK: THE URGENT NEED FOR IMPROVED WORKPLACE SAFETY AND HEALTH POLICIES AND PROGRAMS, AFL-CIO (August 2005), <http://bit.ly/2us8C7G>.

⁶⁰ Sheila Arbury, Matthew Lindsley and Michael Hodgson, *A Critical Review of OSHA Heat Enforcement Cases: Lessons Learned*. 58 JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE 359-363 (April 2016), <http://bit.ly/2NooKA6>.

⁶¹ Letter from David Michaels, assistant secretary for Occupational Safety and Health, to Sidney Wolfe, director of Public Citizen's Health Research Group (July 7, 2012), <http://bit.ly/2KFB8wZ>.

⁶² *Id.*

⁶³ *Id.*

workplace that is “free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employee”⁶⁴ This is known as the “general duty” clause.

OSHA cited its authorities under the general duty clause as a reason for rejecting the 2011 petition submitted by Public Citizen and allies requesting a heat stress standard.⁶⁵ But the disparity between heat-related enforcement by California – which has a state specific law on the subject – and OSHA illustrates the need for a national standard.

California completed 7,082 inspections resulting in at least one heat standard violation between 2013 and 2017. During that same timeframe, federal OSHA conducted 142 inspections resulting in at least one heat citation under the general duty clause. These means that California conducted 50 times more inspections resulting in a violation for unsafe heat exposure practices as OSHA did nationwide between 2013 and 2017. [Table 1]

Table 1. Number of Inspections Resulting in at Least One Citation or Violation For Unsafe Heat Load Conditions, 2013 to 2017

Calendar Year	Cal/OSHA*	Federal OSHA**
2013	1,175	11
2014	1,324	3
2015	1,489	32
2016	1,599	64
2017	1,495	32
Total	7,082	142
Annual Average	1,416	28

Sources: OSHA and Cal/OSHa.

* Cal/OSHA inspections conducted under the authority of its outdoor heat exposure standard (Cal/OSHA Standard 3395). ** Federal OSHA inspections conducted under the authority of the General Duty Clause and include both outdoor and indoor inspections.

Nearly Three Quarters of Workers Killed by Heat Stress Were on Their First Three Days on the Job

It is difficult to conclude that risks faced by new workers in hot environments are not “grave.” In a 2016 study, OSHA researchers analyzed the circumstances surrounding all 84 citations the agency issued for unsafe heat exposure under the general duty clause in 2012 and 2013. Twenty-three of the cases involved worker deaths.⁶⁶

Remarkably, 17 of the 23 fatalities (74 percent) involved workers who were in their first three days on the job, and eight (35 percent) victims were on the very first day of work.⁶⁷ These findings point

⁶⁴ The Occupational Safety and Health Act, 29 U.S.C. § 651(2)(b) (1970).

⁶⁵ Letter from David Michaels, assistant secretary for Occupational Safety and Health, to Sidney Wolfe, director of Public Citizen’s Health Research Group (July 7, 2012), <http://bit.ly/2KFB8wZ>.

⁶⁶ Sheila Arbury, Matthew Lindsley and Michael Hodgson, *A Critical Review of OSHA Heat Enforcement Cases: Lessons Learned*. 58 JOURNAL OF OCCUPATIONAL AND ENVIRONMENTAL MEDICINE 359-363 (April 2016), <http://bit.ly/2NooKA6>.

⁶⁷ *Id.*

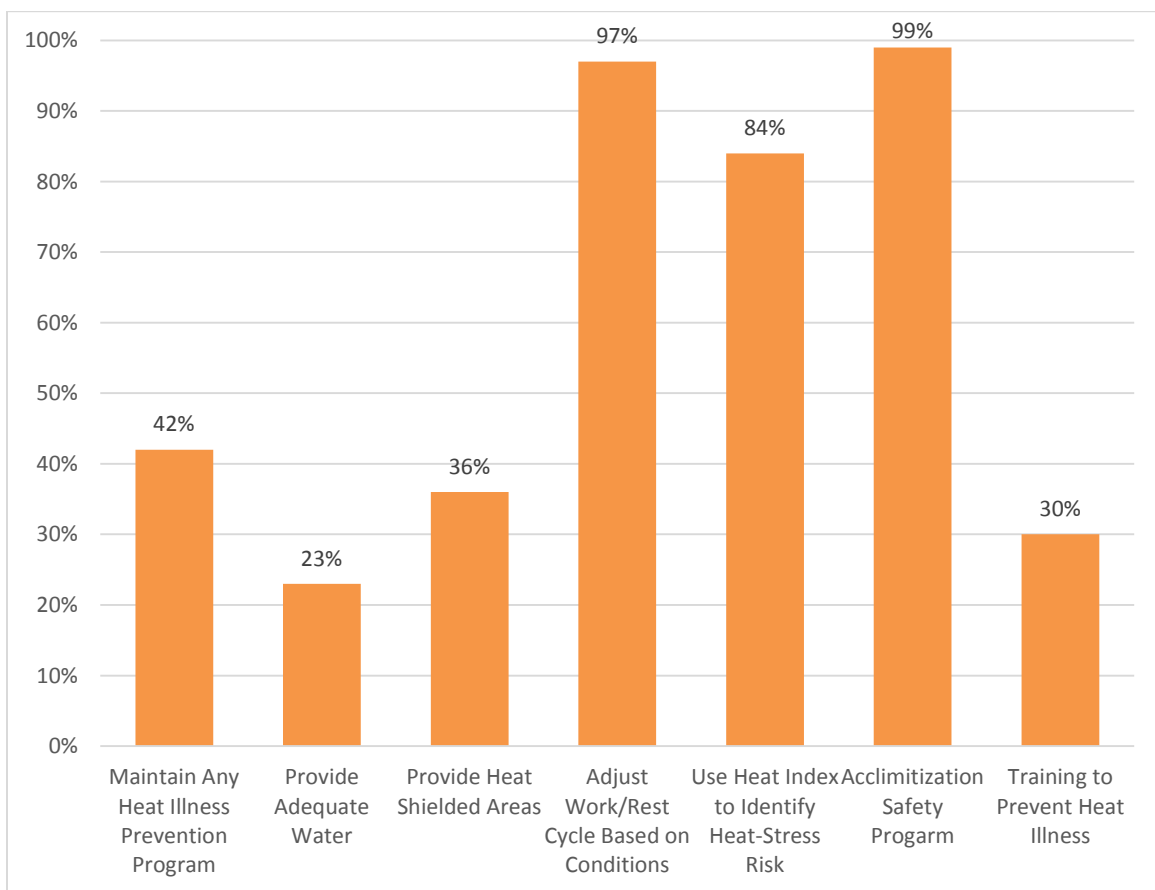
to the urgent need for a standard that requires employers to enact procedures to help new workers adjust to hot working environments and to provide especially close monitoring of new employees.

Employers Are Not Voluntarily Adhering to Recommended Safety Measures

The same study found that large percentages of employers fail to provide advisable safety measures, especially for acclimatization.

Among employers cited for unsafe heat exposure, only 1 percent had an acclimatization program to help new employees adjust to working in a hot environment. Moreover, only 16 percent took the heat index into account when identifying risks of heat stress. Training in heat stress prevention took place in only 30 percent of workplaces. And one-fifth of employers either failed to provide water or to provide adequate access to it.⁶⁸ [Figure 19]

Figure 19 – Percentage of Employers Missing Components in 84 Cases in Which Citations Were Issued by OSHA for Heat Exposure



Source: *Journal Of Occupational And Environmental Medicine*

⁶⁸ *Id.*

V. Elements That Should Be Included in a Heat-Stress Standard, and Why We Need Them

Workers are at risk of serious injury and death from heat stress when working in hot environments. Several factors contribute to heat stress: 1) environmental heat (a combination of the temperature, humidity, and, if outdoors, the amount of direct sunshine); 2) metabolic heat (heat generated by the worker's body through physical labor); 3) whether the worker is physically fit and their body is accustomed to working in such hot environments; and 4) whether cooling clothing or other equipment has been provided to the worker.

In 2016, NIOSH issued its third iteration of its comprehensive recommendations for a heat stress standard.⁶⁹ In its recommendations, NIOSH sets out thresholds that constitute a risk of heat stress, and recommends methods to protect employees' exposure from exceeding those thresholds.

Public Citizen and co-petitioners are asking that OSHA develop a standard that would establish maximum heat load thresholds, require employers to undertake measures that would prevent employees' heat load from exceeding those thresholds, and institute other safeguards. Accordingly, the standard we request would include the following components. Here, we provide summaries of cases in which employees have not providing these safeguards.

1. Provide mandatory rest breaks with increased frequency in times of extreme heat.⁷⁰

Workers at risk of existing heat-load thresholds, either due to external or metabolic factors, should be provided breaks ranging from 15 to 45 minutes per hour depending on conditions.⁷¹ These rest breaks should be taken away from the hot environment and, for outdoor environments, in the shade.⁷²

In 2015 Green Circle Growers Inc. did not adjust worker rest breaks to account for the heat environment:

An inspection ... disclosed the following workplace conditions which have been associated with the development of heat-related illnesses of symptoms in workers ... Employees were working in greenhouses performing various tasks associated with plant propagation ... The normal 8-hour work shift (7:00 am to 4:00 pm) included one 15-minute break given at 9:30

⁶⁹ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zlabnA>.

⁷⁰ At NIOSH's Recommended Exposure Limit (REL) for acclimatized workers and Recommended Alert Limit (RAL) for unacclimatized workers, employers would be required to initiate robust protective measures, including mandatory rest breaks, personal protective equipment, and shade.

⁷¹ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zlabnA>.

⁷² *Id.*

am and a 40-minute lunch break given at noon ... There was no adjustment to this schedule based on environmental conditions.⁷³

In 2013, Carneys Point Care Center required employees to work long shifts in a laundry facility, despite worker complaints of heat-related illnesses and the employers' acknowledgment of the hot working conditions:

[E]mployees performing moderate work for approximately 6 hours each day including folding hot laundry, lifting laundry bags, loading and unloading washers and dryers, were exposed to the hazard of excessive ambient heat from various sources ... [Temperatures] in the Laundry Area measured as high as 90 degrees ... Employees had previously complained to management that the Laundry Area becomes extremely hot and that they had experienced symptoms of heat-related illness in the past, including nausea, dizziness and headache. Further, management performs a daily walk through the laundry facility and admitted that the area gets excessively hot due in part to the lack of air ventilation and the heat generated by the various machines.⁷⁴

2. Provide personal protective equipment, such as water-cooled and air-cooled garments.

Various types of Personal Protective Equipment (PPE) – such as water-cooled garments, air-cooled garments, and cooling vests – can prevent a worker from experiencing heat stress and more rapidly decrease core body temperature for workers suffering from heat strain.⁷⁵ Employers should provide PPE to protect workers from being exposed to excess heat.⁷⁶

Cooling respirators and other cooling PPE can also help protect workers from exposure to toxic chemicals, while reducing the likelihood of heat stress. In the aftermath of the BP Deepwater Horizon oil disaster, a cleanup worker was denied access to a respirator under the explanation that it would result in heat stress:

From the very beginning we asked our supervisors for respirators, and they said they didn't want us to wear them because there were unsafe and would result in heat stress. A couple of the responders told me that they asked for respirators and were denied them, and if a boat had respirators they weren't allowed to wear them.⁷⁷

In 2015, JV Industrial Companies did not provide workers with appropriate PPE, placing its workers in greater danger of developing a heat-related illness:

⁷³ Citation 1087775.015/002, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Nov. 27, 2015), <http://bit.ly/2LiHC21>.

⁷⁴ Citation 909065.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Nov. 18, 2013), <http://bit.ly/2KWqOkW>.

⁷⁵ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zJabnA>.

⁷⁶ *Id.*

⁷⁷ *Deadly Dispersant in Oil Spill Cleanup*, GOVERNMENT ACCOUNTABILITY PROJECT (2013), <http://bit.ly/2LbVX3d>.

[A]t the Valero Norco Alkylolation Unit, the employees were exposed to the hazard of excessive heat from wearing multiple layers of clothing to include an impermeable chemical suit, while working in elevated temperatures as they were cutting with a blade saw and removing process piping from a suspended pipe rack.⁷⁸

3. Provide access to shaded and otherwise cool conditions for employees to rest during breaks.

In outdoor environments, employers should provide access to sufficient areas of shade, both during the rest breaks and upon request.

In 2017, a South Carolina farmworker shared his experience laboring in the hot sun from sun up to sundown:

Life here is very hard when we harvest fruits and vegetables. The sun burns so much and we get weak, and you get irritated from so much heat. And despite that we have to work all day putting up with the fatigue, dehydration and hunger. I'll also tell you that it's very sad to be far from our land which is Mexico... and our loved ones like my parents, my wife and my son. But we're here working hard so that we can support our family... and well, it's very hard to be a farmworker, and sad because you work from sun up to sundown in the fields.⁷⁹

In 2013, employees of the United States Roofing Corporation that had worked in hot temperatures without access to shade were treated for heat exhaustion:

[E]mployees were working at an outdoor jobsite, performing roof repair work at the Chichester Middle School. The employees worked in direct sunlight ... [and] were exposed to excessive heat throughout the day, with a peak heat index of 105 degrees Fahrenheit during the afternoon ... Three employees experienced heat-related illnesses and were transported to Crozer-Chester Medical Center via ambulance where two of them were admitted for treatment.⁸⁰

4. Make provisions for adequate hydration.

All workers should be provided adequate amounts of cool water near the work area and encouraging workers at risk to drink a cup of water every 15 to 20 minutes.⁸¹

In 2015 Select Van and Storage failed to provide workers with access to water while they exerted themselves in unsafe temperatures:

⁷⁸ Citation 1048419.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Sept. 16, 2015), <http://bit.ly/2Lby00v>.

⁷⁹ 2017 Documentary Work, Student Action With Farmworkers from the *Cruzando Puertas, Cosechando Historias / Crossing Thresholds, Harvesting Stories* documentary project by Student Action with Farmworkers, <http://bit.ly/2L2pXiX>.

⁸⁰ Citation 921775.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Nov. 18, 2013), <http://bit.ly/2JlRAxP>.

⁸¹ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zJabnA>.

[T]he employer exposed employees transferring house hold goods from residence to an enclosed trailer to the recognized hazard of excessive heat; at the time of the incident the heat index reached 112 degrees F. The employees were required to perform the strenuous activity of transferring household goods from the home (Air Conditioning was turned off within the residence) to an enclosed semi-trailer. During the inspections the internal temperature of the trailer was measured and found to be 10 degrees F higher than the temperature on the outside. Employees were not provided with water and only drank sodas containing caffeine in an attempt to hydrate.⁸²

Pregnant workers are more susceptible to dehydration and heat stress.⁸³ In 2008, Maria Isabel Vasquez Jimenez, a pregnant teen farmworker, died from heat exhaustion after she was unable to access water within her short break:

Maria Isabel Vasquez Jimenez was tying grape vines at a farm east of Stockton on May 14, when the temperature soared well above 95 degrees. The nearest water cooler was a 10-minute walk away, and workers say the strict foreman didn't allow them a long enough break to stop and get a drink. Vasquez collapsed from heat exhaustion. Her fiancé, Florentino Bautista, cradled her in his arms ... [B]y the time she arrived at a hospital, Jimenez was in a coma, and her body temperature topped 108 degrees. She died two days later. It was only at the hospital Bautista found out she was two months pregnant.⁸⁴

5. Implement heat acclimatization plans to help new workers safely adjust to hot conditions.

Employers should have in place a written heat acclimatization plan.⁸⁵ For new workers, this involves a gradual phase-in to the workload.⁸⁶ The process must be repeated if the worker is absent from the job for a week or longer⁸⁷ or if there is a sudden, significant increase in the environmental or metabolic heat loads.⁸⁸ Throughout the acclimatization process, workers must be given adequate rest in cool, air-conditioned surroundings and be sufficiently hydrated, due to increased sweating brought on by the acclimatization process.⁸⁹

In 2014, a new employee of Scott-Hourigan Co. was not acclimated to the heat and was hospitalized as a result of heat exhaustion:

⁸² Citation 1070948.015/01001 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (June 16, 2015), <http://bit.ly/2Lh2EOp>.

⁸³ Reproductive Health And The Workplace, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (viewed on July 13, 2018), <http://bit.ly/2zyPIBS>.

⁸⁴ Sasha Khokha, Teen Farmworker's Heat Death Sparks Outcry, National Public Radio (July 13, 2018), <https://n.pr/2Lj7udN>.

⁸⁵ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zjabnA>.

⁸⁶ *Id.*

⁸⁷ *Id.*

⁸⁸ *Id.*

⁸⁹ *Id.*

[T]he employer exposed laborers, who perform the task of installing pneumatic grain bin air systems and transfer augers, to the recognized hazard of excessive heat ... As a result of this excessive heat exposure, an employee, who was on the second day on the job, was hospitalized for two days. According to medical records, the employee suffered from chest pains and sustained an acute kidney injury from heat exhaustion due to dehydration and rhabdomyolysis. This employee was required to work outdoors and engage in exertional activities higher than his baseline level of fitness and was not acclimated to the heat.⁹⁰

In 2012, a temporary employee of A.H. Sturgill Roofing Inc. died from heat stroke after engaging in strenuous labor in hot working conditions on his first day on the job:

[A] temporary employee working on the roof in the direct sun throwing roofing material off the roof into a dump truck developed heat stroke as a result of working on the project, his first day with the company. The employee began work between 6:00 am and 6:30 am on August 1, 2012. At approximately 11:41 a.m., the employee collapsed and emergency medical assistance was summoned ... The employee died due to complications from heat stroke.⁹¹

6. Regularly monitor both the environmental heat load and employees' metabolic heat loads during hot conditions.

Employers should monitor the environmental heat load “at least hourly, during the hottest portion of each work shift, during the hottest months of the year, and when a heat wave occurs or is predicted.”⁹² Employers also should develop estimates of the metabolic heat load for each worker who is performing light, moderate, or heavy work.⁹³

In 2016 employees of Briggs Traditional Turf Farms Inc. experienced heat-related illnesses and in one case death after installing large amounts of sod in dangerously hot working conditions:

[E]mployees installed approximately 1,000 square yards of sod at a new residential construction site over the course of 10 hours while exposed to temperatures as high as 98.1 degrees Fahrenheit with a heat index as high as 105-106 degrees Fahrenheit ... This condition exposed employees to heat-related illnesses to include hyperthermia. An employee suffered a fatal heat-related illness as a result of this condition.⁹⁴

In 2016, employees of Schwebel Baking Company were packing bread in excessive heat, and one employee who exhibited heat exhaustion after the first hour of work was ultimately hospitalized:

⁹⁰ Citation 999263.015/001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Feb. 3, 2015), <http://bit.ly/2KSITR4>.

⁹¹ Citation 589300.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Jan. 16, 2013), <http://bit.ly/2NcZqfe>.

⁹² BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zJabnA>.

⁹³ *Id.*

⁹⁴ Citation 1169509.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Dec. 13, 2016), <http://bit.ly/2zBmaUe>.

Employee(s) were exposed to the hazardous conditions of excessive heat during the performance of their duties, which included working on the bun bagger line, packing bread. The maximum NOAA Heat Index was 86 degrees Fahrenheit between the hours of 5:45 PM and 9:45 PM. After approximately 1 hour of work, an employee began experiencing symptoms of heat-related illness. Emergency medical services were summoned and the employee received hospital care in the emergency department.⁹⁵

7. Medically monitor at-risk employees.

Employers should institute a medical monitoring program for all workers who are or may be exposed to heat stress at or above recommended thresholds. Comprehensive medical evaluations, which are designed to assess a worker's risk for heat stress injury, should be given to all workers at the time of hiring and at least annually thereafter. All relevant medical and risk information should be made available to the responsible healthcare provider at the jobsite, with the provider then required to provide to the employer a written report of his or her findings and recommendations regarding the worker's risk for heat stress injury. Emergency medical care should be given to all workers who develop signs or symptoms of heat exhaustion or heat stroke.⁹⁶

In 2015, BFI Waste Services LLC failed to provide medical monitoring for employees who exhibited signs of heat exhaustion during their trash collection route:

[E]mployee(s) were working in extremely hot working conditions when working on a trash collection route at a temperature of 95 degrees Fahrenheit and a humidity of 40%, resulting in a maximum heat index of 99 degrees Fahrenheit. The employer did not take the necessary steps to protect employees such as promptly removing employee(s) from the worksite and providing first aid for employee(s) at the first signs of possible heat-related illnesses.⁹⁷

In 2006, a North Carolina migrant farm worker reported feeling ill after laboring in extreme heat, but he was ultimately left alone by his employer and died from likely heat-related causes:

[A] male Hispanic migrant worker age 44 years died of heat stroke while working at another North Carolina tobacco farm. He had been working in the fields for about the last week of July. On August 1, the heat index was between ... 100°F and 110°F ... Around 3 p.m. the worker complained to the crew leader that he was not feeling well. He drank some water and was driven to the workers' housing and left alone. He was found unconscious approximately 45 minutes later. Emergency medical personnel responded within 5 minutes

⁹⁵ Citation 1169153.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Dec. 9, 2016), <http://bit.ly/2zBlahN>.

⁹⁶ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zlabnA>.

⁹⁷ Citation 1071840.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Nov. 20, 2015), <http://bit.ly/2zDhY6p>.

and the worker was taken to the hospital and pronounced dead. His core body temperature was recorded at 42.2°C (108°F).⁹⁸

8. Notify employees of heat stress hazards.

Employers should provide visible warning signs, in all relevant languages, in all work areas in which there is a “reasonable likelihood” of the total heat load exceeding heat load thresholds.⁹⁹ The signs should contain information on the risk of heat stress and ways to mitigate the risk, including emergency and first aid instructions.

In 2016, employees of Mesa Line Services LLC. experienced heat-related injuries after working on a power line in a high heat environment. The workers had not received heat stress training:

Respondent did not ensure that workers performing transmission tower erection during elevated heat conditions were trained in the health effects associated with, recognition of symptoms, and methods of preventing heat illness. At the site ... the employer did not implement an effective heat stress management program for employees working outside with a heat index of up to 102.4 [Fahrenheit], exposing employees to heat injuries.¹⁰⁰

In 2015, an employee of Shabazz Services Enterprise LLL. was hospitalized for more than a week after experiencing heat stress while performing asbestos abatement in a hot indoor environment. The worker had not received heat stress training:

Employees working on the fourth floor of a gutted brick building, inside of a sealed containment for asbestos abatement experienced signs and symptoms of heat related illness. Employees were not trained in the recognition of health effects associated with heat stress. Employees were permitted to take rest breaks inside of the sealed containment. An employee ... began experiencing symptoms of heat stress, including excessive sweating, feeling ill, nausea, vomiting and cramping ... [A]s a result of excessive heat, this employee was hospitalized for eight days after suffering from acute dehydration and acute kidney failure.”¹⁰¹

9. Establish heat alert program.

Employers should develop a written Heat Alert Program to be implemented whenever the National Weather Service or other authoritative weather service forecasts a heat wave in the coming day or days.¹⁰² Such a program should involve a committee tasked with planning all necessary procedures

⁹⁸ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zJabnA>.

⁹⁹ *Id.*

¹⁰⁰ Citation 1168186.015/001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Dec., 16, 2016), <http://bit.ly/2zJxgXg>.

¹⁰¹ Citation 1073276.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Sept. 17, 2015), <http://bit.ly/2uz7hMq>.

¹⁰² BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zJabnA>.

to be taken in the event of a heat wave, including postponing non-urgent work, increasing the number of workers on each shift, increasing rest breaks, and heightened medical surveillance of workers.¹⁰³

In 2013, Cooper Tank and Welding Corp failed to implement a heat alert program during a week-long heat wave, and an employee died from heat-related causes:

[E]mployees were exposed to excessive ambient heat from environmental sources and heat generated from machinery used in the recycling process ... [A]n employee who had been working for several hours on the conveyor line suffered heat illness and died. The employees were sorting the recyclable materials inside a building. There was a week-long heat advisory issued by the National Weather Service.¹⁰⁴

In 2013, a U.S. Postal Service worker died from heat stress after exerting himself for five hours during a National Weather Service heat advisory:

[W]ith the afternoon temperatures reaching 94 degrees, the humidity up to 46%, the heat index in excess of 100 degrees, and the area under a Heat Advisory from the National Weather Service, a letter carrier collapsed after walking his route for approximately 5 hours between noon and 5 p.m. with a mail bag weighing up to 35 pounds. He was taken to the hospital where his core body temperature was reported to be 110 degrees. He died.¹⁰⁵

10. Train workers on heat stress risks and preventive measures.

All workers who may be put at risk of heat injury or illness should be informed through continuing education programs, of heat stress hazards, preventive measures, signs and symptoms of heat-related illness, first aid procedures, and other key information related to heat stress risk and mitigation. A written training program containing all of the aforementioned information should be developed. In addition, a heat stress safety data sheet should be posted in all at-risk work areas.¹⁰⁶

In 2015, an employee of Crv Precast Construction LLC died after engaging in strenuous labor in excessive heat throughout the day, without access to heat stress literature or warnings:

[E]mployees were exposed to excessive ambient heat from environmental sources. During the performance of their duties, this included laying down hollow core concrete plans on the top floor of the building undergoing construction. The heat index for the day ranged between 99 and 105°F ... [A] worker who worked outdoors for the entire shift collapsed and

¹⁰³ *Id.*

¹⁰⁴ Citation 922211.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Jan. 16, 2014), <http://bit.ly/2zBmHWe>.

¹⁰⁵ Citation 917092.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Dec. 4, 2013) <http://bit.ly/2LhELGy>.

¹⁰⁶ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zJabnA>.

died shortly thereafter. The employer had not developed or implemented a heat stress program.¹⁰⁷

In 2013, a U.S. Post Service worker reported symptoms during the course of her job and was later treated for heat exhaustion. Prior to the incident the worker had received a hasty oral heat stress training:

The mail carrier called her supervisor [and said] she felt overheated and nauseated. The supervisor authorized the break and informed her to call him back to inform of her wellbeing. The mail carrier's symptoms did not improve, and in-fact deteriorated ... she was treated for dehydration and heat exhaustion ... The delivery of heat-related safety training was inadequate for effective information retention by employees. The training was reported as being provided as a three to five minute talk while employees were actively working sorting the mail.¹⁰⁸

11. Conduct heat-related surveillance and recordkeeping.

Employers should maintain records pertinent to the requirements in this standard, including records of heat-related injuries and deaths, medical monitoring data on their employees, environmental data related to heat, and current and historical heat alert and heat acclimatization plans. These records should be and made available to OSHA, workers, and their representatives.

In 2013, OSHA found that Archer Western Contractors LLC's heat stress policy guidance was insufficient, after the on-site foreman did not recognize the signs of heat exhaustion in one of his crewmembers:

[A] concrete finishing crew foreman failed to recognize heat exhaustion in one of his employees, and he did not notify the on-duty Safety Manager or remove the victim from the worksite for an evaluation period ... [The] safety and health program heat stress policy guidance on acclimatization does not address personnel who return from an extended absence from working in a hot environment. It is recognized that even personnel experienced in performing physical work activities in heat stress conditions require a re-acclimation period upon re-introduction to those conditions following an extended absence.¹⁰⁹

In 2004, AT&T failed to mitigate the risk of heat stress by one of its vulnerable workers, Scott Hamilton, who died from heat stroke when working in hot conditions:

Scott Hamilton was just 38 years old when he died on the job in Escondido, Calif., in July 2004. A member of [Communication Workers of America] Local 9511, Scott was an AT&T cable splicer. He suffered fatal heat stroke while replacing a telecom cable in hot, arid,

¹⁰⁷ Citation 1075960.015/01001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Aug. 21, 2015), <http://bit.ly/2L8vzHG>.

¹⁰⁸ Citation 1246837.015/001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (Dec. 14, 2017), <http://bit.ly/2utvX9e>.

¹⁰⁹ Citation 1246461.015/001, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (July 13, 2017), <http://bit.ly/2KXJRLQ>.

desert-like conditions ... [T]he company knew that Scott had medical issues but failed to take adequate steps to protect him.¹¹⁰

12. Institute whistleblower protections.

Employers should institute a whistleblower protection program for workers and supervisors, in order to encourage individuals to identify and help to prevent violations of the heat stress standard while ensuring they have rights against retaliation in the process of coming forward.

In 2011, Verizon denied field technician Brent Robinson's request to be released from a job after he reported feeling sick while working in extreme heat. Later that day he fell unconscious and died:

Brent Robinson, a Verizon field technician [and Communication Workers of America member] started feeling sick while installing phone service at a customer's house in Cucamonga, Calif. Working outdoors in 100-105 degree heat, the Local 9588 member called his supervisor and asked to be released to go home. That request was denied, and Robinson continued with the installation. On route to his next job, Robinson stopped at a grocery store for a cool drink. Feeling worse, he called 911. By the time the ambulance arrived, the tech was unconscious. Medical personnel performed emergency care and he was rushed to the hospital, but it was too late. Robinson, age 55, died.¹¹¹

In 2007, Benjamin, a North Carolina farmworker, explained how his employer threatened to replace him if he did not continue to work after he reported signs of heat stress:

Another thing I did was to pour water over my head, to feel cooler. I didn't know this was dangerous. I got sick, because I stopped sweating. I started having chills; I felt hopeless. I reached for some low leaves and when I tried to stand back up, I fell in the tobacco. A compañero who was walking with me looked at me and said, "Are you sick?" He told the boss that I was sick. The boss said, "Just have him work slowly. If he doesn't work, I'll get someone else from Mexico." So I kept going. My compañero never left me. He walked with me and helped me the whole time.¹¹²

The majority of the aforementioned worker accounts are derived from OSHA citation reports, all of which recommend that employers implement heat stress prevention programs. However, as these tragic events demonstrate, most employers will not voluntarily implement practices to prevent heat stress in their workplace unless they are required to do so. A federal heat stress standard would help to prevent countless preventable injuries, illnesses and deaths caused by heat, benefiting workers and employers alike.

¹¹⁰ *Extreme Heat: What Outdoor Workers Must Know to Protect Their Health When Temperatures Soar*, COMMUNICATION WORKERS OF AMERICA (2010), <http://bit.ly/2Lf1ovf>

¹¹¹ Heat Stress, a Burning Issue for Outside Telecom Techs, CWA News (March 26, 2012), <http://bit.ly/2Nc7ehm>.

¹¹² 2006 Documentary Work, Student Action With Farmworkers, from the *Nuestras Historias, Nuestros Sueños / Our Stories, Our Dreams* documentary project, <http://bit.ly/2JkS9b4>.

VI. Existing Heat Stress Policies

Despite NIOSH having issued three separate *Criteria for a Recommended Standard* documents for heat stress, in 1972,¹¹³ 1986,¹¹⁴ and 2016,¹¹⁵ OSHA has never promulgated a federal standard to protect workers from heat stress, as recommended by its sister agency.

State Standards

Three states – California,¹¹⁶ Minnesota,¹¹⁷ and Washington¹¹⁸ – have implemented standards protecting outdoor (Calif. and Wash.) or indoor (Minn.) workers from heat stress. In addition, California is scheduled to issue a heat stress standard for indoor workers in January 2019.¹¹⁹ Although these state standards fall short of the NIOSH recommendations, they demonstrate the feasibility of heat stress regulations at the state and federal levels. California's heat stress standard, although limited to outdoor workers, is the most comprehensive and detailed state standard. A summary of the three state standards, in addition to the NIOSH recommendations and U.S. Military guidance, is found in Table 2.

¹¹³ NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, CRITERIA FOR A RECOMMENDED STANDARD: OCCUPATIONAL EXPOSURE TO HOT ENVIRONMENTS (1972), <http://bit.ly/2meA9G0>.

¹¹⁴ National Institute for Occupational Safety and Health. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, CRITERIA FOR A RECOMMENDED STANDARD: OCCUPATIONAL EXPOSURE TO HOT ENVIRONMENTS 1986, (April 1986), <http://bit.ly/2KTnojd>.

¹¹⁵ BRENDA JACKLITSCH, W. JON WILLIAMS, KRISTIN MUSOLIN AND AITOR COCA, NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH, OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS, REVISED CRITERIA 2016 (February 2016), <http://bit.ly/2zJabnA>.

¹¹⁶ *Heat Illness Prevention*, Title 8, Section 3395. California Code of Regulations, <http://bit.ly/2uvJk8N>.

¹¹⁷ *Indoor Ventilation and Temperature in Places of Employment*, Minnesota Administrative Rules. 5205.0110, <http://bit.ly/2NfUQ03>.

¹¹⁸ *General Occupational Health Standards*, Washington Administrative Code, 296-62-095, <http://bit.ly/2KX238s>.

¹¹⁹ *Employment Safety: Indoor Workers: Heat Regulations*, Chapter 839, California Legislative Information. Senate Bill No. 1167 (Sept. 29, 2016), <http://bit.ly/2LhbyeL>.

Table 2. Comparison of State and Military Heat Standards with NIOSH Recommendations

Key Element of Standard	California ¹²⁰	Washington ¹²¹	Minnesota ¹²²	Military ¹²³	NIOSH
Worksites	Outdoor	Outdoor	Indoor	All worksites	All worksites
Time of Year	Year-round	May 1 – Sept. 30	Year-round	Year-round	Year-round
Exposure Monitoring	No	No	No	Yes.	Yes
Acclimatization Plan	"Close supervision" for first 14 days	No	No	Yes.	tk
Heat Stress Thresholds	Varying requirements at 80°F and 95°F	89°F, or lower temps for workers wearing insulating clothing	PEL between 77°F and 86°F (WBGT) based on workload.	Navy: PHELS Others: Work / rest and hydration tables.	Yes. RAL and REL curves
Ceiling Exposure Limits	No	No	Yes	Yes	Yes
Rest breaks	Mixed. In agriculture, 10 mins every two hours at >95°F. In other industries, only on request.	No	Yes (in the sense that the threshold is a firm PEL)	Yes. Rigorous work-rest cycles based on WBGT thresholds.	Yes. Threshold limit curves differ depending on amount of work per hour.
PPE	No	No	No	No	Yes
Hydration	Yes. Water, 1 qt/hr.	Yes. Water, 1 qt/hr.	No	Yes. Water, 0.5–1.5 qt/hr based on work intensity and WBGT. Salt or sports drinks during >4 hours sweating if salt from meals is insufficient.	Yes. Provide 1 cup cool (50–59°F), potable water every 15–20 mins. For workers sweating more than 2 hours, provide electrolytes.
Shade Requirements	Required when temp >80°F. Upon request when temp ≤80°F.	No	N/A	Rest should be given in shade.	Provide air-conditioned or shaded area for rest.
Hazard Notification	No	No	N/A	Flag indicating conditions.	Yes
Employee Training	Yes. Upon hiring.	Yes. Upon hiring and annually thereafter.	Yes. Upon hiring and annually thereafter.	Vague guidance on need to educate troops on signs of heat stress and alert them to dangerous heat conditions.	Yes. Upon hiring and continuously thereafter.
Medical Monitoring	Yes. Proactive monitoring for heat-related illness when temp ≥95°F.	Yes. Reactive monitoring and rest breaks for heat-related injuries.	No	Language on monitoring interspersed throughout guidance, but no strict criteria.	Yes. Medical screening and surveillance program.
Injury Surveillance	Yes	Yes	No	Yes	Yes
Record-keeping	Yes. Written exposure control and emergency response plan.	Yes. Written accident prevention program and worker training.	Yes. Accident prevention program.	N/A	Yes. Written Heat Alert Program; extensive record-keeping of heat measurements and surveillance records.

California implemented the regulation for its standard as an emergency measure in 2005 in response to a spike in heat-related worker deaths that year,¹²⁴ and made the measure permanent in

¹²⁰ *Heat Illness Prevention*, Title 8, Section 3395. California Code of Regulations. <http://bit.ly/2uvjk8N>.

¹²¹ *General Occupational Health Standards*, Washington Administrative Code, 296-62-095, <http://bit.ly/2KX238s>.

¹²² *Indoor Ventilation and Temperature in Places of Employment*, Minnesota Administrative Rules. 5205.0110, <http://bit.ly/2NfUQ03>.

¹²³ *Technical Bulletin: Heat Stress Control and Heat Casualty Management*, DEPARTMENTS OF THE ARMY AND AIR FORCE (March 7, 2003).

2006.¹²⁵ The main provisions of the standard are summarized in Table 2, and include requirements for employers to: (1) provide one quart of potable drinking water per worker per hour; (2) monitor, and provide shade for, all employees on particularly hot days; (3) provide rest breaks for employees upon request; and (4) train new employees and supervisors on heat-related illness and preventive measures.¹²⁶

In the first five years after implementation of California's standard in 2005, thousands of inspections were conducted, with millions of dollars in penalties assessed for violations of the standard.¹²⁷ From 2011 through 2017, California issued more than \$13 million in penalties against companies found in violation of its heat stress standard. California targets its inspections at what have traditionally been the highest-risk industries for outdoor heat-related injuries, the agriculture and construction sectors.

U.S. Military Guidelines

The U.S. Navy first developed Physiological Heat Exposure Limit (PHEL) curves based on metabolic and environmental heat load in 1973.¹²⁸ The PHELs represent "maximum allowable" exposure limits,¹²⁹ apparently unique among the branches of the military. In 2002, the U.S. Marine Corps followed the Navy in adopting a "Heat Injury Prevention Program" under which training is curtailed as wet-bulb globe temperatures (WBGTs) rise. WBGT is a measure of heat in direct sunlight, which takes into account temperature, humidity, wind speed, sun angle and cloud cover. Increasing levels of WBGT are signified by colored flags flown at installations, with all nonessential outdoor activity halting at WBGTs greater than 90°F.¹³⁰ The implementing order for Base Quantico notes that "each year" personnel at the base experience "several heat casualties with many resulting in emergency MEDEVAC" between May and September.¹³¹

In 2003, the U.S. Army and U.S. Air Force issued a technical bulletin on heat stress and effective measures to prevent heat-related injury in soldiers in both outdoor and indoor workplaces.¹³² The bulletin provides detailed instructions on acclimatization, with gradually increasing workload and environmental heat exposure over a two-week period. A rigorous WBGT threshold is calculated for differing work intensities and environmental temperatures, with a recommended work-rest cycle developed based on these values.¹³³ The recommendations limit continuous work after

¹²⁴ Cal/OSHA Standards Board Adopts Emergency Regulations on Heat Illness Prevention, CALIFORNIA DEPARTMENT OF INDUSTRIAL RELATIONS (Aug. 12, 2005), <http://bit.ly/2zDvAyl>.

¹²⁵ Elizabeth Wilson, *Heat Stress Prevention Heats Up in California*, EHS TODAY (June 1, 2008), <http://bit.ly/2ukoB8G>.

¹²⁶ Heat Illness Prevention, California Code of Regulations, Title 8, Section 3395, <http://www.dir.ca.gov/title8/3395.html>.

¹²⁷ Data obtained from Cal/OSHA on August 2, 2011. Data compiled from federal IMIS database.

¹²⁸ *Manual of Naval Preventive Medicine*, Rev. 2, U.S. NAVY (2009).

¹²⁹ *Id.*

¹³⁰ Marine Corps Order 6200 (June 6, 2002), <http://bit.ly/2KTNVwE>.

¹³¹ Marine Corps Base Order (July 22, 2002). For description of "wet bulb globe temperature," see *WetBulb Globe Temperature*, NATIONAL WEATHER SERVICE (viewed on July 16, 2018), <http://bit.ly/2KXC3tq>.

¹³² *Heat Stress Bulletin*, Department of Army & Department of Air Force (March 7, 2003).

¹³³ *Id.*

temperatures rise above 82°F for “moderate” intensity work and above 78°F for “hard” work. The Marine Corps has adopted the same guidelines for work, rest, and water intake.¹³⁴

Weaknesses of the military guidelines include the absence of record-keeping requirements to verify compliance, the lack of shade requirements, and the lack of exposure limits, with the exception of the Navy’s PHEL. Also, it is unclear on reading the military materials whether they are merely advisory and, if so, the extent of compliance. Nevertheless, the military’s work-rest cycle and acclimatization protocols, in addition to the Navy’s PHEL, clearly represent rigorous and feasible model provisions on which to base a nationwide federal standard.

¹³⁴ MARINE CORPS ORDER 6200 (June 6, 2002), <http://bit.ly/2KTNVwE>.

Conclusion

OSHA's job is to protect every worker. The nature of work done by many of the workers described in this report already places them at risk. Making matters worse, the socio-economic status of many people who work outdoors leaves them especially vulnerable.

The current system does not account for the fact that workers have very little control over their ability to rest, drink water, find shade or otherwise seek relief from excessive heat.

As a report in *Mother Jones* notes, "heat sickness is a symptom of an agricultural system where laborers can't speak up against unsafe field conditions, in part because many are undocumented."¹³⁵

This fear is likely greater under the Trump administration, as Immigration and Custom Enforcement raids at workplaces with large numbers of immigrants are on the rise.¹³⁶

Compounding all of this is the fact that climate change is going to lead to warmer temperatures in the future, putting workers at even greater risk.

OSHA needs to act.

¹³⁵ Ingfei Chen, *How Heat Kills Farmworkers*, MOTHER JONES (Sept. 20, 2017), <http://bit.ly/2LhEXbQ>.

¹³⁶ Fatima Hussein, *ICE Raids at Work May Keep Undocumented Workers Silent on Safety*, BLOOMBERG (June 27, 2017), <http://bit.ly/2uHB45Y>.