Heat Stress

Protecting outdoor workers in a warming world

Gallagher

Key Insights

1. Heat waves are becoming more common, intense, and prolonged. In the US, their frequency has increased from an average of two heat waves per year during the 1960s to six per year during the 2010s and 2020s.

2. Extreme heat is a major issue for outdoor workers in industries such as construction, agriculture, transportation, and energy.

3. Accidents are more likely to occur when workers are operating under heat stress and handling complex machinery, causing property damage and business interruption.

4. The growing frequency of heat waves feeds into the degradation of air quality as wildfires increase in both frequency and intensity, causing smoke particulates and respiratory issues.

5. As the pressures of climate change become more apparent, industries relying on outdoor labor will need to do more to adapt and protect the health of outdoor workers.

6. Protective equipment, air quality monitoring, and wearable devices are some of the innovations that can keep workers safe in all conditions.

Introduction

Over a quarter of the world's population works outdoors. As heat waves become normalized, employers must adapt to protect the health and safety of their people and prevent costly accidents.

For thousands of years, outdoor workers have advanced several of the most important elements of civilization, from agriculture to construction. An estimated 1.6 billion people worked outdoors globally in 2022, over a quarter of the population.[1]

However, the increasing frequency and intensity of heat waves, coupled with deteriorating air quality, pose growing risks for outdoor workers globally. In many parts of the world, working in the open air is becoming increasingly perilous due to climate-related threats.

As heat stress and air pollution become more common, the burden of responsibility is shifting toward employers to implement the necessary protections. This report delves into the implications of heat stress and air pollution for outdoor workers, highlighting the associated health risks, economic costs, and strategies for mitigation.

"Heat-related illnesses are preventable. We know this, and we know a company's management must lead from the top for workplace health and safety to be taken seriously."

Ania Caruso, Casualty Practice Leader, Gallagher

Heat is the deadliest weather-related hazard in the US, causing more fatalities annually than hurricanes, floods, or tornadoes.

Spotlight

The climate challenge for outdoor workers

According to the World Health Organization (WHO), outdoor workers are "occupationally exposed to risk factors linked to climate change." These include ambient air pollution, heat, and solar ultraviolet radiation. As heat waves become normalized around the world, the impacts on the workforce are many and varied.

There is a 1% increase in workplace injuries for every increase of 1°C, according to Swiss health insurer Suva, with 7% more workplace accidents occurring when temperatures rise above 30°C (86°F).[3] This is because workers operating under heat stress are more likely to make a mistake and suffer an injury, particularly if they are carrying out complex tasks, because their cognitive functions are impeded.[4]

Heat waves are becoming more common, intense, and prolonged. In the US, their frequency has steadily increased, from an average of two heat waves per year during the 1960s to six per year during the 2010s and 2020s. The average heat wave in major US urban areas is now four days long, about a day longer than the average heat wave in the 1960s.

According to the National Oceanic and Atmospheric Administration, heat is the deadliest weather-related hazard in the US, causing more fatalities annually than hurricanes, floods, or tornadoes.

From 1992 to 2022, a total of 986 workers across all industry sectors in the US died from exposure to heat, according to data from the Environmental Protection Agency.[5] Some estimates claim as many as 2,000 worker fatalities in the US each year are linked to heat (with up to 170,000 workers injured in heat stress-related accidents).[6]

With nighttime temperatures increasing faster than daytime temperatures, it means that workers are also often impacted out of hours when they are trying to rest and cool down. For this reason, moving shift patterns so that laborers work earlier into the day and/or longer into the evening may not be the best solution, particularly as visibility may also pose an issue a night.

And it is not just heat but excessive exposure to the sun that is bad for the long-term health of outdoor workers. Nearly one in three deaths from non-melanoma skin cancer is caused by too much exposure to UV rays, according to joint estimates by the WHO and the International Labour Organization.

Air pollution, wildfires, and smog

According to the WHO, up to 7 million deaths around the world are caused by health issues relating to air pollution each year. While total death rates from air pollution are falling, nearly halving since 1990, the numbers don't tell the whole story. The decline has been primarily driven by improvements in indoor air pollution, meaning outdoor workers remain exposed.

The growing frequency of heat waves feeds into the degradation of air quality as wildfires increase in both frequency and intensity. The result is a dual threat: Workers are not only at risk of heat stress but also of respiratory issues, reduced lung function, and other serious health problems due to polluted air.

"I am concerned about the impact of the recent wildfires on people's health," says Steve Bowen, chief science officer, Gallagher Re. "I believe there must have been a significant number of people affected by the smoke from wildfires, not only in Canada but also in the US. The smoke from large fires can travel thousands of miles and affect people globally. It's even been reported that soot from the Canadian fires reached parts of Europe."

The convergence of extreme heat and poor air quality creates an increasingly hostile environment for outdoor workers, demanding urgent attention from businesses and regulators to protect health and safety.

There is a 1% increase in workplace injuries for every increase of 1°C.

Case study: Heat stress and power outages

A June 2024 report from Imperial College London highlighted how extreme heat in North and Central America has resulted in severe impacts, such as more than 125 heat-related deaths in Mexico since March, thousands of cases of heatstroke, and power outages.

The report cites a recent Lancet study on Latin America, covering El Salvador, Guatemala, and Honduras, which found that heat-related deaths and risks for outdoor workers across the region have increased significantly from 2013 to 2022.

Imperial College notes that existing drought conditions have further aggravated the situation by preventing the dispersion of polluting particles, decreasing water availability, and reducing hydropower generation and electricity supply.[7]

Health, safety, and productivity

Heat stress poses serious health risks, such as heatstroke, heat exhaustion, heat cramps, or heat rashes.[8] Extreme heat can also impair cognitive function, increasing the likelihood of workplace accidents. The risks can be particularly acute for older workers.

"Several studies have documented that the severity of losses, measured both by medical and indemnity cost, doubles once an employee reaches 55 or older," says Ania Caruso, Casualty practice leader at Gallagher US. "The body just can't recover in the same way, often due to the presence of chronic health conditions and increased risk of complications, so the same type of work-related injury that a 25-year-old employee might endure can result in a loss that is doubled or more when the employee is 55 or older."

Heat stress and air pollution can significantly reduce productivity by impairing workers' physical and cognitive abilities, leading to slower work and more errors. The increased likelihood of accidents under extreme conditions can disrupt operations, resulting in costly business interruptions.

The cost of heat stress on the US economy is estimated to be nearly $100 billion each year.[9] Industries that are highly reliant on outdoor labor are particularly vulnerable, including construction, agriculture, transportation, and oil and gas.

Strategies for mitigation and adaptation

Businesses must take proactive steps to safeguard workers from the dangers of heat stress and poor air quality. While outdoor workers are most exposed, there are implications for indoor workers as well. Infrastructure investment is becoming more important. Companies are investing in more heat-resistant working environments, including sustainable building infrastructure with better air-conditioning systems.

Businesses should implement comprehensive heat stress management programs that prioritize worker safety. This includes providing regular hydration, ensuring scheduled rest breaks in shaded or cooled areas, and setting up cooling stations to help employees regulate their body temperature.

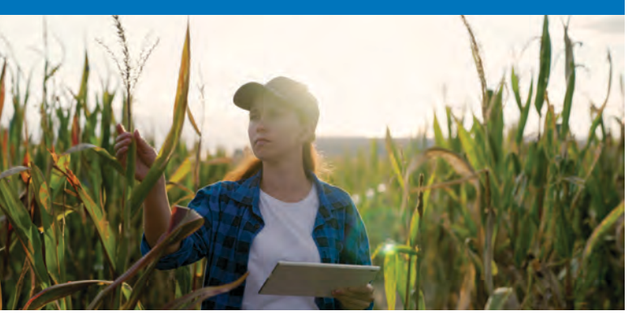
The National Institute for Occupational Safety and Health also recommends a period of acclimatization by gradually increasing workers' time in hot conditions over 7–14 days.[10] Workers should be encouraged to wear clothing that is "breathable, light-colored and loose-fitting."[11]

Investing in protective equipment can further reduce the risks. Items such as cooling vests, breathable clothing, and personal sun protection can make a significant difference in worker comfort and safety, while specialized masks and respirators can help shield workers from harmful air pollutants.

1 in 4

adults work outdoors

These workers face health risks from pollution and climate change.



Wearable sensors can monitor vital signs and environmental conditions, providing instant feedback to both workers and managers.

Air quality monitoring

Monitoring air quality better protects workers from harmful pollutants. Businesses can use air quality sensors and mobile apps to track pollution levels in real time. This allows for timely decisions, such as adjusting work schedules or relocating employees, to minimize exposure to poor air conditions.

The US Environmental Protection Agency's AirNow website[12] provides frequent monitoring of air quality conditions. Anyone can put in their ZIP code, city, or state and receive a graphic review and statistics on the current air quality. This is particularly useful when there is a nearby wildfire and outdoor workers are scheduled to work.

The role of advanced technologies in early detection and prevention is becoming more important. Wearable sensors, for instance, can monitor vital signs and environmental conditions, providing instant feedback to both workers and managers. These tools can help prevent heat-related illnesses and ensure that air quality remains within safe limits.

For example, preliminary experiments have shown how a dual-heat-flux thermometer, a device which allows real-time monitoring of body temperature, can alert a user to the early signs of heatstroke.[13]

"There is an increased emphasis on monitoring the health of the outdoor workers," says Gallagher's Ania Caruso. "That includes regular healthcare checkups, monitoring air quality, and providing information associated with the health risk associated with heat and poor air quality."

"The use of technology to monitor the air quality in real time is becoming very common. This includes the use of portable air quality monitors and applications that can help workers and employers to make informed decisions about when and how to work safely outdoors."

Roles for government and urban planning

Early warning systems provide timely alerts, while strengthening grid resilience ensures that sources of power remain reliable during heat waves. Promoting water conservation also helps manage resources and takes the pressure off hydroelectric systems.

Improved urban planning, including creating green spaces and enhancing public transportation, reduces heat exposure and air pollution. These measures collectively protect public health and create more resilient, cooler urban environments.

In July 2024, the Biden-Harris administration proposed changes to OSHA laws, requiring employers to develop an injury and illness prevention plan to control heat hazards in workplaces affected by excessive heat, and to implement requirements for drinking water, rest breaks, and control of indoor heat.

Such laws have become a politically charged area, with some state policymakers moving to prevent local governments from effectively enforcing heat protection rules. This puts more of the onus on companies to do the right thing to protect the health and safety of outdoor workers, regardless of the prevailing legislation.

The increased likelihood of accidents under extreme conditions can disrupt operations, impact reputations, and potentially result in health and safety fines and penalties.

Spain moves to protect workers from excessive heat

Last year, Spain moved to protect workers by banning outdoor labor during extreme heat conditions. The ban was designed to take place when the national weather agency AEMET issued an alert warning about a severe or extreme risk of high temperatures. The measure impacts a wide range of outdoor professions, including construction, municipal waste management, and agriculture.[14]

"We have already seen many episodes, certainly very serious ones, in cleaning and waste collection in which workers have died from heatstrokes," said Spain's Labour Minister Yolanda Diaz in a statement.

It follows in the footsteps of some MENA countries, which have banned working outside during the hottest hours of the day.[15]

Spotlight

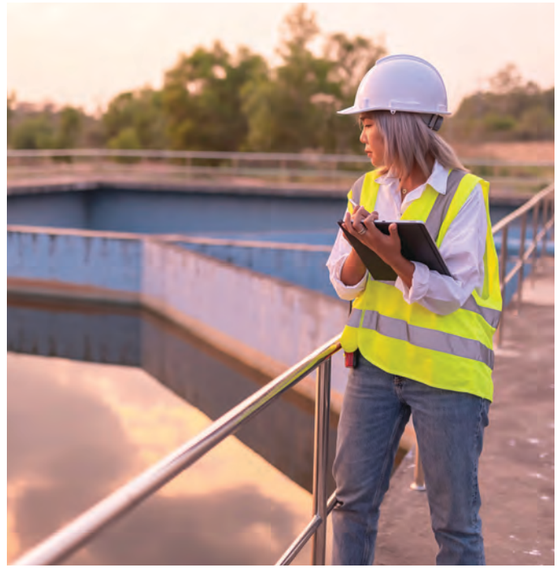
Enhancing the duty of care

Outdoor workers are disproportionately at risk from heat waves, air pollution, and the harmful effects of the sun's rays. As the pressures of climate change become more apparent, industries that rely on outdoor labor will need to do more to adapt and protect the health of outdoor workers.

What this looks like will vary by industry and business, but it may involve altering shift patterns or moving to a four-day week. A growing number of employers are conducting periodic heat-risk assessments, and implementing heat-related health and wellbeing initiatives.[16]

Proactive measures, such as implementing heat stress management programs, investing in protective equipment, and enhancing air quality monitoring, are essential. Adapting to these challenges is crucial to safeguarding worker health and safety, and for maintaining productivity and economic stability across affected industries.

Ultimately, effective occupational health and safety protects people, plant and machinery, and corporate reputations.



Citations

1 "Climate Change Indicators: Heat Waves," US EPA, Jun. 2024.
2 Roelofs, Cora, and David Wegman. "Workers: The Climate Canaries," AJPH, 10 Sep. 2014.
3 "Accident Warning for Outdoor Workers in Summer Heat," *SWI swissinfo.ch*, 28 Jan. 2024.
4 Taylor, Lee, et al. "The Impact of Different Environmental Conditions on Cognitive Function: A Focused Review," *Frontiers in Physiology*, 6 Jan. 2016.
5 "A Closer Look: Heat-Related Workplace Deaths," US EPA, Jun. 2024.
6 Fulcher, Juley. "Hot Take: The Demand for Immediate Worker Protections Increases as Dangerous Temperatures Rise," Public Citizen, 25 May 2023.
7 "Extreme Heat Killing More Than 100 People in Mexico Hotter and Much More Likely Due to Climate Change," Imperial College London, accessed on 24 Aug. 2024.
8 "Heat Stress," Centers for Disease Control and Prevention, 31 Aug. 2020.
9 Fulcher, Juley. "Workplace Heat Stress: The Cost of Inaction," Public Citizen, 5 Oct. 2022.
10 "Heat Stress — Recommendations," Centers for Disease Control and Prevention, 6 Jun. 2018.
11 "Protect Your Workers From Heat Stress," Centers for Disease Control and Prevention, 6 Jun. 2018.
12 "Get Air Quality Data Where You Live," AirNow, accessed on 24 Aug. 2024.
13 Tamura, Toshiyo, et al. "An Advanced Internet of Things System for Heatstroke Prevention With a Noninvasive Dual-Heat-Flux Thermometer," *Sensors*, 18 Dec. 2018.
14 Edmond, Charlotte. "Extreme Heat Is Forcing Spain's Outside Workers to Shift Their Hours," World Economic Forum, 21 Aug. 2023.
15 "Summer Means Suffering: How Workers Survive Intense Gulf Heat," *The Economic Times*, 26 Jun. 2022.
16 Bennett, Elizabeth. "How Will Extreme Temperatures and Heat Waves Change How We Work?" *BBC*, 21 Jul. 2023.

AJG.com **The Gallagher Way.** Since 1927.