



REPORT

ON THE FRONT LINES: CLIMATE CHANGE THREATENS THE HEALTH OF AMERICA'S WORKERS

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About NRDC

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Executive Summary

Millions of workers in the United States get injured or sick on the job every year, and thousands die.¹ Although the rates of occupational injuries and deaths have declined since the Occupational Safety and Health Administration was established in 1971, workers still face countless hazards—from the physical stress of repetitive motions to chainsaw accidents to landslides.²

Climate change is already making existing workplace hazards worse and creating new ones, and the situation will only accelerate as our world gets even hotter and our weather more extreme.³ Outdoor workers will be exposed to more severe heat, more toxic substances, and a heightened risk of infectious diseases. As increasingly extreme weather events destroy infrastructure and threaten communities, first responders and cleanup crews will face ever more frequent, exhausting, and dangerous deployments. And as the world grapples with the magnitude of the climate crisis and the societal upheaval it causes, workers across the occupational spectrum may have to provide aid to colleagues or to people in their care who find themselves in mental distress.

To better understand the scope and scale of the dangers climate change poses to occupational health and safety, NRDC scoured government databases, media reports, and the latest peer-reviewed scientific studies relevant to climate change and workers. We also talked to labor leaders, occupational health and safety experts, and union members about their personal experiences with climate-related threats to their health.

We found through our literature review and reporting that:

- **The people we depend on to harvest our food, fix our houses and roads, and keep essential services running are among the most vulnerable workers to heat-related illnesses and deaths.** As Robert Hogue, a telephone line technician in Southern California put it: “We’re always trying to keep customers’ telephone service alive, but it’s exhausting work and can cause heat illness. Heat exhaustion can hit you when you’re climbing a telephone pole or crawling under a house or through an attic.”
- **Indoor workers aren’t immune to the health and safety effects of climate change.** This is particularly true for teachers, janitors, and other people who spend time in older or poorly maintained buildings. Pam Rall-Johnston, a night-shift janitor in Pittsburgh, said, “Growing up, the climate was very different. We never had air-conditioning; now you can’t survive without it . . . Some of the buildings we work in are more than 100 years old, and they turn the air-conditioning off at night. It often gets over 90 degrees and extremely humid in the buildings, and it’s tough to do physical labor in those conditions.”
- **Climate-related losses in take-home pay—particularly among lower-wage workers—make it harder to afford food and health care.** After Hurricane Florence hit North Carolina in 2018, Gina Williams told us, “I work in a garment factory, and some of my coworkers had to miss three weeks of work because the roads were unusable, which was a financial burden on top of the losses we’d all experienced.”
- **There’s an urgent need for more research on how the effects of climate change, including exposure to wildfire smoke, impact occupational health and safety.** Shawn Heape, a communications worker in Northern California, worried about the health effects of spending 20 years around wildfires. “My coworkers and I get nosebleeds,” he said, “and when we blow our noses black mucus comes out. Then we’re going home to our children and spouses covered in all those poisonous chemicals . . . I’m afraid of what my family and I have been exposed to over the years.”

Unfortunately, federal labor laws and the practices of most employers have not kept pace with our changing climate. These laws and practices will be woefully insufficient for the effects that even a best-case scenario of climate change would have on worker health and safety.

In addition to urgent and ambitious action to eliminate climate-changing pollution, NRDC recommends that federal lawmakers and regulators take the following steps to adapt workplaces to an increasingly climate-disrupted world:

- **Modernize our health and safety laws and policies** to address the realities of the climate crisis and **ensure that enforcement funding and staffing are up to the challenge** of protecting workers.
- **Strengthen the role of unions and other worker organizations** to ensure workers are full partners in the effort to protect their health and safety from climate change.
- **Build a better system to track, analyze, and quickly act on existing and emerging health and safety threats** to workers.
- **Support research on the best health and safety interventions** to protect worker health from climate change.

Introduction

We spend a lot of time at work: In 2018, on average, employed Americans spent more than half of their waking hours working, commuting to and from work, or looking for work.⁴ When talking about health, we cannot ignore the crucial role that work plays in the lives of most adults and many teenagers in the United States.⁵

Different industries and forms of employment place different stresses on the health of workers.⁶ For example, the occupational fatality rate for grounds maintenance workers, who labor outdoors with dangerous equipment, is 37 times higher than for people who work in finance.⁷ Temporary and informally employed workers are more susceptible to occupational injuries and illnesses than are permanent employees because they often have less work experience, are unfamiliar with their workplaces, get inadequate health and safety training, are assigned the most dangerous jobs, or are fired for requesting or taking time off.⁸ And, as discussed further below, immigrant workers face myriad health and safety challenges on the job, particularly if they are undocumented and fear retaliation for reporting illness or unsafe conditions.⁹

Work is also considered a “social determinant of health” because wages and benefits such as health insurance are a key factor in workers’ ability to pay for safe housing, nutritious food, and medical care.¹⁰ In fact, the American College of Physicians considers socioeconomic status to be the “primary nonmedical factor affecting health.”¹¹ However, just 55 percent of workers had employer-based

health insurance in 2019, even though employer-based plans are the most common source of health insurance in the United States.¹² The availability, quality, and cost of employer-based health insurance also vary widely by business size, geographic location, and proportion of low-wage workers.¹³

The climate crisis is adding to the existing health and safety vulnerabilities of workers in three key ways. First, **climate change is worsening both day-to-day weather conditions and extreme events such as wildfires, floods, and hurricanes.** Weather-related workplace hazards that already harm worker health—including exposure to extreme heat, toxic air and water pollution, infectious diseases, and storm debris—are intensifying across a wide array of occupations. As Mark Burleson (Spotlight 1), a fiber-optic technician in Florida, put it, “It didn’t used to be this hot, but in recent years I’ve seen a lot of guys get overheated and dehydrated.”

Second, **climate change is economically devastating whole communities.** Disasters can cut into take-home pay by shuttering businesses, disrupting commuting routes, and reducing the number of hours and days during which people can safely work. After Hurricane Michael closed the laundry at which she worked in 2018, said Ashley Williams (Spotlight 2), “it was a real struggle to support my family. My car got repossessed, and I had to choose between paying my utility bills or the rent.”

SPOTLIGHT 1: MARK BURLESON, FIBER-OPTIC TECHNICIAN, CWA LOCAL 3176, OVIEDO, FLORIDA

“As fiber-optic technicians, we connect businesses to high-speed internet service. To do this, we often have to block off an area in the middle of a six-lane highway and open up a 300-pound manhole lid made of cast iron. Then we pump the water out of the tunnel and climb down underneath the highway to snake the fiber-optic cable through the conduit system to the business’s computer server room. In central Florida the summers have gotten horrendously hot, so the asphalt is sizzling and the tunnels can get up to 112 degrees [Fahrenheit].

“I’ve been a line technician for 40 years and started out setting telephone poles in the ground, climbing up, and hanging the copper wire. It didn’t used to be this hot, but in recent years I’ve seen a lot of guys get overheated and dehydrated. They get nauseous, their body shuts down, they stop sweating, their skin gets cold and clammy, and they get the shakes. When this happens, I try to get them to a cooler location and get liquid into them, but you have to give them water slowly because otherwise they can throw it up.

“Along with the heat, there are more intense storms and hurricanes, which threaten service for customers because the lines get flooded and corroded. We have to cut out all the damaged cables and junction boxes and replace them. Sometimes in the aftermath of storms, we’ve worked 18 to 20 hours a day and slept in our trucks. We wouldn’t go home for weeks until service was restored for our customers.

“I’m a fourth-generation Floridian, so I know firsthand that it’s getting hotter and we’re hit by more storms. My grandmother was 91 when she died, and had only seen one hurricane in this part of the state during her lifetime. I’m 62 and have seen seven or eight hurricanes already. I was born and raised without air-conditioning, and now there are so many 100-plus degree days, I don’t think you could make it without AC. I pity the younger guys coming up who have to work in these conditions. My heart goes out to them.”

SPOTLIGHT 2: ASHLEY WILLIAMS, LAUNDRY WORKER, WORKERS UNITED SOUTHERN REGION, SEIU, TALLAHASSEE, FLORIDA

“The increasing heat in Florida makes it hard to work in my industrial laundry, but the storms hurt my ability to make a living because they shut down the businesses that need laundry services.

“I’m a single mom raising three kids ages sixteen, nine, and six. I make \$12.55 an hour at the laundry, folding and assembling items once they’re clean so they can be wrapped and shipped out to customers. We clean hotel and restaurant linens, hospital sheets and scrubs, and uniforms for city workers. Inside our laundry, it can reach temperatures over 105 degrees in the summer, so it’s tough and exhausting work. I’ve stayed with it for 10 years because normally it provides a steady income at 40 hours a week so I can support my family.

“That changed when Hurricane Michael hit in 2018. Michael was a category five and caused so much flooding and damage that many of the businesses that use our laundry were shut down, especially in Panama City on the Gulf Coast. The entire local economy took a hit. Our laundry closed for three days because the area lost power, but when the lights came back on, we could only work half days due to the loss of business.

“So I only had around 26 hours a week at the laundry and had to find other work. I started a second job with an app-based food delivery service at night. I would get off from the laundry around 12:30 p.m. and then deliver food from 5 p.m. to about 11 p.m. Sometimes I only made around \$10 an hour at the delivery job, and it was a real struggle to support my family. My car got repossessed, and I had to choose between paying my utility bills or the rent. The only reason we weren’t homeless was that I paid my other bills late every month.

“When I was working that schedule, my mom had to come up from Miami to assist with the kids and stay with them at night. My children barely got to see me, which was really hard on them. When they were going to school I was going to work at the laundry, when they came home I was going to my delivery job, and then when I finally got home at night they were asleep. I wasn’t even able to help them with their homework. Once my youngest daughter said to me, ‘We never get to see you anymore,’ and it broke my heart. The drastic changes in the climate are causing insecurity and hardship for working families.”

Finally, **our rapidly changing climate is outstripping the ability of state and federal agencies to hold employers accountable for unsafe and unhealthy work practices.** Major labor laws, such as the 1970’s Occupational Safety and Health Act, were drafted before most lawmakers were aware of the impacts of climate change and are not being used to their full advantage to protect workers.¹⁴ Recent rollbacks of state and federal occupational safeguards and funding cuts for legal enforcement already threaten increasing numbers of workers with occupational illnesses, injuries, and death, and the added risks from climate change only exacerbate the problem.¹⁵

This report reviews the latest evidence documenting how climate change is threatening the health and safety of workers, identifies research needs, and offers a series of federal policy recommendations to protect workers in an increasingly climate-disrupted world. We also share stories from workers across the United States who offer their personal experiences of climate-related health and safety harms and share their fears about—and hopes for—the future.

Climate Disruption Is a Present and Growing Danger to Worker Health

“Workers are often exposed to conditions that the general public can elect to avoid.”

—Max Kiefer et al., “Worker Health and Safety and Climate Change in the Americas: Issues and Research Needs”¹⁶

Climate disruption can be a matter of life or death for people who work without protection from the elements either outdoors or indoors.¹⁷ The occupations most highly exposed to the types of weather extremes fueled by climate change—such as buildings and grounds maintenance workers, transportation and materials-moving workers, and farmworkers—tend to be overrepresented by Blacks or African Americans, Hispanics or Latinos, and low-wage workers.¹⁸ Facts like these underscore how the climate crisis will exacerbate existing environmental and social injustices among underserved communities in the United States.

These workers face extreme heat, floods, hurricanes, wildfires, and droughts and the myriad health risks that come from working in those conditions. The physical, mental, and financial burdens of climate-related health threats—from heatstroke to Lyme disease to depression and anxiety—are real and urgent and must be addressed.

EXTREME HEAT IS KILLING WORKERS

The average annual temperature of the contiguous United States increased 1.8 degrees Fahrenheit over roughly the past century.¹⁹ Because warming happens unevenly, average temperature increases of up to 3 °F have occurred in areas such as Southern California, western Colorado, northern North Dakota, and much of New Jersey.²⁰ Heat waves have also gotten longer, more frequent, and more intense in recent decades.²¹

Without a dramatic reduction in the pollution causing climate change, the United States could experience twice as many days with a heat index greater than 100 °F between the years 2036 and 2065 than in the period from 1971 to 2000.²² For context, the National Weather Service typically issues heat advisories when the forecast calls for two or more consecutive days with a heat index of 100 °F or more.²³

Heat is a serious occupational health threat, particularly for workers engaged in strenuous physical labor.²⁴ As both average temperatures and the number of heat waves climb, more and more workers in the United States will face costly and life-threatening heat-related illnesses.²⁵

Health Threats

Exposure to extreme heat can cause a range of mild to deadly conditions, from heat rashes and muscle cramps to heart attacks and heatstroke.²⁶

There is also emerging evidence that extreme heat can increase the risk of injuries on the job, by making workers irritable or confused or by interfering with balance, motor control, or even vision.²⁷ A recent study of outdoor agricultural workers in Washington State found the odds of traumatic injury were 13 percent higher on days with a maximum humidity index above safe occupational thresholds.²⁸ (Similar to the heat index, the humidity index is a measure that combines heat and humidity.) In an international study of 139 workers, heat stress combined with dehydration was associated with a 4 percent decline in performance on a simple cognitive task and a 16 percent decline in performance on a complex motor task.²⁹



From 1992 to 2016, heat killed more than 780 workers in the United States and sickened or injured nearly 70,000 others.

Heat strain over multiple days can have a cumulative effect on workers.³⁰ Multiple days of excessive heat exposure can reduce the effectiveness of the human body's natural cooling mechanisms, particularly in older workers, leading to longer-lasting impairments.³¹

Even small changes in temperature can significantly affect the health of workers, especially when doing physical labor. Exertional heat illness, which is associated with increased production of internal body heat due to strenuous activity, can happen under cooler conditions than those that trigger classic heat illness.³² After the 2010 Deepwater Horizon disaster in the Gulf of Mexico, the risk of heat illness in people engaged in cleanup activities was 1.4 times higher for every 1.8 °F increase over a wet globe bulb temperature (heat stress in direct sunlight) of 68 °F.³³

Heat exposure may also increase the vulnerability of roofers, farmworkers, firefighters, and others to toxic chemicals.³⁴ There is some evidence that high temperatures accelerate the movement of chemicals such as polychlorinated biphenyls (PCBs) in the air and increase chemical uptake by human lungs and skin.³⁵ Workers also may not want to wear personal protective gear during extreme heat, increasing their likelihood of exposure in the first place.³⁶

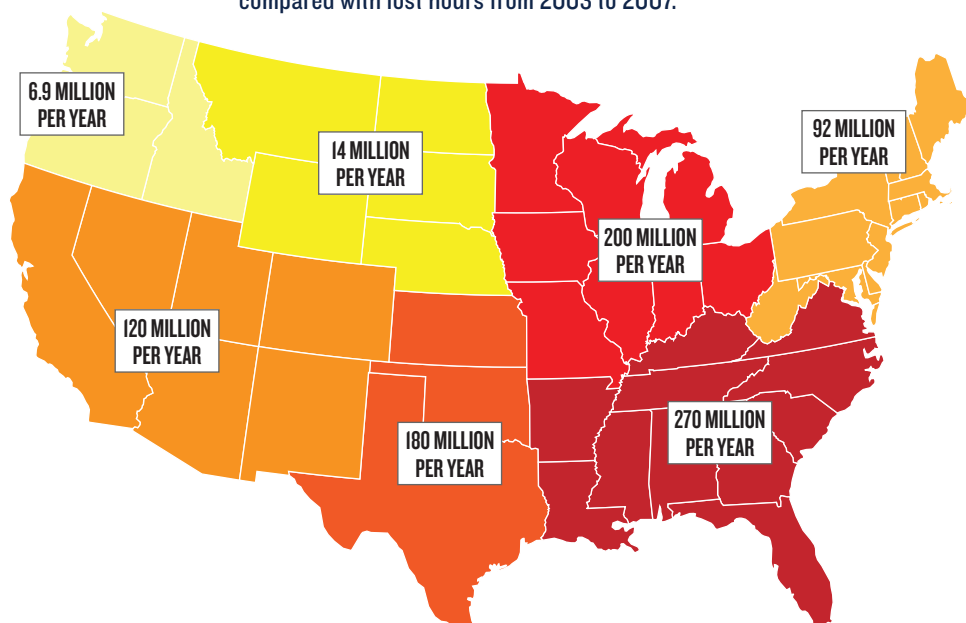
From 1992 to 2016, heat killed more than 780 workers in the United States and sickened or injured nearly 70,000

others.³⁷ These are conservative estimates, because employers and medical examiners don't always indicate when heat is a contributing factor to an injury, illness, or death.³⁸ Employers with ten or fewer employees are legally exempt from reporting workplace illnesses and injuries of any kind.³⁹ Furthermore, workers may choose not to report mild to moderate symptoms because of workplace culture or a fear of retribution.⁴⁰ For instance, fear of discrimination or deportation dissuade some immigrant workers from reporting unsafe conditions or injuries and illnesses sustained on the job.⁴¹

Finally, heat can indirectly harm health by reducing take-home pay, making it harder to afford medical care, food, and housing.⁴² Heat can reduce productivity, which is a problem for piece-rate employees, whose total income depends on the number of units of work they complete, or it can stop work entirely.⁴³ In the United States, extreme heat led to the cumulative loss of nearly 1.1 billion work hours among agricultural, manufacturing, and service sector employees between 2000 and 2018.⁴⁴ If high emissions of climate-changing pollution continue, workers in the contiguous United States could lose nearly 883 million hours of work to heat in 2050 *alone* (Figure 1). The largest losses would be felt in the Midwest and Southeast.⁴⁵ For context, 883 million lost hours is the rough equivalent of 423,000 full-time workers sitting idle for a year.⁴⁶

FIGURE 1: PROJECTED NET REGIONAL INCREASES IN LOST LABOR HOURS DUE TO TEMPERATURE EXTREMES IN 2050

Projections based on changes in lost labor hours within each region under a high-carbon emissions scenario, compared with lost hours from 2003 to 2007.



Data source: EPA.⁴⁷

Heat can also lead to extended absences from work, which hurts those who don't have paid sick leave. In 2018 fewer than half of farm and construction workers—the two groups most vulnerable to heat-related deaths—had paid sick leave, compared with 80 to 90 percent of workers in finance, insurance, real estate, and public administration.⁴⁸ From 2013 to 2018, private sector workers in the United States experienced an estimated 1,020 occupational cases of nonfatal heat stroke that required time away from work.⁴⁹ About three-quarters of the cases resulted in one to five days of time away. The worst 10 percent of cases, however, resulted in lost-work time of a month or longer.⁵⁰

Farm and Construction Workers

Workers in construction and agriculture will be hurt first, and hurt most, by a continued rise in extreme heat days. Both construction and farm work involve heavy physical labor (often in the sun), protective clothing that can trap body heat, and heavy equipment that generates external heat.⁵¹ It's not surprising that in the United States, workers employed in construction, farming, and related industries consistently have the highest rates of occupational heat deaths, as shown in Table 1.⁵²

Nonfatal heat illnesses are also common in these industries. In 2017 nearly half of 202 child farmworkers studied in North Carolina reported heat-related symptoms such as vomiting, confusion, and fainting in the previous year.⁵³ (Note that the agriculture industry is exempt from federal age and wage minimums and overtime limits for child labor.⁵⁴) As for construction, we already know that over the past two decades, increases in average summer temperatures across the United States were statistically associated with increases in the number and rate of heat-related deaths among construction workers.⁵⁵



The health impacts of heat on farm and construction workers will disproportionately affect immigrant workers from Mexico and Central and South America.⁵⁶ Immigrant workers may have inadequate housing and a lack of access to nutritious food or health insurance, are often poorly trained in health and safety procedures, and can be unaware of their workplace rights or ineligible for workers' compensation.⁵⁷ Workplace discrimination and deportation fears also dissuade some immigrant workers from reporting unsafe conditions or injuries and illnesses sustained on the job.⁵⁸ In 2016, 75 percent of hired crop workers in the United States and about 20 percent of construction workers were born in Mexico or Central or South America.⁵⁹ Nearly half of all hired crop workers were undocumented.⁶⁰ As a result of these factors, from 2000 to 2010, Latinos were more than three times likelier than non-Latinos to die on the job from heat exposure.⁶¹

TABLE 1. NONMILITARY OCCUPATIONS WITH THE HIGHEST RATES OF HEAT DEATHS, 2012 TO 2018

Based on publicly available data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries and the Current Population Survey.⁶² Years with no data included or data that did not meet BLS publication criteria were excluded.

OCCUPATIONS	AVERAGE PERCENT OF EMPLOYED WORKFORCE	NUMBER OF OCCUPATIONAL HEAT DEATHS	PERCENT OF HEAT DEATHS ACROSS ALL OCCUPATIONS	ESTIMATED AVERAGE ANNUAL RATE OF HEAT DEATHS PER MILLION WORKERS
Farming, fishing, and forestry	0.7	17	7.1	4.0
Construction and extraction	5.2	87	36.2	1.6
Building and grounds cleaning and maintenance	3.9	37	15.4	1.1
Protective services	2.1	12	5.0	1.0
Installation, maintenance, and repair	3.3	11	4.6	0.7

Utility and Communications Workers

Electric utility and communications workers, who deal with many of the same risk factors as farm and construction workers, face the additional pressure of getting their work done on deadline or in the wake of emergencies.⁶³ This means workers may be exposed to heat over unusually long stretches and be unable to take rest breaks in the shade. As the climate crisis deepens, utility and communications workers will face hotter conditions *and* more service calls as demand for electrical power increases (for cooling purposes) and more severe storms and wildfires damage infrastructure.⁶⁴

Military Personnel

Members of the military are also seriously threatened by heat given the physical and outdoor nature of their work, the hot climates of many U.S. military installations at home and abroad, the need to carry heavy gear and wear protective body armor, and the drive to “train like you fight.”⁶⁵ In just a five-year period (2014 to 2018), there were 11,452 cases of heat-related illnesses among active duty members of the Armed Forces.⁶⁶ The rate of heatstroke among active duty members increased by 73 percent during that time, and the rate of heat exhaustion increased by nearly 53 percent.⁶⁷

The increase in heat stress among active duty members also contributed to a 40 percent increase in the rate of rhabdomyolysis from 2014 to 2018.⁶⁸ Rhabdo, as it’s often called, which can strike anyone engaged in strenuous activity in extreme heat, causes muscle tissue to break down and can lead to kidney failure or death.⁶⁹

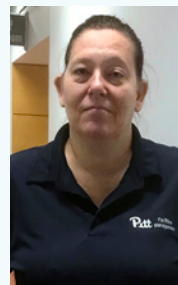
According to an analysis by the Union of Concerned Scientists, military installations in the United States could see nearly five times more days with a heat index above 100 °F from 2036 to 2065 than they did from 1971 to 2000.⁷⁰

Indoor Workers

Most indoor workers engaged in sedentary or light work find a temperature range of 71.6 to 77.9 °F comfortable.⁷¹ The comfortable range is lower under humid conditions and for workers engaged in more physically intense work (Spotlight 3).⁷² Insufficient ventilation or air-conditioning can cause discomfort for many indoor workers, including janitors and flight attendants.⁷³ As summer travelers well know, small airplanes can heat up quickly while they’re sitting on the tarmac. In response to reports about heat extremes causing flight attendants to pass out, vomit, or suffer other health consequences, the Association of Flight Attendants–CWA launched the 2Hot2Cold app to track temperature extremes.⁷⁴ From August 2018 through October 2019, flight crews reported more than 2,800 incidents of extreme temperatures in airplane cabins to the union’s app.⁷⁵ About 51 percent of the reported temperatures were between 80 and 89 °F, and nearly 31 percent were 90 °F or more.⁷⁶

Other indoor workers lack any air-conditioning at all, whether due to outdated infrastructure or unforeseen disruptions. In 2017 and 2018, Hurricane Maria caused the largest electricity blackout in U.S. history and second-largest blackout in the world. For months afterward, many workers in Puerto Rico toiled in hot indoor environments with no air-conditioning (Spotlight 4).⁷⁷ In a summer 2018 survey, 68 percent of public sector workers from 10 Puerto Rican workplaces reported working in extreme heat.⁷⁸

SPOTLIGHT 3: PAM RALL-JOHNSTON, JANITOR ASSISTANT DISTRICT LEADER OF WESTERN PA ELECT, 32BJ SEIU, PITTSBURGH



© Courtesy of Pam Rall-Johnston

“I was born and raised in Pittsburgh, and I’ve seen the effects of the climate crisis for our city over the past five decades. Growing up, the climate was very different. We never had air-conditioning; now you can’t survive without it. There used to be distinct seasons of summer, fall, winter, and spring. Now it goes from cold weather right into extreme heat.

“The rivers used to support farmers outside of the city. Now they flood farmland and city streets, causing sinkholes and mud slides. People have gotten stuck in their cars and drowned right here in the city. The water comes down the hills so fast it backs up the sewage pipes, which are very old and not equipped to handle that much rain in such a short period of time.

“The bugs weren’t so bad growing up. Now we’re being invaded by all sorts of strange bugs I’ve never seen before. There are more ticks that spread Lyme disease and mosquitoes that lay eggs in all the standing water and transmit West Nile.

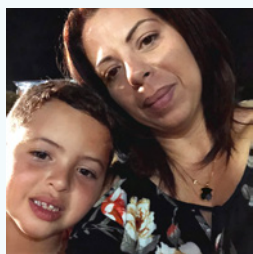
“The crazy weather is affecting us on the job too. I’ve been a janitor for 27 years, and I work the night shift from 11 p.m. to 7 a.m. Some of the buildings we work in are more than 100 years old, and they turn the air-conditioning off at night. It often gets over 90 °F and extremely humid in the buildings, and it’s tough to do physical labor in those conditions. Sometimes it’s so humid we can’t wax the floors because they won’t dry after we clean them.

“Our union supports solutions to the climate crisis because working-class people are hit the hardest. A lot of workers don’t have health insurance, so they can’t deal with the impacts of increased heat and smog, like asthma. If America’s workers don’t take on this fight, who will? Certainly not the executives who are selling the fossil fuels and putting money in their pockets.

“It’s important to make sure that working people have access to good jobs as we transition to clean energy. Here in Pittsburgh, we used to have a lot of coal jobs, mines and steel mills. We need to reach out to those families who are angry about losing their fossil fuel jobs and work with the city, county, state, and federal government to create opportunities for job training and placement. We must bring everyone along and make sure nobody’s left behind.”

SPOTLIGHT 4: MARICELI GONZÁLEZ, ASSISTANT CHIEF OF STAFF, SINDICATO PUERTORRIQUEÑO DE TRABAJADORES, SEIU LOCAL 1996, SAN JUAN, PUERTO RICO

© Courtesy of Mariceli González



“Due to the higher temperature of the oceans, we’re getting hurricanes that are much stronger and bigger in Puerto Rico. In 2017 we had two level five hurricanes back to back, first Irma and then a couple weeks later Maria. Maria caused so much damage to our communities that we now refer to Puerto Rico ‘before Maria’ and ‘after Maria.’

“During that hurricane, I was at home with my husband and five-year-old son. The storm ripped the wood covering off our balcony and our door was swinging wildly back and forth, so we had to move our furniture to barricade the doorway. When we emerged, everyone was in shock because it looked like an atomic bomb had hit us. All the trees were stripped of their leaves and looked burned. We walked past one school where the basketball court was covered with dead fish from the river flooding.

“Some areas went almost a year without electricity, months without clean water or cell phone signals, and weeks without access to ATM machines. The roads were all blocked with mud, and people’s roofs had been torn completely off. People couldn’t work because there was no way to get to their jobs. The local government wasn’t prepared for that level of total devastation.

“Now two years later [in 2019], many roads still haven’t been fixed, some people still have the blue FEMA tarps covering their homes, and hurricane season is starting again. The response we received from the federal government wasn’t fair—they treated us like we’re second-class citizens.

“I will say that Hurricane Maria brought out the best in fellow union members and our communities. We cooked for each other and helped our neighbors. We need that kind of cooperation throughout the country to solve the climate crisis before it gets worse.”

SPOTLIGHT 5: ORLANDO GREEN, SCHOOL BUS OWNER/OPERATOR, ST. TAMMANY FEDERATION OF TEACHERS AND EMPLOYEES, AFT, SLIDELL, LOUISIANA

“I always try to go above and beyond in my job as a school bus operator. I treat my bus as a rolling classroom, an opportunity to teach kids character, courtesy, politeness, and empathy for one another. Sometimes kids are going through tough times, like their parents’ divorces or deaths, and the school bus needs to be a welcoming, nurturing environment. It’s also important to recognize, address, and report any bullying.

“But the increasing heat in Louisiana has made my job a lot harder because it makes the kids agitated. Starting in the spring, temperatures begin rising into the 80s, and there is no air-conditioning on the bus. Even with all the windows down and the top hatches open, the heat can become unbearable.

“During the humid summers, with all 40 kids crowded inside, the heat index can reach around 105 degrees in the bus. Their little faces become flushed red, and they start yelling, ‘Mr. Green, it’s too hot in here!’ One child has diabetes and his mother has told me the extreme heat can be really dangerous for him. I don’t think it’s conducive to the children’s health, good behavior, or learning.

“I was born in New Orleans and have lived in Slidell, northeast of the city, for three decades. During my lifetime I’ve seen the heat get way out of normal range, along with the severity of storms and flooding. On the eastern side of Slidell is the Pearl River, and in recent years it has been flooding a lot due to snowmelt from up north, and excessive rain. The flooding has been so bad in some subdivisions that it’s prevented me from picking up kids at their homes. Our drainage system is just based on gravity, without much mechanical pumping, so we’re at the mercy of Mother Nature.

“Growing up, most of the storms would be called ‘tropical depressions’ and you could ride them out. But nowadays it seems like we’re getting 100-year storms with violent winds and flooding almost every season. I learned my lesson starting with Hurricane Katrina to always evacuate when big storms are coming in. We keep close track of the ‘cone of uncertainty,’ and if it looks like Slidell is going to get hit, the Green family is getting out of Dodge.

“During Katrina, my wife, daughter, and I battened down the hatches, loaded up the truck, and went to stay with my son in Texas. When we returned, 17 trees on our property were snapped in half or uprooted. Other families were hit a lot worse, with their entire properties flooded and destroyed. It’s been a burden on our neighbors and all working people in this area to pay for the considerably higher premiums for our flood insurance.

“Increased heat, rain, and flooding are also hurting our local economy. When the Mississippi River swells too much, they open up the spillway and dump water into Lake Pontchartrain. That lake has supplied the fishing industry with abundant seafood, including crabs, shrimp, and oysters, for as long as I can remember.

“But the Mississippi carries all sorts of fertilizers from upriver, which combined with excessive heat have caused massive blooms of toxic green algae in the lake. The algae create dead zones where no life can survive.

“I hope that elected officials and candidates at every level start supporting solutions to this emergency, so we can get a handle on the increasingly dangerous conditions we’re experiencing.”

Educators in many U.S. school districts also regularly work in unhealthy heat, especially at the start and end of the school year (Spotlight 5). According to the U.S. Energy Information Administration, only 63 percent of U.S. educational buildings (including grade school, middle school, high school, postsecondary, and other instructional buildings) were fully air-conditioned in 2012.⁷⁹ About 11 percent of educational buildings had cooling for no more than 50 percent of their floor space, and 7 percent had no cooling at all.⁸⁰ A 2017 investigation by the nonprofit news outlet *The 74* found that most schools in some of the nation's largest school districts—including Milwaukee, Denver, and Detroit—are not fully air-conditioned.⁸¹ Teachers across the country have reported buying window units with their own money or trying to solicit contributions from private donors.⁸² In October 2019, Columbus City Schools in Ohio closed for two days due to extreme heat and humidity, because just one-third of the buildings had air-conditioning.⁸³ However, even under those conditions essential employees, including bus drivers, were still expected to report to work.⁸⁴

Even in schools that have air-conditioning, the cooling system may not work very well. For instance, school staff made more than 1,000 requests to the Los Angeles Unified School District in the summer of 2019 for repairs to air-conditioning.⁸⁵ That same summer, teachers at two schools in San Antonio, Texas, reported symptoms of heat illness after the central air-conditioning broke down.⁸⁶ In 2017 the American Society of Civil Engineers rated the windows, plumbing, and HVAC systems of more than 30 percent of schools nationwide as being in fair or poor condition.⁸⁷ By one estimate, the nation should be spending \$145 billion per year to get schools up to modern, safe, and healthy standards—\$46 billion more than historical annual spending.⁸⁸

Finally, teachers in some school districts are at higher risk of heat-related illnesses because they don't have adequate access to and use of restroom facilities and therefore may intentionally avoid drinking water. In 2015, 45 percent of more than 30,000 teachers surveyed across the nation by the American Federation of Teachers reported getting inadequate bathroom breaks.⁸⁹ In 2019, 63 percent of teachers surveyed in Florida's Orange County Public School District said they avoided drinking water to limit their trips to the bathroom.⁹⁰ Dehydration compromises the human body's natural cooling mechanisms (including sweating) and can lead to kidney damage.⁹¹

FLOODS AND HURRICANES SWAMP WORKERS WITH HEALTH PROBLEMS

Severe floods and hurricanes damage infrastructure, spread toxins and infectious diseases, encourage mold growth, and disrupt essential services, creating unhealthy conditions for community members and workers alike.⁹²

Climate change is fueling an increase in the number and intensity of heavy precipitation events in the United States.⁹³ Since 1958 every region of the country except Hawaii and the U.S. Caribbean has experienced at least a 9 percent increase in the total amount of extreme precipitation.⁹⁴ The largest increases have been in the Midwest (42 percent) and the Northeast (55 percent).⁹⁵

More extreme rainfall, in turn, increases the risk of more severe flooding.⁹⁶ Multiple studies have shown that climate change increased the intensity of the rainfall and flooding in Louisiana during a summer storm in 2016 and from Hurricane Harvey in Texas in 2017.⁹⁷ In the mid-Atlantic region, climate change may have more than doubled the likelihood of the extreme rainfall that contributed to months of serious flooding in 2018.⁹⁸

Heavy precipitation events and floods will continue to worsen as pollution from fossil fuels warms the climate.⁹⁹ With an additional 3.6 °F of average global warming, the intensity of 500-year rainstorms (those that historically had a 0.2 percent chance of happening in a given year) could increase 10 to 50 percent across the contiguous United States.¹⁰⁰ That same amount of warming could also more than double the expected annual damages from 500-year river floods in the Midwest, Northeast, and northern and southern Great Plains.¹⁰¹

The average global sea level has gone up by 7 to 8 inches since 1900, and coastal flooding is getting worse as this rise continues.¹⁰² In the United States since the year 2000, rising seas have dramatically increased the number of high tide floods (i.e., floods that aren't associated with a storm), which make roads and parking lots inaccessible and damage businesses.¹⁰³ In 2018, 12 U.S. locations broke or tied their record for the number of days with high tide flooding, including Apalachicola, Florida (10 days); Wilmington, North Carolina (14 days); and Washington, D.C. (22 days).¹⁰⁴ Under continued high levels of climate-changing emissions, the national median number of high tide flood days could increase from 5 in 2018 to as many as 75 in 2050.¹⁰⁵

In addition to more frequent and severe high tide floods, sea level rise increases the destructive potential of coastal storms by increasing the height of storm surges.¹⁰⁶ (Storm surge, which is a wall of water pushed onshore by strong winds, is responsible for roughly half of the death toll of hurricanes.¹⁰⁷) What's more, warming ocean temperatures associated with climate change are expected to increase the intensity of hurricanes. Together these factors will make hurricanes more deadly and dangerous than ever.¹⁰⁸ The current consensus is that 3.6 °F of climate warming will increase hurricane wind speeds by a global median of 5 percent and will increase the global proportion of category 4 to 5 hurricanes by 13 percent.¹⁰⁹



Physical Health Threats

Floods and hurricanes create a multitude of hazards that threaten the health and life of workers directly engaged in disaster response and recovery.¹¹⁰

From 1992 to 2006, an estimated 72 occupational deaths in the United States were associated with hurricanes.¹¹¹ About 40 percent of those involved recovery workers engaged in activities such as storm cleanup and reconstruction.¹¹²

The inherent dangers of post-storm work—such as downed power lines, falling tree limbs, and falls from ladders and roofs—can be exacerbated by 12- to 18-hour workdays, inadequate health and safety training, a lack of housing, and insufficient access to, or time for, proper meals.¹¹³ For example, one worker engaged in recovery after Hurricane Michael (2018) required medical assistance after fainting from hunger while on a ladder.¹¹⁴

Non-hurricane floods caused at least 62 occupational deaths in the United States from 1992 to 2006; 45 percent were vehicle related.¹¹⁵ More than three-quarters of the workers drowned, often while in a motor vehicle, and nearly a quarter of the deaths were among employees in the transportation and materials-moving industry (e.g., delivery truck drivers).¹¹⁶

Floodwaters can also displace, injure, or trap wildlife, domestic animals, and pests, putting disaster workers at risk of stings, bites, or other injuries. In the wake of Hurricane Harvey (2017), for example, the Montgomery County Fire and Rescue Service in Texas warned that first responders were facing “flotillas of fire ants.”¹¹⁷ Fire

ants will aggressively attack people when disturbed, and their venomous stings can lead to skin infections or severe allergic reactions.¹¹⁸ After Hurricanes Katrina and Rita in 2005, close to half of 2,834 Coast Guard responders surveyed reported bites, scratches, or other injuries from insects or other animals.¹¹⁹ (The threat of tick- and mosquito-borne illnesses to workers is discussed in a later section.)

After floodwaters have receded, cleanup and reconstruction crews can be exposed to mold, dust, and other lung irritants.¹²⁰ For example, more than a quarter of day laborers who had been engaged in demolition, cleanup, and reconstruction efforts in 2017 after Hurricane Harvey reported difficulty breathing, more than a third reported headaches, and two-fifths said they had watery eyes or eye infections.¹²¹ Only 15 percent of the workers said they had been trained on the health risks of mold, and fewer than 40 percent had been given respirators while on the job.¹²²

Water or wind damage to industrial facilities, nuclear power plants, and even hospitals can expose workers to hazardous chemicals and nuclear radiation.¹²³ In 2017 Hurricane Harvey severely flooded the Arkema Chemical plant in Crosby, Texas.¹²⁴ The 12-person “ride-out crew” at the plant during the storm put their own lives at risk to keep organic peroxide containers cool so they wouldn’t ignite—including by manually moving more than 2,100 potentially flammable containers through chest-high water to back-up refrigeration.¹²⁵ Despite their efforts, the peroxide eventually exploded when the back-up refrigeration failed, releasing toxic smoke and fumes

The mental health consequences of disaster response can last for years.

that affected at least 21 emergency responders. The long-term health effects of this peroxide exposure remains to be seen.¹²⁶

Nurses and other health workers commonly endure long shifts, insufficient or unsafe food and water supplies, and inadequate bathroom facilities in the wake of major storms and floods.¹²⁷ Insufficient supplies and safe shelter in the wider community may even increase exposure to workplace violence.¹²⁸ Some Houston-area hospitals experienced “eruptions of domestic violence” among people who were using the hospitals as shelters from Hurricane Harvey, as well as break-ins by people looking for drugs.¹²⁹

Mental Health Threats

Storms and floods also put workers under considerable mental stress, particularly when they face the double whammy of challenging work conditions and harm to loved ones and personal property (Spotlight 6).¹³⁰

Multiple studies have found that firefighters, police officers, military personnel, and health care professionals engaged in disaster response have an elevated risk of unhealthy coping behaviors, such as problem drinking, and mental health challenges like depression and suicidality.¹³¹ The mental health risks of disasters can be further heightened among responders who have pre-existing mental illness, work in the most severely affected areas, have multiple or ambiguous job roles, face barriers to getting mental health care, or don’t get enough sleep.¹³²

The mental health consequences of disaster response can last for years. In June 2006, 5 percent of nearly 1,500 public health workers exposed to the severe 2004 and 2005 hurricane seasons in Florida met the criteria for post-traumatic stress disorder (PTSD).¹³³ More than 8 percent reported 14 or more mentally unhealthy days in the previous month.¹³⁴ In surveys done 10 to 12 months after Hurricane Maria, 23 percent of nearly 800 healthcare and social service workers in Puerto Rico reported moderate-to-severe anxiety, and nearly half met the clinical criteria for PTSD.¹³⁵

There is emerging evidence that journalists and school staff also may be prone to mental health problems after severe storms. During a disaster such as a hurricane, journalists can be repeatedly exposed to devastating scenes and have disturbing encounters with disaster survivors.¹³⁶ Two months after Hurricane Harvey hit Texas in 2017, for example, 20 percent of 30 television and newspaper journalists surveyed met the criteria for PTSD and 40 percent met the criteria for clinical depression.¹³⁷ In severely affected school districts, teachers and other school staff may struggle to cope with the emotional burden of providing mental health support to children.¹³⁸ Unfortunately, there is a dearth of data on the psychological well-being of journalists and school employees in the wake of disasters, making it difficult to provide them with the care they need.¹³⁹

SPOTLIGHT 6: JANET FONSECA, HEALTH CARE WORKER, SEIU TEXAS, CORPUS CHRISTI, TEXAS

“My area of Texas is getting hotter every year, and the storms are becoming more violent. When Hurricane Harvey hit in 2017, my 82-year-old great-aunt was living with me at the time. The storm was so powerful, it knocked trees over onto electrical lines, causing the power to go out in the area for a week.

“The heat was incredibly intense and my great-aunt, who was diabetic, started to pant and go through heat exhaustion. My husband and I had to go on a scavenger hunt to find generators, gas, and power to get the air conditioner running in her room. We were afraid her health could be at risk, and we needed to keep her insulin refrigerated.

“When the utility company tried to turn the electricity back on, the downed power lines would set trees and bushes on fire, so they’d have to shut it off again. My coworkers and my husband’s cousins came out to help clear debris off the lines because the company and local government were overwhelmed.

“One of my neighbors across the street was an older gentleman and a veteran, and his wife was on hospice, in the process of dying. A tree had fallen on their home and smashed through the roof, and they had no power. We tried to help and support them as best we could. I felt terrible for them.

“Everything was shut down, including hospitals, gas stations, and grocery stores. The hospital where I work was closed to new admissions for three to five days because of wind-driven rain and roof damage. For the patients who were already in my hospital when the storm hit, we couldn’t discharge some of them because their homes had been destroyed. Some were confused and traumatized; they just couldn’t wrap their minds around the fact that they didn’t have homes to go back to. It was like they were suddenly homeless.”

In 2012 temporary work interruptions associated with Hurricane Sandy resulted in \$7 billion in lost income over just four days from Florida to New Hampshire.

Wage and Job Losses

As discussed above in the section about extreme heat, losses in income can make it harder for workers to pay for housing, utilities, food, and medical care.¹⁴⁰ This is particularly true for the low-wage workers who make up 44 percent of the U.S. workforce aged 18 to 64 and are least likely to have pay-protection benefits such as paid sick leave.¹⁴¹ Losses in income or meaningful employment also can harm mental well-being and increase the frequency and severity of mental disorders such as depression and substance abuse.¹⁴²

Floods and Hurricanes

Recent floods and hurricanes in the United States have led to significant losses of income, especially for hourly workers without paid time off (Spotlight 7).

In 2012 temporary work interruptions associated with Hurricane Sandy resulted in \$7 billion in lost income over just four days from Florida to New Hampshire.¹⁴³ In New York City, flooding from the hurricane and months of subsequent repairs created significant commuting delays for employed New Yorkers and made it harder for unemployed people who depend on the subway system to look for new work.¹⁴⁴ For example, the R Train in Brooklyn was closed for repairs for two months in 2012 and another month in 2013. Average annual unemployment in Brooklyn neighborhoods with high dependence on the R Train increased 0.4 percent between those two years even as it decreased 1.4 percent in other, nearby neighborhoods.¹⁴⁵ The increase in unemployment was about three times higher for individuals without access to a vehicle than for those with one, and nearly two to five times higher among Asians, Blacks, and Hispanics than among whites.¹⁴⁶

In spring and summer 2019, historic flooding in the Midwest prevented a record-high number of farmers from planting crops such as corn.¹⁴⁷ Although much of the lost income for farmers will eventually be recovered through crop insurance, the wait for insurance checks combined with international trade disputes and other factors increased U.S. farm bankruptcies by 24 percent from 2018 to 2019.¹⁴⁸

In September 2019, workers in areas of the southeastern United States affected by Hurricane Dorian reported concerns about paying their bills due to business closures before and after the storm.¹⁴⁹ A few weeks later, a third of 3,300 Texas residents surveyed in the wake of Tropical Storm Imelda reported wage losses associated with the storm.¹⁵⁰

There is also the issue of wage theft, a common problem for immigrant workers after major storms.¹⁵¹ For instance, more than a quarter of 361 day laborers reported incidents of employers not paying them for work in the first month of recovery after Hurricane Harvey.¹⁵² Employers stole an average of \$212 per incident.¹⁵³ As a recent commentary in the *American Journal of Public Health* put it, “The chaos of the disaster recovery worksite, weak oversight by federal and state regulators, and fly-by-night contractors combine with immigrants’ own vulnerabilities to create maximally exploitative conditions for this workforce.”¹⁵⁴

Sea Level Rise

Sea level rise is already making it harder for people to travel to work in coastal U.S. cities. In 2015, for example, 43 percent of about 2,000 Portsmouth, Virginia, residents reported in surveys that recurrent flooding had kept at least one household member from getting in or out of

SPOTLIGHT 7: GINA WILLIAMS, GARMENT SEWER, WORKERS UNITED SOUTHERN REGION, SEIU, SAMPSON COUNTY, NORTH CAROLINA

“When Hurricane Florence hit North Carolina [in 2018], it flooded our roads and washed some of them completely away. I’ve been a lieutenant in my local volunteer fire department for a decade, and my husband, son, and daughter are also volunteers. The storm damaged our home’s floor and roof, but we had to get out into our community because some of our neighbors were impacted much worse.

“Many people’s homes were completely destroyed, and others had no food, water, or power for up to a month. We rescued them from their houses, fed them, and invited them to take showers at the fire department. We cleared fallen trees from roads and properties day after day.

“I work in a garment factory, and some of my coworkers had to miss three weeks of work because the roads were unusable, which was a financial burden on top of the losses we’d all experienced. I’m strongly dedicated to supporting my community in times of need, but I worry that we just won’t have the capacity to help everyone as these storms get worse and worse.”

their neighborhood.¹⁵⁵ Residents dependent on public transportation were particularly concerned about their ability to get to work when roads flooded.¹⁵⁶

In coastal New Jersey, an additional two feet of sea level rise could reduce the accessibility of jobs by nearly 45 percent in the town of Cape May, nearly 64 percent in Atlantic City, and more than 88 percent in Wildwood.¹⁵⁷ The average loss of accessibility would be 5.6 times higher for the lowest-income workers than for the highest-income workers.¹⁵⁸ According to one estimate, there is about a 50 percent chance that New Jersey will experience 1.9 to 2.5 feet of sea level rise by 2070.¹⁵⁹

Disruptions to infrastructure also affect local economic activity. In 2017, for example, recurrent flooding in a major parking lot in downtown Annapolis, Maryland, reduced the income of 16 businesses that year by somewhere between \$86,000 and \$172,000.¹⁶⁰

WILDFIRES POSE MYRIAD HEALTH THREATS

The relationships among wildfire, climate, and how people prevent and manage fire is complicated and highly location dependent.¹⁶¹ In general, however, rising temperatures and changes in precipitation are drying out soils and vegetation and, in some areas, boosting the growth of grasses that act as kindling.¹⁶²

As a result, wildfire seasons are getting longer and more severe. From 1985 to 2016, the total area burned annually by wildfires in the United States increased fourfold.¹⁶³ And communities in wildfire-prone areas are growing rapidly, putting more people in harm's way. In the contiguous United States, the number of homes in areas with a medium to very high likelihood of wildfire increased by an estimated 6.1 million (more than 1,000 percent) from 1940 to 2010.¹⁶⁴

Increases in wildfires will put more emergency responders and recovery workers in dangerous situations and expose more outdoor and indoor workers to unhealthy wildfire smoke.



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From 2009 to 2018, 144 wildland firefighters in the United States died from on-duty illnesses or injuries.

Deaths and Injuries Among Wildland Firefighters

Wildland firefighting is an inherently dangerous job.¹⁶⁵ It typically requires strenuous work over 12 to 16 hours a day for up to 14 consecutive days.¹⁶⁶ During that time, workers wear heavy protective gear that can restrict their movement and increase the risk of heat illness.¹⁶⁷

From 2009 to 2018, 144 wildland firefighters in the United States died from on-duty illnesses or injuries.¹⁶⁸ Common causes of death among wildland firefighters are direct exposure to flames, vehicle and aircraft accidents, and illnesses such as heatstroke and heart attacks.¹⁶⁹

From 2003 to 2007, wildland firefighters in the United States experienced an estimated 1,301 nonfatal injuries on the job.¹⁷⁰ Slips, trips, and falls made up 28 percent of the injuries, possibly due to uneven or steep terrain; 22 percent of injuries were related to equipment, tools, and machinery.¹⁷¹ Late-season injuries had twice the odds of being severe than those during early or peak season, potentially because of fatigue.¹⁷² (The study authors defined a severe injury as one that “requires days away from work, days of restricted work, or job transfer.”¹⁷³) As wildfires increase, wildland firefighters will spend more time on the job, risking injury or death in each fire season.

Health Threats of Wildfire Smoke

Wildfire smoke contains hundreds of chemicals and components that are hazardous to human health, such as formaldehyde, heavy metals, and tiny particles (particulate matter).¹⁷⁴ The exact composition of wildfire smoke is determined by factors such as the temperature of the fire, the materials that are burning, and the weather.¹⁷⁵

Particulate matter is the primary—and best understood—health threat from exposure to wildfire smoke.¹⁷⁶ When small particles travel deep into the lungs and enter the bloodstream, they can exacerbate or cause a wide range of health effects, including asthma, heart attacks, lung cancer, and premature death.¹⁷⁷

A 2019 study of firefighters across the United States found that long-term exposure to particulate matter in wildfire smoke significantly increased the risk of dying from lung cancer and cardiovascular disease.¹⁷⁸ Wildland firefighters who worked longer seasons and for more years

had a higher risk of deadly illness. For example, the risk of lung cancer was more than 65 percent greater among long-season workers (98 days per year) than among short-season workers (49 days per year). Firefighters with 25 years of experience had roughly double the risk of lung cancer relative to those with 10 years of experience.¹⁷⁹ As fire seasons continue to lengthen under climate change, wildland firefighters will face increasing threats to their lung health.

Polycyclic aromatic hydrocarbons, a carcinogen found in wildfire smoke, may elevate the risk of lung, bladder, and skin cancers; immunological disorders; and some forms of heart disease in wildland firefighters.¹⁸⁰ Studies in California suggest that exposures to polycyclic aromatic hydrocarbons can happen both on the fire line and off it, while firefighters are at nearby command posts.¹⁸¹

Finally, there is carbon monoxide, a colorless, odorless gas generated both by wildfires themselves and by the diesel- or gas-powered machines commonly used during wildfire cleanup and recovery.¹⁸² In high enough concentrations, carbon monoxide reduces the amount of oxygen delivered to the body’s organs and tissues.¹⁸³ It can cause a range of symptoms, from headache, weakness, and confusion to coma and death, and is particularly problematic for people who have cardiovascular disease.¹⁸⁴ Wildland firefighters are most vulnerable to carbon monoxide exposure during the “mop up” stage, when materials are smoldering and firefighters are putting out lingering small fires.¹⁸⁵

Most of what is known about the occupational health harms of wildfire smoke comes from studies of firefighters, who have the highest levels of exposures to smoke over the longest periods of time. However, wildfire smoke can cause significant health effects hundreds of miles from the flames.¹⁸⁶ This means that outdoor workers such as farmworkers, telephone line technicians (Spotlight 8), and construction workers can also be at risk.¹⁸⁷ Indoor workers may likewise be exposed to smoke if their building HVAC systems don’t provide enough filtration or are otherwise working incorrectly.¹⁸⁸ More research is needed to understand the long-term health effects of wildfire smoke exposure in workers, particularly among low-wage populations who feel they have to work through dangerous situations to make ends meet.¹⁸⁹

SPOTLIGHT 8: SHAWN HEAPE, TELEPHONE LINE TECHNICIAN, CWA LOCAL 9400, LAKE COUNTY, CALIFORNIA

“What people need to understand is that telephone line technicians are first responders too. When wildfires break out, we’re out there working day and night to restore landline and cell phone service to customers while the fires are still burning. Residents, businesses, and government agencies need their ability to communicate with each other in order to keep people safe, so our work can be a matter of life and death. We’re dealing with heat exhaustion and also breathing in soot, ash, and toxic chemicals, which is one of my main concerns.

“I’ve been doing this work for 20 years and have been going to wildfires from the beginning. In recent years we’ve been having wildfires one right after the other, which can stretch for hundreds of miles. During wildfire season, I work 16 hours a day, seven days a week for up to four months straight.

“The fire department doesn’t care about putting out telephone poles and lines that are on fire because they have other priorities, so it’s up to us. The poles and lines contain chemicals that can be highly toxic when burned. We’re breathing those chemicals in and getting covered in dark ash. My coworkers and I get nosebleeds, and when we blow our noses black mucus comes out. Then we’re going home to our children and spouses covered in all those poisonous chemicals. I’ve raised five kids while I’ve had this job, and one’s still at home. I’m afraid of what my family and I have been exposed to over the years.

“We should have wash stations for clothes instead of having to bring our clothes back and clean them in our home washing machines. We also need high-quality respirator masks that effectively filter the air and are easy to wear and breathe with in high temperatures. Companies and governments need to start taking steps to protect those of us who are working in and around wildfires to keep communications services going.”

Mental Health Threats

As with storms and floods, the danger and destructiveness of wildfires can harm the mental health of people engaged in fire response and recovery. Potential outcomes for these workers include depression, PTSD, and suicidality.¹⁹⁰

Wildland firefighters may be at elevated risk of mental health challenges due to repeated exposure to highly stressful or traumatic situations, long workdays without enough rest, extended time away from home, lack of social support among colleagues, and workplace stigmas about seeking mental health care.¹⁹¹ Suicidality appears to be a growing problem among firefighters and other emergency responders across the country, although official data on deaths by suicide are lacking for wildland firefighters.¹⁹² In 2019 California lawmakers were concerned enough by available data to pass a trio of bills intended to provide more mental health support to first responders.¹⁹³

After wildfires, some workers may become unofficial mental health counselors for their colleagues and community. Without appropriate training in self-care, they may themselves experience emotional distress.¹⁹⁴ For example, six months after the 2018 Camp Fire in California, public school educators without mental health training struggled to help affected students when the Butte County Office of Education couldn’t fill all the requests it got for trained mental health professionals.¹⁹⁵ Beauty salon workers likewise were exposed to repeated stories of loss from their clients who had survived the Camp Fire, leading a local community liaison from California State University to wonder, “How can beauty industry professionals cope with the trauma that they encounter every day?”¹⁹⁶

Additional research is needed to better understand how wildfires affect the mental health of workers, particularly when those workers suffer serious personal losses during the fires (Spotlight 9).¹⁹⁷

SPOTLIGHT 9: JOHN ALLEN, HOSPITAL COOK, SEIU UNITED HEALTHCARE WORKERS WEST, CHICO, CALIFORNIA



© Courtesy of John Allen

“[In 2018] I drove to work one morning at 4 a.m. and it was just like any other normal day. But when I got to the hospital where I work, one of the doctors said to me, ‘Don’t you know there’s a fire where you live? The entire town of Paradise is on fire.’

“My wife was recovering at home from breast cancer surgery and was in no shape to drive. I raced to my car and tried to drive back up the mountain to our house, but the authorities had blocked the roads and turned me away. I called her and said, ‘Just get out! Don’t grab anything, just leave now!’

“The fire moved so fast, people barely escaped with their lives, and some didn’t escape at all. My wife’s mother was living in a senior mobile home park and was partially deaf, so she didn’t hear the evacuation announcement and died in the fire. A couple of my coworkers and my wife’s sister lost their homes and everything inside. The senior home where my wife worked was completely destroyed, but fortunately the residents were evacuated.

“We loved living in Paradise, but now there’s no infrastructure and nothing to go back to, so we’ve rented an apartment in Chico. For weeks afterwards, you couldn’t go outside without a mask, even to just get the mail. Ash was always falling from the sky so thick that it covered cars and filled the beds of pickup trucks. Seven months after the fire, FEMA contacted us and asked if we wanted to live in a trailer but we said no thanks.

“We lost everything—birth certificates, our parents’ keepsakes, bicycles for the grandkids, all our life’s photographs. That’s one of the hardest parts: All we have left are memories and the pictures on our phones.”



DROUGHT IS KICKING UP UNHEALTHY DUST

Outdoor workers in parts of the Southwest and Great Plains face heightened health risks as rising temperatures increase the frequency and severity of dust-producing droughts.¹⁹⁸ Droughts that are currently considered 100-year events (i.e., those with a 1 percent chance of occurring in any given year) could become more than 20 times as frequent across most of the United States by the period of 2070 to 2099, relative to the period of 1980 to 2009.¹⁹⁹ In arid areas of the western United States, drier soils and increased wildfire activity—which removes vegetation and other natural soil stabilizers—will increase wind erosion and cause more unhealthy dust to be released into the air.²⁰⁰ By one estimate, warming and drying of the U.S. Southwest could increase average annual concentrations of fine dust by 57 percent in the period of 2080 to 2099, relative to the period of 1986 to 2005.²⁰¹

Respiratory Health Threats

Fine dust is a threat to lung health. Small dust particles travel deep into the lungs and enter the bloodstream, where they can cause or exacerbate conditions such as asthma and bronchitis.²⁰² Silica, a major component of desert dust, can permanently scar lung tissue and cause lung cancer.²⁰³ Dust also can carry pesticides and heavy metals as well as viral, bacterial, and fungal pathogens.²⁰⁴

One such infectious disease is valley fever, a respiratory illness caused by multiple species of *Coccidioides* fungi and spread by contaminated dust.²⁰⁵ Arizona and California typically account for more than 96 percent of U.S. valley fever cases.²⁰⁶ About 40 percent of those infected get flulike symptoms such as coughing, fever, and fatigue.²⁰⁷ In rare situations, the infection can spread outside the lungs, causing meningitis and other severe conditions.²⁰⁸ For unknown reasons, African-Americans and people of Filipino descent are more likely to develop serious valley fever infections than are other racial and ethnic groups.²⁰⁹

From 1940 to 2015, more than half of all outbreaks of valley fever worldwide were associated with workplace exposures to *Coccidioides*.²¹⁰ Workers engaged in construction, farming, or other activities that disturb soil are most likely to be infected.²¹¹ For example, 574 active duty service members of the U.S. military were diagnosed with valley fever between 2007 and 2017.²¹²

Valley fever can result in significant medical expenses and time away from work. From October 2011 to 2014, there were 44 cases of valley fever among workers at two solar farm construction sites in California's San Luis Obispo County.²¹³ Thirty-nine percent of the infected workers visited the emergency room, and 20 percent were hospitalized for a median of three days. More than 80 percent of the infected workers had to take time off work, with two of them missing 18 or more months.²¹⁴

Traffic Accidents

In 2018 work-related vehicle accidents caused 40 percent of all work-related deaths in the United States.²¹⁵ Blowing dust can cause dangerous conditions in which drivers are unable to see the road and other vehicles.²¹⁶ For instance, a dust storm in May 2019 near Hazelton, Idaho, led to a multi-vehicle pileup that killed one person and put two semi-truck drivers in the hospital.²¹⁷ From 2006 to 2016 there were 204 wind-related vehicle accidents in California's San Bernardino, Riverside, and Imperial Counties during dust events.²¹⁸

The National Weather Service issues dust storm watches and warnings to warn drivers of dangerous conditions.²¹⁹ These advisories are most common in the region spanning the southwestern Great Plains to the desert Southwest—areas expected to become hotter and drier as the climate changes.²²⁰ In one part of the southern Great Plains covering southeast New Mexico, West Texas, southeast Colorado, southwest Kansas, and the Oklahoma panhandle, researchers found 620 areas with particularly high concentrations of dust production from 2010 to 2016.²²¹ These zones, most of which were close to highways, produced even more dust after severe drought.²²²

TICKS AND MOSQUITOES THREATEN OUTDOOR WORKERS

Climate change is helping some species of disease-carrying ticks and mosquitoes move into new parts of the country, stay active over more of the year, and produce more offspring in a given season (Spotlight 10).²²³ These changes in the distribution, seasonality, and abundance of pests likely will increase the exposure of outdoor workers to diseases such as West Nile virus, Zika virus, and Lyme disease.²²⁴

Few studies have examined the occupational threats of mosquito- and tick-borne illnesses.²²⁵ In general, however, outdoor workers who spend time in wooded or brushy areas, in flood zones, and on urban construction sites are thought to have the greatest exposure.²²⁶ For instance, after a Zika virus scare at a Miami Beach construction site in 2016, local mosquito-control authorities issued warnings about the threat workers face from mosquito-borne illnesses.²²⁷

SPOTLIGHT 10: MICHELLE BOYLE, REGISTERED NURSE, SEIU HEALTHCARE PENNSYLVANIA, PITTSBURGH

© Courtesy of Michelle Boyle



"I'm a registered nurse at a hospital in Pittsburgh, and the climate crisis is affecting my family, my neighbors, and my patients. We're experiencing an onslaught of life-threatening heat, flooding, smog, and Lyme disease.

"As average temperatures keep rising, the warmer winters mean ticks are thriving, spreading the diseases they carry. My neighbor's son was infected with Lyme disease three times by the time he was 12—and we live in the city. I worry that as insect-borne diseases like Zika, West Nile, and chikungunya spread, we don't have enough tools in our arsenal to fight them.

"Hotter temperatures also increase ground-level ozone pollution which results in smog, and our city has an F rating for air quality from the American Lung Association. My husband is a runner, and he developed asthma after we moved here 17 years ago. Air pollution also leads to cardiovascular disease, heart attacks, and strokes. I'm worried about the health of my two teenage daughters who've grown up breathing this air.

"The climate crisis is also generating higher precipitation. Pittsburgh, known for its three major rivers, has a higher chance of flooding in many of our neighborhoods. This inflicts millions of dollars in damage to homes and businesses and makes it harder for emergency workers to reach people who need medical care. Recently we were unable to transport certain patients because roads were closed due to flooding. How many consecutive years can we have '100-year floods' before they stop calling them that?

"Not only are ambulances being impeded, but I know flight nurses who haven't been able to take off because it's too hot and humid to fly, or have been grounded due to increasingly intense storms. I work at a level one trauma center, and getting patients to the hospital as fast as possible really is a matter of life and death.

"My family and I have been advocating for solutions to the climate crisis on a local level, but we need to address these multiple problems on a grand scale. We need our hospitals to have proper staffing and emergency protocols in place to deal with climate-related disasters. We need more funding invested in infectious disease research and treatment. We must vastly expand the renewable energy economy to clean up our air, and make sure those new jobs are good, middle-class jobs where workers have a union voice.

"As a nurse for the past 25 years, when I look at all the interrelated problems created by the climate crisis, it's terrifying. Science tells us this is just the beginning of these types of issues. I try to remember the quote by Jonas Salk, who developed the polio vaccine here in Pittsburgh: 'I have had dreams and I have had nightmares, but I have conquered my nightmares because of my dreams.' I'm committed to conquering our climate nightmare, because it's the least I can do for my children."

Members of the U.S. military are exposed to a wide array of infectious diseases carried by mosquitoes and ticks.²²⁸ The most common tick-borne illness among military personnel is Lyme disease: From 2006 to 2012, there were more than 1,300 new cases of Lyme disease among active duty military forces at just 14 bases in the central and eastern United States.²²⁹ Left untreated, Lyme disease can cause severe headaches, muscle and joint pain, nerve pain, and other debilitating symptoms.²³⁰ In recent years, at least two cadets and two graduates of the U.S. Military Academy at West Point were discharged from the Army because of late-stage Lyme disease.²³¹

Mosquito-borne illnesses of concern to the military include St. Louis encephalitis, West Nile virus, dengue fever, and Zika virus.²³² From 2006 to 2015, there were 323 confirmed cases of West Nile virus and 700 confirmed cases of dengue fever among U.S. military personnel.²³³ Although most people infected with West Nile and dengue suffer few to no symptoms, these diseases can cause hospitalization or death.²³⁴

Laboratory and modeling studies suggest that transmission of Zika virus is highly temperature dependent—about 84 °F seems to be optimal—and that rising global temperatures could expand Zika’s geographic range and lengthen its annual season.²³⁵ As of 2016, about 6 percent of the 733 military bases in the United States were suitable habitats for both Zika virus and the mosquitoes that carry it.²³⁶ Typically, people infected with Zika virus don’t feel ill or experience only mild, flulike symptoms.²³⁷ However, Zika can cause miscarriages and a range of severe birth defects, and it appears to be linked to a rare neurological condition in children and adults called Guillain-Barré syndrome.²³⁸

DOCUMENTING CLIMATE DISRUPTION IS A MENTAL HEALTH BURDEN

One emerging area of occupational health is the mental well-being of scientists and other professionals engaged in documenting, analyzing, and communicating the scope of the climate crisis. Although there is virtually no research on the topic, recent media reports indicate that many climate and environmental science professionals are under considerable mental stress.²³⁹ For example, a 2018 analysis of 43 letters written by climate scientists for the storytelling project “Is This How You Feel?” found 38 mentions of seven positive emotional terms such as “hopeful” and “grateful” but 60 mentions of nine negative terms such as “frustrated” and “afraid.”²⁴⁰

A potential barrier to mental well-being among climate scientists is the widespread idea that being emotional about one’s science indicates “weakness, character deficiency, or, worse, lack of scientific integrity and objectivity.”²⁴¹ The perceived need to be unemotional may pose a particular challenge to scientists and communicators in the current political context, when their alarms are unheeded or even mocked.²⁴²

Anecdotally, at least, the mental health challenges of working on climate change has driven some scientists and communicators to switch careers.²⁴³ Given how important scientists and communicators are to understanding and solving the climate crisis, these departures give new meaning to the International Workers of the World motto: “An injury to one is an injury to all.”²⁴⁴

Recommendations to Keep Workers Safe in a Hotter, More Extreme World

Climate change is layering a daunting array of health and safety threats onto the already challenging and complicated landscape of workplace hazards. In some cases, the climate crisis will exacerbate existing conditions such as extreme heat. In others, it will create entirely new hazards, such as the permanent inundation of long-standing businesses or transportation corridors. Across the board, unchecked climate change has the potential to harm individual workers again and again—within their lifetimes, in the space of a few years, or even during a single season (Spotlight 11).²⁴⁵

Across the board, unchecked climate change has the potential to harm individual workers again and again—within their lifetimes, in the space of a few years, or even during a single season.

Fortunately, many of the occupational harms of climate change can be managed by adhering to four basic principles of worker health and safety:

1. All workers have the right to a safe and healthy workplace.
2. All occupational injuries and illnesses can be prevented if workplace hazards are correctly identified and eliminated or adequately controlled.
3. Occupational safety and health laws and regulations need to be established, effectively communicated, periodically updated, and rigorously enforced.
4. Collective action by workers and their representatives is an essential element of workplace health and safety.

The recommendations that follow flow from these principles and our research and reporting.

SPOTLIGHT 11: JULIA KNOWLES, SERVICE REPRESENTATIVE, CWA LOCAL 3201, ALBANY, GEORGIA

© Courtesy of Julia Knowles



“I’ve survived three natural disasters. In 1994 and ’98 we had ‘100-year floods’ that hit Georgia twice in four years, and then Hurricane Michael struck in 2018. In 1994 my husband at the time was on leave from the military, and we came home to Georgia with our two children to surprise our families. He was staying at his parents’ home in East Albany and I was at my mother’s with the kids in South Albany, so we were separated by the river. When the rain started, my mom called me from the local hospital where she worked as a nurse and said to leave her home because a flood was coming. When I went outside the water was already halfway up the car tires.

“My mother lost her entire home in the flooding. My children and I had to go to a shelter and spent two weeks there. For three days my mom was stuck at her hospital, and then the National Guard brought her to join us at the shelter. The floodwaters and damage kept my ex-husband from getting to us.

The experience was financially devastating and also emotionally disturbing for our whole family. There was so much human suffering in the shelter. Some people were disabled and didn’t have proper accommodations, and others had urgent medical needs that went unmet.

“When Hurricane Michael hit, it was another extremely difficult experience. We went 12 days without power, and it was a real struggle because I was living with and caring for my disabled mom, who’s now 76 years old. By the time Michael got to us, it was still a category two storm, but our city’s infrastructure isn’t designed to handle that. In my lifetime we’d never had a hurricane in this area. We’re three hours north of the Florida state line and far inland.

“A hundred percent of the city lost power. Our water became contaminated with sewage and for weeks we had to boil it before we could drink or bathe with it. Phone lines were down and cell phone towers were damaged, so our phones and internet weren’t working and we had no form of communication. It was months before we got internet service back. My work was also shut down so we didn’t have any income coming in. We went down to try get some help from the government so we could eat, and there must have been 1,000 people waiting in line for food stamps.

“Another way that climate change is affecting our community is the spread of insect-borne disease. It’s become so hot that the number of mosquitoes has increased, because the winters aren’t cold enough to kill them off. There are more and more cases of West Nile each year. It’s a vicious circle as the storms and flooding overwhelm our drainage and sewer system, and then the water just sits there, providing a breeding ground for more mosquito eggs. The working class and poor neighborhoods are hit the hardest, where the infrastructure is the most in need of repair.

“I know people are experiencing this kind of violent, erratic weather all over the U.S. When I hear there are over 90-degree temperatures in Alaska, it’s clear global warming is a real problem for our whole country. I hope our government starts to proactively deal with these issues by upgrading our infrastructure, promoting electric cars and charging stations, and creating more storm preparedness before it’s too late.”

ALL WORKERS HAVE THE RIGHT TO A SAFE AND HEALTHY WORKPLACE

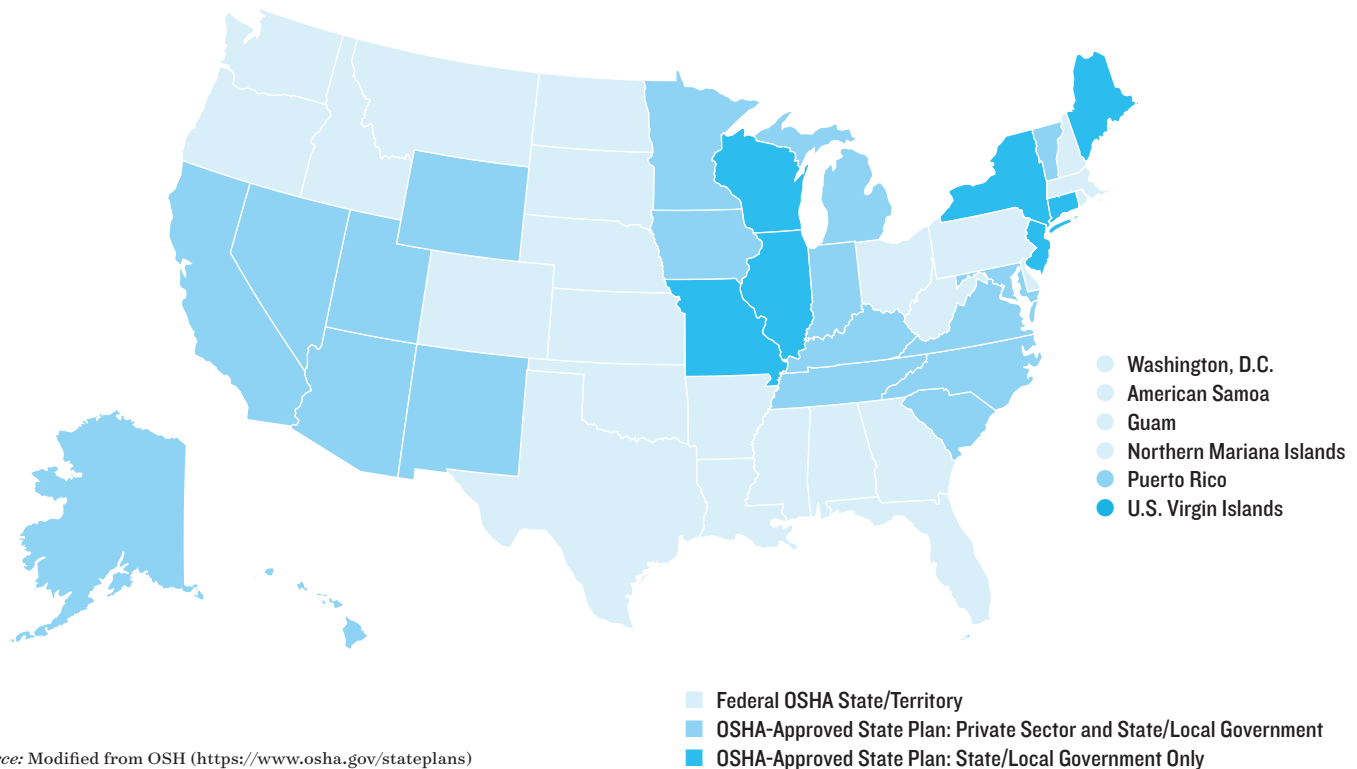
■ **Congress should amend Section 3 of the Occupational Safety and Health Act of 1970 (OSH Act) to expand protections for public sector workers.** The OSH Act, which is administered by the Occupational Safety and Health Administration (OSHA), is intended “to assure safe and healthful working conditions for working men and women.”²⁴⁶ Unfortunately, the OSH Act covers most private sector and federal workers but doesn’t apply to state and local government workers.²⁴⁷ State and local public sector workers enjoy OSH Act protections only if they work in one of 28 states or territories that have developed an OSHA-approved state plan that must “operate at least as effectively as OSHA” and “[meet] its mandated responsibilities under the [OSH] Act.”²⁴⁸ (Those states are shown in Figure 2.) Many of the remaining states and territories (known as federal OSHA states and territories) are the most vulnerable to climate-related disasters, such as the Gulf Coast states and the island territories. Public sector employees deserve full protection under the OSH Act, especially given their critical role in disaster preparation, response, and recovery.

OCCUPATIONAL INJURIES AND ILLNESSES CAN BE PREVENTED IF WORKPLACE HAZARDS ARE CORRECTLY IDENTIFIED AND ELIMINATED OR ADEQUATELY CONTROLLED

■ **The Bureau of Labor Statistics (BLS) should work with the U.S. Centers for Disease Control and Prevention (CDC) and the Office of Personnel Management to develop a coordinated, climate-relevant, and publicly accessible national surveillance system for occupational health and safety.** Comprehensive and timely collection, analysis, and interpretation of occupational illness and injury data—known as “surveillance”—is an essential first step in developing plans to improve worker health.²⁴⁹ Unfortunately, occupational health surveillance systems in the United States suffer from multiple shortcomings, particularly when it comes to climate-related health conditions. These shortcomings include underreporting of illnesses and injuries by workers and employers; inconsistent identification of deaths that occur years after occupational exposure to harmful agents like wildfire smoke and toxic chemicals; lack of a “one-stop shop” for data on exposure, injury, illness, and death; inadequate tracking of injuries among migrant and

FIGURE 2: OCCUPATIONAL SAFETY AND HEALTH PROTECTIONS, BY STATE, FOR PRIVATE SECTOR AND STATE AND LOCAL PUBLIC SECTOR WORKERS

Levels of OSH Act protections in the District of Columbia and U.S. territories are shown in the circles at lower right.



Source: Modified from OSH (<https://www.osha.gov/stateplans>)

seasonal farmworkers; inconsistent tracking of heat-related and disaster-related deaths and illnesses; and the absence of relevant demographic data (e.g., occupation, industry, and employment status) in some databases.²⁵⁰ A national, standardized tracking system is crucial to understanding the scope of the problem and being able to adequately address it.

- **Congress should amend Section 20 of the OSH Act to explicitly direct the CDC's National Institute for Occupational Safety and Health (NIOSH) to expand its climate change research, and to ensure NIOSH is sufficiently funded to carry out the research.**²⁵¹ Despite a recent uptick in scientific interest in the occupational health harms of climate change, remarkably little is known about how climate hazards other than heat affect workers.²⁵² Even the heat research hasn't adequately explored questions such as the economic costs and benefits of heat interventions.²⁵³ These information gaps hamper the ability of workers, occupational health and safety activists and professionals, employers, and regulators to design and implement protective strategies and policies.²⁵⁴ For instance, the California Occupational Safety and Health Administration in 2019 established an emergency regulation requiring employers to provide special masks to their outdoor workers to protect them from wildfire smoke. However, no one is sure how well the masks will work in the real world.²⁵⁵ NIOSH is one of the institutions best poised to lead policy-relevant research on health—it now needs the mandate and funding to be able to do so.²⁵⁶
- **The Department of Labor should work with NIOSH and other federal agencies to develop a comprehensive plan to address the cumulative threats of climate change.** Workers don't face climate-related hazards in isolation. For example, moving work hours to cooler periods to avoid heat ends up increasing the likelihood of encountering disease-carrying mosquitoes.²⁵⁷ The personal protective equipment used to avoid wildfire smoke and valley fever increases the risk of heat-related illnesses (Spotlight 12).²⁵⁸ Furthermore, climate change exacerbates existing economic stressors on both workers and employers. Any federal plan to improve worker health and safety must keep these inter-connected variables and risks in mind.

- **Congress and the administration should look for creative ways to help professionalize disaster response and recovery across multiple sectors, including through job creation and training programs and climate information support to labor unions and employers.** As weather extremes continue to get more frequent and intense, increasing numbers of workers are acting as disaster responders, but without appropriate training, technical support, or pay (Spotlight 13).²⁵⁹ In one extreme example, the Instituto de Educación Popular del Sur de California documented multiple cases of domestic workers—who earn just \$10,000 to \$20,000 per year—tasked with protecting their employers' homes and pets during the 2018 Woolsey Fire in California.²⁶⁰ Disaster responders, both professional and ad hoc, need increased support.

SPOTLIGHT 12: BURT VILLALBA, TELEPHONE LINE TECHNICIAN, CWA LOCAL 9423, SAN JOSE, CALIFORNIA

"The wildfire in Paradise was the worst I've ever seen in 20 years of doing telephone line repair. The whole town was completely destroyed, burned down to the foundations. If you walked down a block, maybe you'd see one house still standing.

"I also repaired lines in and around wildfires in Napa, Clear Lake, and Redding [in 2018], and the extent of the damage over hundreds of miles was shocking. We started our days at 5:30 a.m. and worked until seven at night, seven days a week for eight months straight with no days off, trying to restore service. We were tearing down old telephone poles, cell phone towers and lines, and replacing them with new ones.

"We were constantly breathing in smoke and ash and covered head to toe in soot. You could taste the toxic chemicals from the smoke in the back of your throat. The company gave us thin dust masks, but a lot of us didn't want to wear them because in the intense heat, they make it hard to breathe. In Clear Lake, it was over 100 degrees multiple days in a row. One coworker got heatstroke so bad he couldn't walk. He nearly passed out and had to miss a couple days of work.

"Our attitude is 'Just get the job done,' and we do what it takes despite the heat exhaustion and smoke. But I wonder what long-term effects those chemicals will have on me. I'm a father of four, and I hope I'm around to spend time with my grandkids."

SPOTLIGHT 13: DEBRA BRYANT, IN-HOME SUPPORTIVE SERVICES PROVIDER, SEIU LOCAL 2015, WILLITS, CALIFORNIA

© Courtesy of Debra Bryant



“I’ve lived in Willits near California’s Redwood Valley for 30 years, and recently the forest fires have gone mad. The winds are crazy, and the fires are hotter and faster than ever before. This is really dangerous for more isolated, rural areas and our growing senior population in those communities.

“For the past five years I’ve been working as an in-home supportive services provider, caring for seniors and people with disabilities. I put my entire heart into my job—it’s very personal, and I become bonded to my clients.

“In October 2017, hundreds of wildfires broke out all over Northern California and were so out of control that they cut off Highway 101. My town is 1,500 feet up in the mountains and that highway is our only way in or out. We also had no way to communicate or get information because all the landlines and cell towers had burned, leaving us with no phones, radio, or internet.

“I didn’t know what was going on until all of a sudden I found out that the fires were only a mile away. I became really worried about the client I was taking care of and the two senior complexes in town. I couldn’t get hold of the local social services agency or the sheriff, so I went myself to see a friend who worked at one of the senior facilities. I told her we needed to do something, and she said, ‘Go door to door and ask the residents if they have a way to get out. If not, we’ll commandeer the facility’s vans and evacuate them to a shelter.’ There was no pre-designed plan to get folks out of there.

“Fortunately, that fire was brought under control before it destroyed our town, but the smoke and ash were choking. I have asthma, and the smoky air caused me to have frequent coughing, tightness in my throat, sinus infections, and a heaviness in my chest when I tried to breathe. Prior to becoming a home care worker, I was a respiratory therapist, and with my professional experience I was anxious about people with chronic obstructive pulmonary diseases like emphysema.

“Then, in October 2019, Pacific Gas and Electric preemptively shut off power in our area for four days to prevent its equipment from causing another outbreak of wildfires during high winds. But the power shutoff was a crisis in its own way. The temperature dropped down to 24 degrees at night, and our house was freezing because like most people around here, we have electric heat. To cook, we set up a propane camping stove on the deck.

“Another problem was that the power outage shut off medical devices such as oxygen machines and ventilators that seniors relied on. Concentrators, the machines that make oxygen-rich gas from the surrounding air, couldn’t run, and the local company that sells oxygen tanks ran out. My home care client at the time was a woman in her 60s with a chronic disease, and she could have gone unconscious or died if her oxygen didn’t last.

“Even though home care providers and their families were suffering during the shutoff, they really went above and beyond for their clients. One caregiver took hot water and blankets to a client, another stayed at the client’s home the entire time, and one brought the client to stay at her own house. If it hadn’t been for home care workers, people would have died.

“These climate-related disasters are going to get worse, and more remote areas of the country will be particularly hard hit. We need local governments, home care agencies, and health care facilities to put plans in place and prepare. For example, we need solar panels that can kick in during power outages, especially for nursing homes and hospitals. We need a system to track, contact, and quickly evacuate seniors and people with disabilities. We also need to increase the number of home care workers in our rural communities and improve their jobs so we can recruit and retain caregivers. With the aging population, home care workers are the first responders who will go out, check on people, and save lives.”



OCCUPATIONAL SAFETY AND HEALTH LAWS AND REGULATIONS NEED TO BE ESTABLISHED, PERIODICALLY UPDATED, AND RIGOROUSLY ENFORCED

- **OSHA should establish an enforceable federal heat health standard for all workers based on the 2016 recommendations made by NIOSH and the July 2018 Public Citizen petition to OSHA.**²⁶¹ OSHA's General Duty Clause requires employers to supply "employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to [their] employees."²⁶² The General Duty Clause hypothetically protects workers from hazards that aren't covered by specific regulatory standards, such as extreme heat.²⁶³ However, many employers aren't even taking basic steps to protect workers from heat, and OSHA rarely enforces the General Duty Clause.²⁶⁴ Water, rest, and shade are the three most fundamental elements of workplace heat health programs.²⁶⁵ Yet in an analysis of 84 federal OSHA heat enforcement actions from 2012 to 2013, researchers found that nearly a quarter of the cited employers didn't provide adequate access to water, and more than a third didn't provide shade or a cool indoor space in which to rest.²⁶⁶ Furthermore, the General Duty Clause is difficult to enforce because it has particularly stringent rules about evidence. The Occupational Safety and Health Review Commission set a dangerous precedent in February 2019 when it overturned an OSHA citation to a roofing company for the heatstroke death of a temporary worker, based in part on a perceived lack of evidence of a heat hazard.²⁶⁷ This case only reinforces the dire need for an enforceable federal heat health standard.

- **OSHA should expedite its review and update of the existing emergency response and preparedness standards.** Many of the federal workplace standards for emergency response and preparedness are decades out of date, are not comprehensive, and do not consider the effects of climate change. For example, hospitals are supposed to create emergency action plans to protect employees from hazardous substances, but there do not appear to be any requirements to develop evacuation plans in case of a hurricane or other extreme weather event.²⁶⁸ OSHA has been "considering updating these standards" since at least 2014 but has made little progress.²⁶⁹ They should expedite that process now, and ensure that any new or revised standards are designed to withstand future climate conditions.
- **Congress should ensure that OSHA has enough budget and staffing for timely and effective enforcement.** OSHA's general lack of enforcement capacity makes it difficult for the agency to hold employers accountable for workplace health and safety.²⁷⁰ According to the AFL-CIO, there was only one federal or state inspector for every 79,262 workers in fiscal year (FY) 2018.²⁷¹ For context, the International Labor Organization recommends that developed nations have one labor inspector for every 10,000 workers.²⁷² Moreover, OSHA worksite inspections for heat violations declined 43 percent between FY 2016 and FY 2018, and OSHA investigated only a quarter of the occupational deaths reported from 2014 to 2017 by the BLS.²⁷³ Worker safety standards will continue to mean little unless OSHA has the funding and manpower to enforce them.
- **Congress should ask the U.S. Government Accountability Office to evaluate OSHA's current use of maximum penalties where warranted and consider directing OSHA to further increase those maximums.** Under the Obama administration, OSHA significantly increased civil penalties for employers for the first time since 1990.²⁷⁴ The agency also started making yearly adjustments for inflation.²⁷⁵ Even so, the penalties may be too low to deter unsafe behavior, and OSHA isn't required to consider whether employers will benefit from noncompliance when it determines penalties.²⁷⁶ As of January 2020, maximum OSHA penalties were \$13,494 for each single violation and \$134,937 for each "willful or repeated" violation.²⁷⁷ The problem is made worse by OSHA's regular practice of reducing penalties in an effort to avoid formal challenges from employers.²⁷⁸ Such challenges can significantly delay corrective actions and impose additional administrative burdens on OSHA.



SPOTLIGHT 14: ROBERT HOGUE, SPLICING TECHNICIAN, CWA LOCAL 9423, SAN LUIS OBISPO, CALIFORNIA

"I've been a telephone line technician for 20 years, and during that time heat, wildfires and poor air quality have become major problems directly impacting me and my coworkers.

"You may not realize it, but your cell phone service relies on wires just like your landline. Every cell phone tower has wires feeding it, and my job is to connect those wires up, install new cables, and troubleshoot when repairs are needed. We've been seeing summers getting hotter and hotter, wildfires increasing, and records being broken year after year. That's an empirical fact. Wildfires are a product of dry heat and drought, and when they ignite they burn up telephone poles, cell phone towers, and cables, leaving people with no way to communicate.

"We're always trying to keep customers' telephone service alive, but it's exhausting work and can cause heat illness. Heat exhaustion can hit you when you're climbing a telephone pole or crawling under a house or through an attic. The extreme heat we're seeing nowadays is especially hard on older workers because they have a lower threshold. I've had two coworkers who had to go to the emergency room because it was scorching hot out and the air quality was compromised from wildfires, even though they were hundreds of miles away. Some days it's so bad your eyes and throat are burning, you're coughing, and you can taste the ash in your mouth. It affects my family and home life as well. My stepson has had asthma attacks, and we've had to cancel his football team practices because of the smoky air.

"Unfortunately, our employer is being very reactive instead of proactive, and they're not giving us the tools we need to address these dangerous conditions. They only give us flimsy dust masks when they should be giving us respirators with cartridges that can really filter the particles out of the air. We need to take breaks and sit in our vans with the air-conditioning on to cool down sometimes, but the company remotely tracks us and reprimands us if we're idling too long.

"Overall, we need to set up a committee of workers and employer representatives to create a plan that outlines what to do if the air quality drops or temperature soars, and how to communicate with workers quickly, such as through text alerts. A labor-management committee could make sure the voices of frontline technicians are being heard and help address these unsafe working conditions we're experiencing because of the changing climate."

COLLECTIVE ACTION BY WORKERS AND THEIR REPRESENTATIVES IS AN ESSENTIAL ELEMENT OF WORKPLACE HEALTH AND SAFETY

■ **Legislators at all levels of government must honor the right of workers to a safe and healthy workplace by strengthening and enforcing legal protections for unionization and collective bargaining.**²⁷⁹ To stay safe on the job, workers and their representatives must have adequate knowledge, training, and freedom from retaliation to help shape and improve occupational health programs (Spotlight 14), refuse hazardous work, report workplace injuries and illnesses, and file complaints with state or federal inspectors.²⁸⁰ Federal and state policies and standards are clearly important, but as occupational health and safety expert Celeste Monforton recently wrote, "Every worker health and safety accomplishment came about by agitating and organizing."²⁸¹ Unionization and collective bargaining, which are rights codified by the National Labor Relations Act, often provide more protection to workers than OSHA does.²⁸² However, union representation of workers has declined nationwide since the 1950s, in part because of aggressive anti-union tactics by private sector employers.²⁸³ Protecting the right to collective action is, quite simply, a crucial part of increasing workplace safety.

Conclusion

Climate change isn't some faraway or future health threat; it's harming U.S. workers now.

Many workers are already unable to avoid climate-related hazards to their health and safety because of the location of their work, the physical demands or compensation structure of their jobs, or unsafe or discriminatory practices at their workplace. To help today's workers, we need lawmakers, regulators, employers, unions, other worker organizations, and workers themselves to start adapting to a fundamentally different world.

Adapting to our new climate means overhauling existing safeguards to respond to an intensified set of occupational hazards; extending occupational health and safety protections to all workers; and ensuring workers have the training, job security, flexibility, and empowerment they need to collectively demand protection from climate change. Because climate disruption is sure to create cascading failures through multiple sectors and to bring some nasty surprises, occupational health and safety activists and professionals must also build a better way to track, analyze, and quickly act on existing and emerging health threats to workers.

Of course, there are biological, logistical, economic, and legal barriers and limits to how much workers and employers can adapt to unchecked climate change. In the near future, for instance, some parts of the world simply may not have enough heat-safe days for outdoor workers to do their jobs without risk.²⁸⁴ Although workers, unions, employers, and regulators must continually improve health and safety measures to keep ahead of harmful changes in climate, the United States and the world must also limit future warming by moving away from deadly fossil fuels and drawing climate-warming carbon pollution out of the atmosphere.²⁸⁵

Everybody deserves to get through their workday safely. That's always been true, and never more so than now. Protecting worker health from the impacts of the climate crisis is fully within our grasp—but will only get harder the longer we wait to act.

ENDNOTES

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