

Extreme Heat at Work

More than 1 in 7 Outdoor Workers Experienced Heat Exhaustion or Heat-Related Symptoms at their Jobs in 2023

Lisa Clemans-Cope, Dulce Gonzalez, Sara McTarnaghan, and Michael Karpman

SEPTEMBER 2024

The increased frequency and intensity of extreme heat waves have drawn growing attention to the risk of illness and injury among workers who are directly exposed to the adverse consequences of climate change. Exposure to extreme heat, combined with strenuous and fast-paced work activities, can lead to heat exhaustion, injury, and long-term health complications (Kenny et al. 2018; Bukhari 2023). With climate impacts intensifying, it is critical to better understand how exposure to extreme temperatures is currently affecting workers, especially those with lower wages and low job control—less ability to influence their work environments. As decisionmakers, employers, and labor organizations grapple with these shifts, they can benefit

from understanding potential policy responses and changes in workplace practices that can strengthen protections for different groups of workers and industries.

In this study, we provide the first nationally representative estimates of how workers self-report being affected by extreme heat at their jobs, using 2023 data from the Urban Institute’s Well-Being and Basic Needs Survey (WBNS).¹ We estimated the share of workers ages 18 to 64 who are exposed to extreme heat based on their work environment (i.e., those working outdoors or indoors in places that are not environmentally controlled) and the frequency with which they are exposed to temperatures above 90° F at work. Throughout the brief, we use the terms “environmentally controlled” and “climate-controlled” interchangeably. We also assessed the health impacts of extreme heat on workers in 2023 by estimating the share of adults who reported experiencing heat exhaustion and other heat-related symptoms at work in the 12 months prior to the December 2023 survey. We then explored variation in exposure to heat and health impacts by job characteristics and demographic factors. Finally, we examined the extent to which workers with the greatest exposure to extreme heat can secure workplace protections through union membership and/or state workplace safety laws that could mitigate heat-related health risks (for more information, see Data and Methods). Our findings include the following:

- One in 3 employed adults (33 percent) reported working outdoors at least sometimes at their main job. Overall, about 4 in 10 (42 percent) employed adults worked either outdoors or indoors in places that are not environmentally controlled,²² potentially exposing them to extreme heat and its associated health risks.
- One in 10 workers (10 percent) reported they were frequently (i.e. always or often) exposed to high temperatures at work, and more than 1 in 5 (22 percent) reported always or often engaging in strenuous activities at work. Outdoor workers were most likely to report frequent exposure to high temperatures (25 percent) and strenuous work activities (37 percent).
- More than 1 in 7 outdoor workers (15 percent) reported experiencing heat exhaustion or other heat-related symptoms at work in 2023. The share of all employed adults who reported experiencing these heat-related health effects in the

past year was 7 percent and the share of indoor workers without climate-controlled workplaces who reported these effects was 9 percent.

- Adults in the agriculture, mining, and construction industries reported the highest rates of outdoor work and health impacts from exposure to extreme heat. Nearly 8 in 10 adults (79 percent) in these industries reported at least sometimes working outside, and nearly 1 in 5 (19 percent) reported experiencing heat-related symptoms at work in the past year.
- Low-wage workers, defined as adults earning less than \$15 an hour, were at greater risk of exposure to extreme heat and its health impacts than those earning higher wages. Over 4 in 10 low-wage workers (43 percent) worked outdoors, and almost 1 in 8 (12 percent) experienced heat-related symptoms at work in the past year.
- Looking at variation by demographic and health characteristics, Hispanic men, noncitizens, and adults who were in fair or poor health reported high rates of exposure to outdoor work and adverse health impacts from extreme heat. For example, 55 percent of Hispanic men worked outdoors at least sometimes, and 18 percent reported experiencing heat-related symptoms at work in the past year. Outdoor work was also more common among Hispanic and Black women than among white women, and Hispanic women were more likely than women in other racial and ethnic groups to report heat-related health impacts.
- More than 4 in 10 (42 percent) young adults ages 18 to 24 reported working outdoors at least sometimes, making them more likely than adults in other age groups to report outdoor work.
- Most workers who are exposed to extreme heat at their jobs were unlikely to be covered by safety protections against extreme heat through state workplace safety laws or collective bargaining agreements, and federal workplace heat protections are limited. About 1 in 5 outdoor workers (20 percent) and 1 in 7 adults working indoors in non-climate-controlled settings (14 percent) live in one of the 5 states with heat protection standards for at least some workers (California, Oregon, Washington, Colorado, and Minnesota) (Constible 2024). Fewer than 1 in 5 adults who worked outdoors (17 percent) or indoors in non-climate-controlled settings (15 percent) were union members.

Heat-related illnesses and injuries can have long-lasting consequences for worker health, labor force participation, and economic mobility, as well as short-term impacts such as lost wages (Amoadu et al. 2023; Ananian 2023). Exposure to extreme heat may also exacerbate economic and health disparities over time, with Hispanic and low-wage workers facing the greatest risks. These groups of workers may have limited access to resources that help mitigate the impacts of these health risks, such as paid leave and health insurance (Claxton, Rae, and Winger 2024; Boyens, Karpman, and Smalligan 2022). Finally, the effects of climate change are likely to be felt unevenly across industries and segments of the workforce, requiring tailored policy responses in different sectors of the economy.

Understanding how climate change affects low-wage workers will be crucial to informing policies that bolster worker protections. Key policies to mitigate the health impacts of climate change on workers may include:

- implementing comprehensive federal workplace heat safety standards and expanding these standards to cover outdoor and indoor workers across all industries;
- adopting state- and local-level protections;
- prioritizing monitoring and enforcement for high-risk industries and workers;
- raising awareness among workers and employers of heat risks, safety recommendations, and workplace standards;
- and strengthening workers' ability to negotiate for heat-related protections through collective bargaining agreements.

Background

Health Risks Associated with Occupational Heat Exposure

Workers face both immediate and long-term health risks from heat exposure on the job. Short-term health risks of occupational heat exposure include heat exhaustion and heat stroke; cardiovascular dysfunction, including hypertension, heart rate disturbances, and ischemic heart disease due to acute heat stress (Liu et al. 2022); dehydration, mental health impacts, adverse pregnancy outcomes, acute respiratory issues and other acute heat-

related illnesses due to physiological stress (Ebi et al. 2021; Bell, Gasparrini, and Benjamin 2024; Liu et al. 2022). Even a single severe heat exposure such as an episode causing heat stroke can lead to immediate neurological and cardiovascular damage (Bell, Gasparrini, and Benjamin 2024). Long-term health complications can result from repeated exposure to even moderately high temperatures (Liu et al. 2022), potentially leading to chronic kidney disease (Ebi et al. 2021), chronic cardiovascular impairment such as hypertension and coronary heart disease (Liu et al. 2022), respiratory diseases such as chronic obstructive pulmonary disease, and increased morbidity and mortality (Ebi et al. 2021; Bell, Gasparrini, and Benjamin 2024; Liu et al. 2022). High temperatures in work environments also increase the risk of workplace injuries due to reduced cognitive function and physical performance, which can have both immediate and lasting effects on workers' health and safety (Varghese et al. 2018), and reduces worker productivity (Ananian 2023; Amoadau et al. 2023).

Increasing Frequency and Intensity of Extreme Heat Due to Climate Change

Scientific evidence demonstrates increasing global temperatures and the growing frequency and intensity of heat waves due to human-induced climate change, as documented in the United Nations Intergovernmental Panel on Climate Change's Sixth Assessment Report (UN IPCC 2023). This report predicts that global temperatures will increase 2.1° to 3.5° Celsius above preindustrial levels by 2100 if greenhouse gas emissions are curbed moderately, and 3.3° to 5.7° Celsius if no coordinated global action is taken to reduce these emissions.

Increased global temperatures and heat waves directly impact workers, especially those in outdoor and non-environmentally controlled settings such as warehouses without air conditioning. Mortality from heat stroke among outdoor workers has risen over the past two decades (Sokas and Senay 2023), and the wide-ranging health impacts associated with rising temperatures are also increasingly recognized as health threats for workers in indoor occupational environments.^{3, 4} A recent systematic review examined the relationship between temperature increase and occupational injuries, showing that for every 1° Celsius increase above average temperatures, the overall risk of occupational injuries increases by 1 percent, and during heatwave periods (typically three or more

consecutive days with temperatures above the 95th percentile for a given location), the risk increases by 17.4 percent (Fatima et al. 2021).

Health and Economic Impacts on Vulnerable Worker Populations

Understanding the health risks of rising temperatures for specific populations, industries, and occupations is critical for developing policies to protect workers at local, state, and national levels. Recently, occupational safety and health agencies and groups have acknowledged the detrimental health effects of occupational heat exposure in both outdoor and indoor settings (NIOSH 2023; OSHA 2024d).^{5, 6, 7} Outdoor work includes a wide variety of occupational categories, such as janitors and landscapers; truck drivers and bus drivers; electricians and miners; agricultural workers and loggers; heating and air conditioning installers and mechanics; packers and freight movers; and police officers and firefighters. Farm workers are particularly vulnerable to heat exposure, with some reports estimating they are 35 times more likely to die from heat exposure compared with the general population (Sokas and Senay 2023; Fulcher 2023). The agriculture industry is also exempt from many federal labor protections, and the Occupational Safety and Health Administration (OSHA) generally cannot conduct enforcement activities for small farms with 10 or fewer employees (Farmworker Justice 2022). Indoor workers who are particularly vulnerable to excessive heat exposure include workers in warehouses, bakeries, and foundries (Sokas and Senay 2023), and the warehousing and storage industry is projected to be one of the fastest-growing sectors over the next decade (Colato and Ice 2023).

Research demonstrates that certain socioeconomic groups are more likely to have jobs with exposure to high heat. These studies have found that populations with generally more limited employment options and resources face higher heat exposure risks than other groups, including workers who earn low wages and those who are non-unionized, Hispanic/Latinx and Black, farmworkers or migrant workers, undocumented, younger workers, aging workers, men, and engaged in heavy physical work (Berumen-Flucker, Kekeh, and Akpinar-Elci 2022; McInnes et al. 2017; Kjellstrom, Oppermann, and Lee 2020; Constible 2020; Fulcher 2023; Sokas and Senay 2023; John and Jha 2023). In some cases, other groups can be at higher risk, for example, in the absence of sufficient toilet facilities at a workplace, women are more likely than men to reduce their fluid intake, compromising the body's ability to manage extreme heat effects (John and Jha 2023).

Workers with preexisting health conditions, limited access to health care or access to only low-quality care, and limited labor protections also face increased health risks as well as economic vulnerability due to higher health care costs and lost wages from missed work (Kjellstrom, Oppermann, and Lee 2020). In addition, disparate exposure to occupational heat is linked to structural racism, as Hispanic and Black workers are disproportionately segregated into hazardous jobs. This occupational segregation stems from histories of slavery, migrant exploitation, and discriminatory policies and contributes to health disparities that perpetuate income inequality (Dixon and Traub 2022).

Current Knowledge Gaps in Occupational Heat Exposure

Research on the prevalence and impacts of occupational heat exposure is limited, with a few studies addressing the extent and specifics of outdoor and indoor workers' exposure to heat and extreme temperatures (Licker, Dahl, and Abatzoglou 2022; Dahl and Licker 2021).^{8, 9, 10} The associations between job characteristics, heat exposure, impacts, and health risks are poorly understood for both outdoor and indoor workers, highlighting a critical gap in current knowledge. The next section highlights new findings on these issues based on data from a nationally representative sample of working-age adults who participated in the December 2023 WBNS.

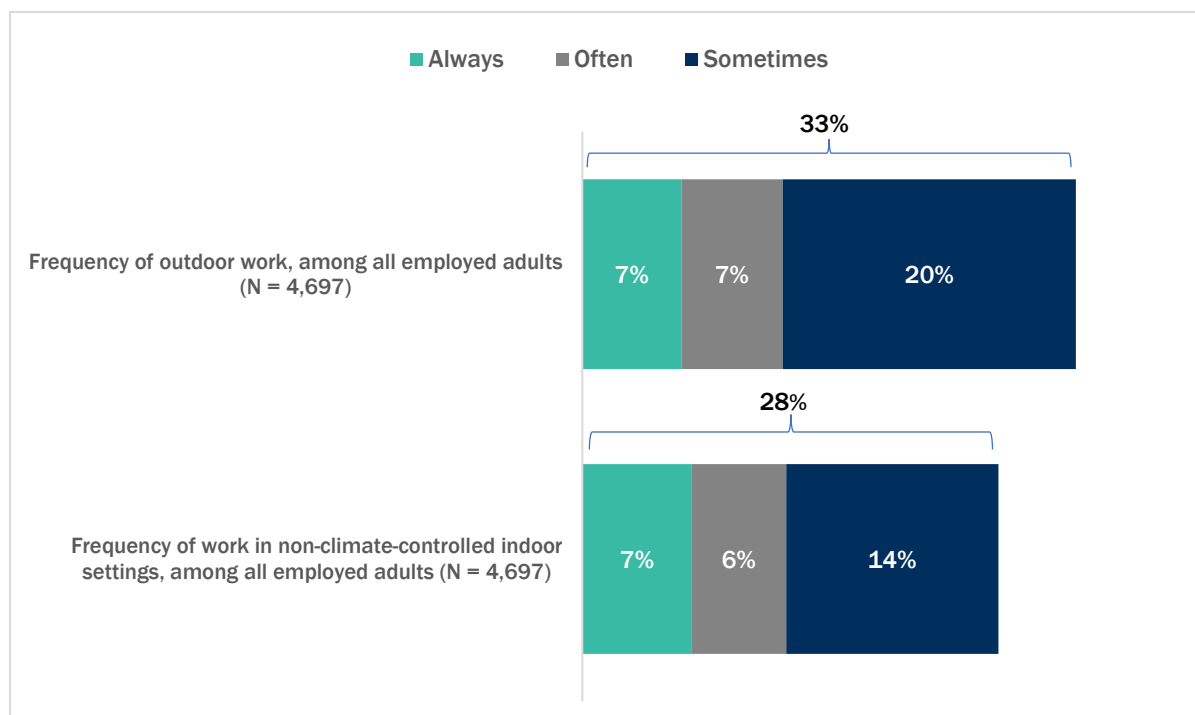
Findings

In December 2023, 1 in 3 Employed Adults Reported That They Work Outdoors at Least Sometimes at Their Main Job, and More than 4 in 10 Worked Either Outdoors or Indoors in Places That Are Not Environmentally Controlled.

One-third (33 percent) of workers reported that they always, often, or sometimes work outdoors at their current main job (figure 1). This included 14 percent who always or often work outdoors and 20 percent who sometimes work outdoors. These estimates are consistent with data from the Bureau of Labor Statistics Occupational Requirements Survey, an establishment-based survey that found one-third of employees have regular outdoor work exposure (BLS 2020).¹¹

Many employed adults participating in the WBNS (28 percent) also reported at least sometimes working indoors in places that are not environmentally controlled, such as a warehouse or truck without air conditioning, including 13 percent who always or often work in these conditions. Some of these adults reported a mix of working both outdoors and in non-climate-controlled indoor settings.

FIGURE 1
Frequency of Working Outdoors or in Non-Climate-Controlled Indoor Settings Among Employed Adults Ages 18 to 64, December 2023



Source: Well-Being and Basic Needs Survey, December 2023.

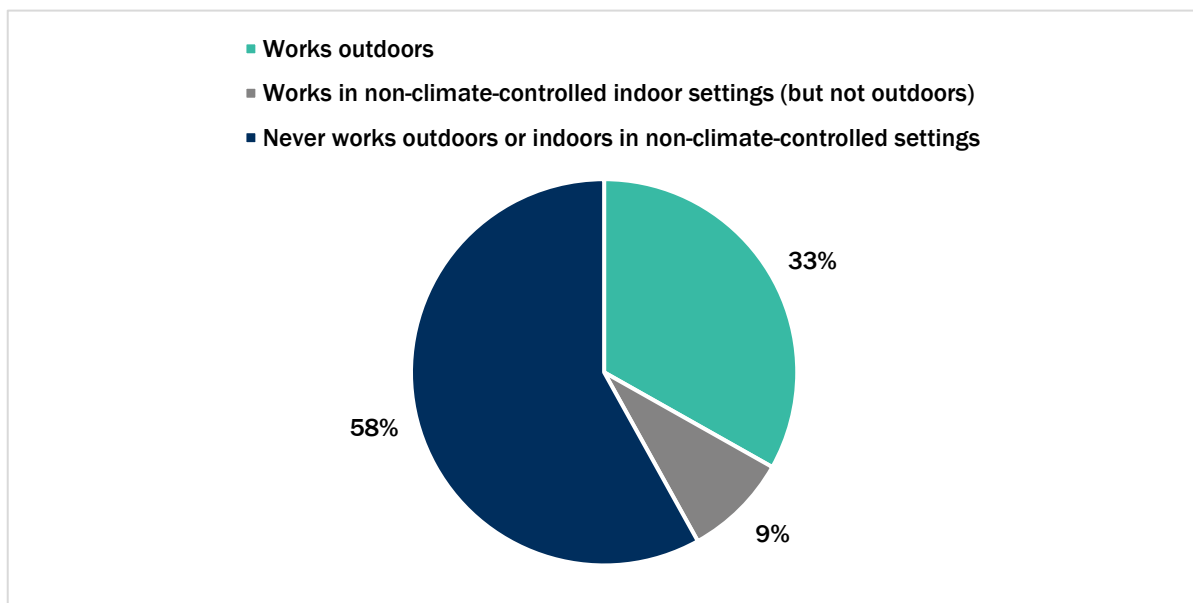
Notes: “Outdoor work” refers to adults who always, often, or sometimes work outdoors, either exposed to all weather conditions or under cover (e.g., an open shed). “Work in non-climate-controlled indoor settings” refers to adults who always, often, or sometimes work in places or vehicles that are not climate-controlled (e.g., a warehouse or truck without air conditioning). Outdoor and indoor groups are not mutually exclusive – adults could have reported working both outdoors and indoors in places that are not climate-controlled. Estimates are not shown for adults who never work outdoors or indoors in places that are not climate-controlled. Estimates may not add up to cumulative totals because of rounding.

Overall, 42 percent of working adults reported working either outdoors or indoors in places that are not environmentally controlled, potentially exposing them to extreme heat and its

associated health risks (figure 2). This includes 33 percent who work outdoors and 9 percent who work in non-climate-controlled indoor settings. The remaining 58 percent of workers reported working in neither of these types of environments.

FIGURE 2

Work Environment among Employed Adults Ages 18 to 64, December 2023



Source: Well-Being and Basic Needs Survey, December 2023.

Notes: “Outdoor work” refers to adults who always, often, or sometimes work outdoors, either exposed to all weather conditions or under cover (e.g., an open shed). “Work in non-climate-controlled indoor settings” refers to adults who always, often, or sometimes work in places or vehicles that are not climate-controlled (e.g., a warehouse or truck without air conditioning); estimates for this group exclude adults who work outdoors.

Overall, 1 in 10 Workers Reported They Were Always or Often Exposed to High Temperatures at Work, and More than 1 in 5 Reported Frequently Engaging in Strenuous Activities at Work. These Experiences Were Most Common Among Outdoor Workers.

Ten percent of all employed adults reported they are always or often exposed to very hot temperatures (above 90° F) at their main job (table 1). Among adults who ever work outdoors, 25 percent were frequently (i.e. always or often) exposed to high temperatures,

and this share rose to 50 percent among adults who always or often work outdoors. Many adults who do not work outdoors but work indoors in places that are not environmentally controlled also reported frequent exposure to high temperatures (11 percent).

More than 1 in 5 employed adults (22 percent) reported that their job always or often involves strenuous activities, including tiring or painful positions, heavy lifting, or repeated lifting, pushing, pulling, or bending. Working conditions involving physical overexertion can increase the risk of heat exhaustion or even heatstroke for those who are exposed to high temperatures.¹² Frequent strenuous activities were most common among adults who work outdoors at least sometimes (37 percent) and among workers in non-climate-controlled indoor settings (30 percent).

More than 1 in 7 Outdoor Workers Reported Experiencing Heat Exhaustion or Other Heat-Related Symptoms at Work in 2023.

Seven percent of all employed adults reported experiencing heat exhaustion or other heat-related symptoms (such as a fast and weak pulse, fatigue, or dizziness) because of their job in the past 12 months (table 1). This share more than doubled among outdoor workers, 15 percent of whom reported experiencing heat exhaustion or heat-related symptoms because of their job in the past year, and was highest among workers who always or often work outdoors (23 percent). Adults who did not work outdoors but worked indoors in places that are not environmentally controlled also were at risk of exposure to health impacts from extreme heat (9 percent), though to a lesser degree than outdoor workers.

TABLE 1

Heat Exposure, Work Activities, and Past-Year Heat-Related Symptoms at Work among Employed Adults Ages 18 to 64, by Work Environment, December 2023

	Share always or often exposed to high temperatures at work (%)	Share whose work always or often involves strenuous activity (%)	Share experiencing heat exhaustion or heat-related symptoms at work in the past 12 months (%)
All employed adults	10	22	7
Adults who work outdoors	25	37	15
Adults who always or often work outdoors	50	55	23
Adults who sometimes work outdoors	9	25	9
Adults who work in non-climate-controlled indoor settings (but not outdoors)	11***	30**	9***

Source: Well-Being and Basic Needs Survey, December 2023.

Notes: Examples of work in non-climate-controlled indoor settings include a warehouse or truck without air conditioning; estimates for this group exclude adults who work outdoors. High temperatures at work refer to temperatures above 90 degrees Fahrenheit. Strenuous activities include tiring or painful positions; heavy lifting; and repeated lifting, pushing, pulling, or bending.

*/**/*** Estimate differs significantly from adults who work outdoors at the 0.10/0.05/0.01 level, using two-tailed tests.

Adults in the Agriculture, Mining, and Construction Industries Reported the Highest Rates of Outdoor Work and Health Impacts from Exposure to Extreme Heat.

Table 2 shows differences in work environments and exposure to heat-related health impacts by major industry groups. In some cases, smaller industries are combined to provide sufficient sample sizes for reporting estimates.

Nearly 8 in 10 adults (79 percent) in the agriculture, mining, and construction industries reported at least sometimes working outside, and nearly 1 in 5 adults in these industries (19 percent) reported experiencing heat-related symptoms at work in the past year.¹³

Other workers with high rates of outdoor work and heat-related health impacts included those in the transportation, warehousing, and utilities industries; 66 percent of

these adults worked outdoors and 12 percent reported experiencing heat exhaustion or heat-related symptoms at work in the past year.

Many adults in the manufacturing industry and in the transportation, warehousing, and utilities industries did not work outdoors but reported working indoors in places that are not environmentally controlled (30 percent and 12 percent, respectively). A lack of climate-controlled environments at work for these adults also places them at risk of exposure to high temperatures and its associated negative health impacts.

TABLE 2

Work Environment and Past-Year Heat-Related Symptoms at Work among Employed Adults Ages 18 to 64, Overall and by Major Industry Category, December 2023

	Share who work outdoors (%)	Share who work in non-climate-controlled indoor settings (but not outdoors) (%)	Share experiencing heat exhaustion or heat-related symptoms at work in the past 12 months (%)
All employed adults	33	9	7
Agriculture, mining, and construction	79	5	19
Transportation, warehousing, and utilities	66	12	12
Other services (e.g., personal services, repair and maintenance)	58	8	14
Arts, entertainment, recreation, accommodation and food services	39	8	10
Wholesale and retail trade	32	10	6
Professional, scientific, management, administrative, and waste management services	24	6	4
Manufacturing	23	30	7
Education, health care, and social assistance	21	6	3
Finance, insurance, real estate, and rental and leasing	14	6	1
Information technology	10	6	4

Source: Well-Being and Basic Needs Survey, December 2023.

Notes: Categories of major industries are based on the North American Industry Classification System and correspond to major industry groups in the Current Population Survey. We combine agriculture, mining, and construction to provide sufficient sample size for reporting estimates for these groups. Examples of administrative services include call centers, security, landscaping, and janitorial services. “Agriculture” includes agriculture, forestry, fishing, and hunting. “Mining” includes mining, quarrying, and oil and gas extraction. Examples of personal services include beauty, pet care, and household services. Estimates are not shown for

adults who reported another industry type or did not report their industry. Outdoor work refers to always, often, or sometimes working outdoors. Examples of work in non-climate-controlled indoor settings include a warehouse or truck without air conditioning; estimates for this group exclude adults who work outdoors. Estimates for the public administration industry are not shown because of small sample sizes.

Low-Wage Workers Were at Greater Risk of Exposure to Extreme Heat and Its Health Impacts than Those Earning Higher Wages.

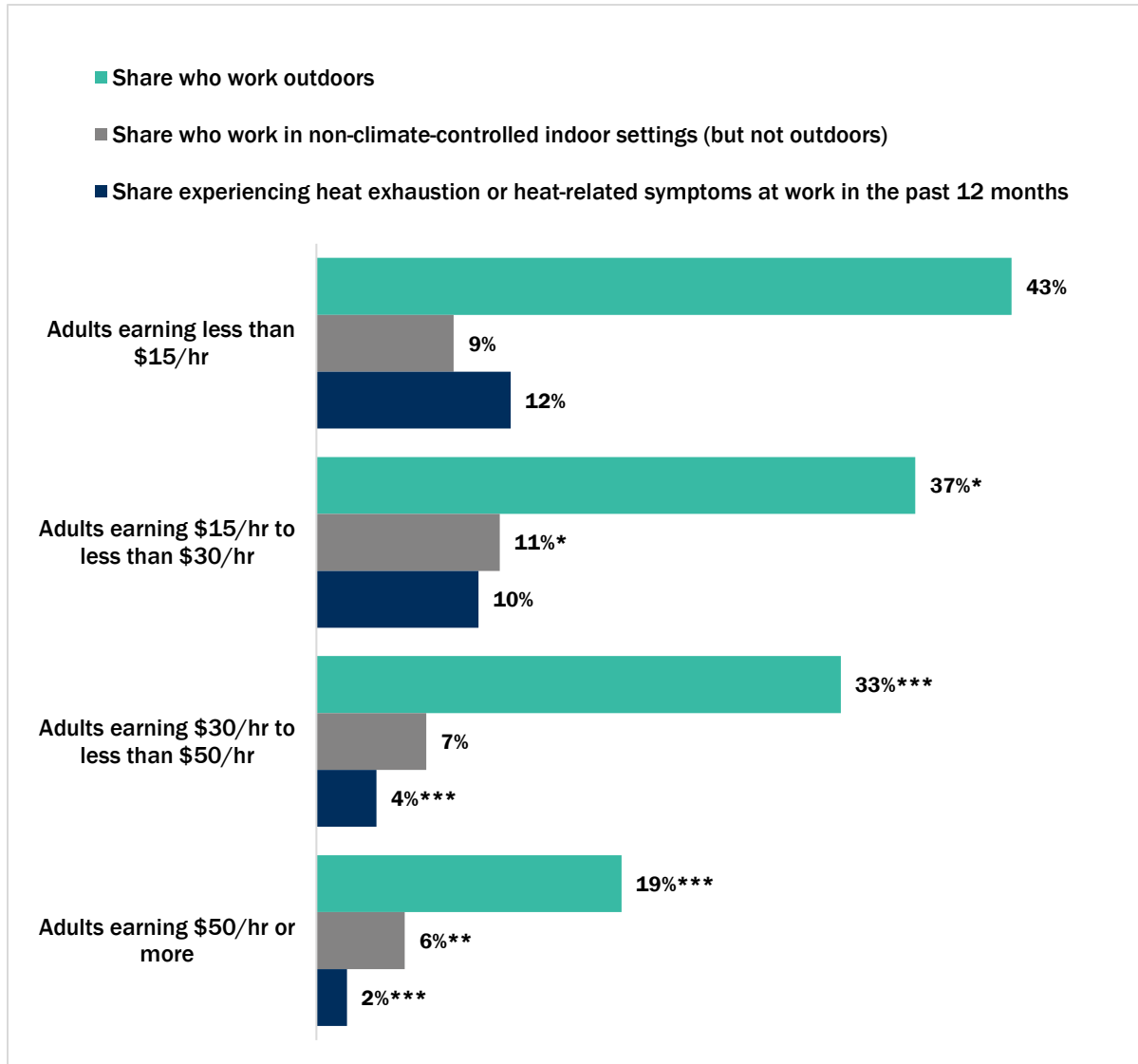
Figure 3 shows differences in work contexts and heat-related health impacts by workers' hourly earnings. We define low-wage workers as those earning less than \$15 per hour, a threshold just below two-thirds of the median wage of workers in their prime working years.¹⁴

More than 4 in 10 (43 percent) workers earning less than \$15 per hour reported working outdoors at least sometimes, a rate over twice as high as those earning \$50 an hour or more (19 percent). Low-wage workers were also more likely to work outdoors than those earning between \$15–30 an hour (37 percent) and those earning between \$30–50 an hour (33 percent).

Consistent with their higher prevalence of outdoor work, low-wage workers were also more likely than those with higher wages to experience heat exhaustion or heat-related symptoms at work. For example, 12 percent of low-wage workers experienced heat-related symptoms in the past year, compared to only 2 percent of workers earning \$50 an hour or more.

FIGURE 3

Work Environment and Past-Year Heat-Related Symptoms at Work among Employed Adults Ages 18 to 64, by Hourly Pay, December 2023



Source: Well-Being and Basic Needs Survey, December 2023.

Notes: Outdoor work refers to always, often, or sometimes working outdoors. Examples of work in non-climate-controlled indoor settings include a warehouse or truck without air conditioning; estimates for this group exclude adults who work outdoors.

*/**/*** Estimate differs significantly from adults with earnings below \$15 an hour at the 0.10/0.05/0.01 level, using two-tailed tests.

Hispanic Men, Noncitizens, Younger Workers, and Adults Reporting Fair or Poor Health Reported High Rates of Exposure to Outdoor Work and High Rates of Experiencing Heat-Related Symptoms.

In the sections that follow, we describe variation in rates of exposure to outdoor work and reported heat-related symptoms by race/ethnicity and gender, citizenship status, age, and self-reported health status.

Race/Ethnicity and Gender

Overall, Hispanic adults were more likely than adults in other racial/ethnic groups to report working outdoors at least sometimes (43 percent; table 3). Hispanic adults were also more than twice as likely as adults of other races/ethnicities to report heat exhaustion or heat-related symptoms at work (16 percent, compared to 6 percent of non-Hispanic Black adults, 5 percent of non-Hispanic white adults, and 2 percent of non-Hispanic adults of additional races). About 1 in 8 Black adults worked indoors in places not environmentally controlled, a share higher than other races/ethnicities.

Table 3 also shows a large gender divide in rates of exposure to extreme heat and its health risks, as well as significant racial/ethnic disparities within gender groups. For instance, more than half (55 percent) of Hispanic men reported working outside at least sometimes, compared with 41 percent of non-Hispanic men who are Black or white. Hispanic men were also more than twice as likely as non-Hispanic Black men and white men to report heat-related symptoms at work (18 percent versus 7 percent and 6 percent).¹⁵

Among female workers, outdoor work was also most common among Hispanic women (29 percent). Black women were more likely than white women to work outdoors (27 percent versus 20 percent) or indoors in places that were not environmentally controlled (11 percent versus 6 percent). Hispanic women were more than twice as likely as non-Hispanic Black women and white women to report heat-related symptoms at work in the past year (14 percent versus 6 percent and 4 percent).

Table 3

Work Environment and Past-Year Heat-Related Symptoms among Employed Adults Ages 18 to 64, by Race/Ethnicity and Gender, December 2023

	Share who work outdoors (%)	Share who work in non-climate-controlled indoor settings (but not outdoors) (%)	Share experiencing heat exhaustion or heat-related symptoms at work in the past 12 months (%)
By race/ethnicity			
Hispanic adults [^]	43	8	16
Black adults	33***	12*	6***
White adults	31***	8	5***
Adults of additional races	26***	10	2***
By race/ethnicity and gender			
Hispanic men [^]	55	8	18
Black men	41***	12	7***
White men	41***	10	6***
Hispanic women [^]	29	8	14
Black women	27***	11	6***
White women	20***/++	6++	4***

Source: Well-Being and Basic Needs Survey, December 2023.

Notes: Outdoor work refers to always, often, or sometimes working outdoors. Examples of work in non-climate-controlled indoor settings include a warehouse or truck without air conditioning; estimates for this group exclude adults who work outdoors. Adults who are Black, white, or additional races are not Hispanic. “Additional races” includes people who are American Indian or Alaska Native; Asian; Native Hawaiian or other Pacific Islander; some other race; or more than one race. Estimates for additional races by gender are not shown because of limited sample size.

*/**/*** Estimate differs significantly from reference group, denoted by (^), at the 0.10/0.05/0.01 level, using two-tailed tests.

+/**/+++ Estimate differs significantly from that for Black women, at the 0.10/0.05/0.01 level, using two-tailed tests. Estimates for Black men do not differ significantly from those for white men.

Citizenship Status

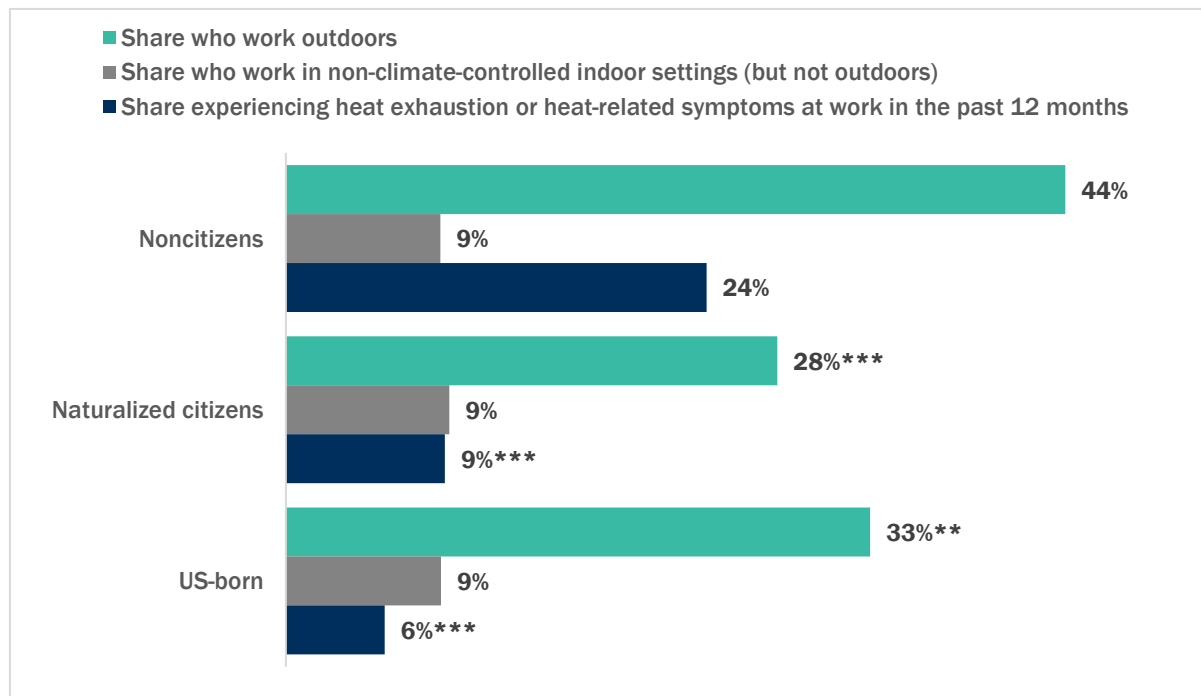
Past research indicates that noncitizens are disproportionately employed in jobs where the risk of exposure to extreme heat and its health risks is high and that pay low wages (Ndugga, Pillai, and Artiga 2023).¹⁶ Additionally, noncitizens are disproportionately represented in industries such as agriculture, where there is less oversight on workplace protections (Farmworker Justice 2022).¹⁷

We find that adults who are noncitizens were more likely to report working outdoors than naturalized citizens and US-born adults (44 percent versus 28 percent and 33 percent;

figure 4). Noncitizens were over twice as likely as naturalized citizens and over four times as likely as US-born adults to report heat-related symptoms at work (24 percent versus 9 percent and 6 percent).

FIGURE 4

Work Environment and Past-Year Heat-Related Symptoms among Employed Adults Ages 18 to 64, by Citizenship Status, December 2023



Source: Well-Being and Basic Needs Survey, December 2023.

Notes: Outdoor work refers to always, often, or sometimes working outdoors. Examples of non-climate-controlled indoor work settings include a warehouse or truck without air conditioning. Estimates for this group exclude adults who work outdoors.

*/**/*** Estimate differs significantly from noncitizens at the 0.10/0.05/0.01 level, using two-tailed tests.

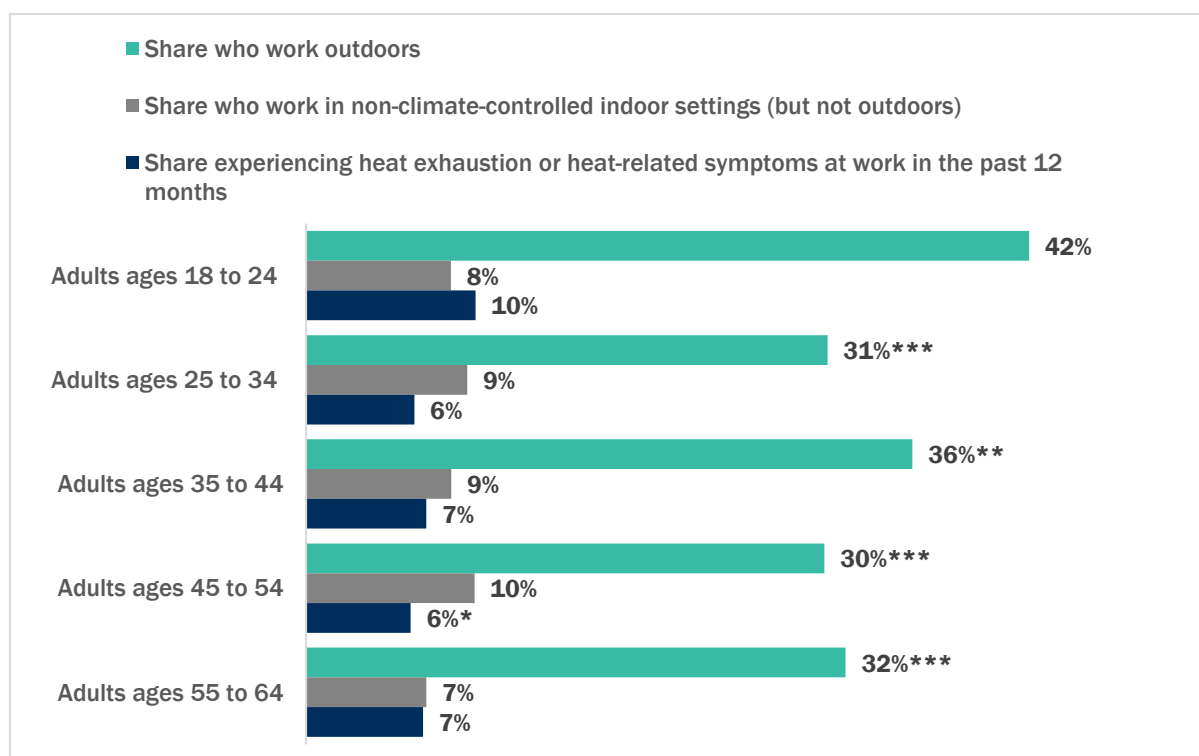
Age

More than 4 in 10 (42 percent) young adults ages 18 to 24 reported working outdoors at least sometimes, making them more likely than adults in other age groups to report outdoor work (figure 5). There was little variation by age group in the share working indoors in places that are not environmentally controlled and in the share who experienced heat-related symptoms at work in the past year.

Monitoring exposure to extreme heat is important for workers of all ages. Although young adults are generally more resilient to heat, extreme heat exposure can lead to potentially detrimental longer-term health impacts for younger people, including impaired cognition,¹⁸ cardiovascular health (Liu et al. 2022), and kidney health (McKenna et al. 2024). Additionally, older workers are more likely than younger adults to have conditions such as cardiovascular diseases, which increases the risk of heat-related illness (Rodgers et al. 2019).

FIGURE 5

Work Environment and Past-Year Heat-Related Symptoms among Employed Adults Ages 18 to 64, by Age Group, December 2023



Source: Well-Being and Basic Needs Survey, December 2023.

Notes: Outdoor work refers to always, often, or sometimes working outdoors. Examples of work in non-climate-controlled indoor settings include a warehouse or truck without air conditioning; estimates for this group exclude adults who work outdoors.

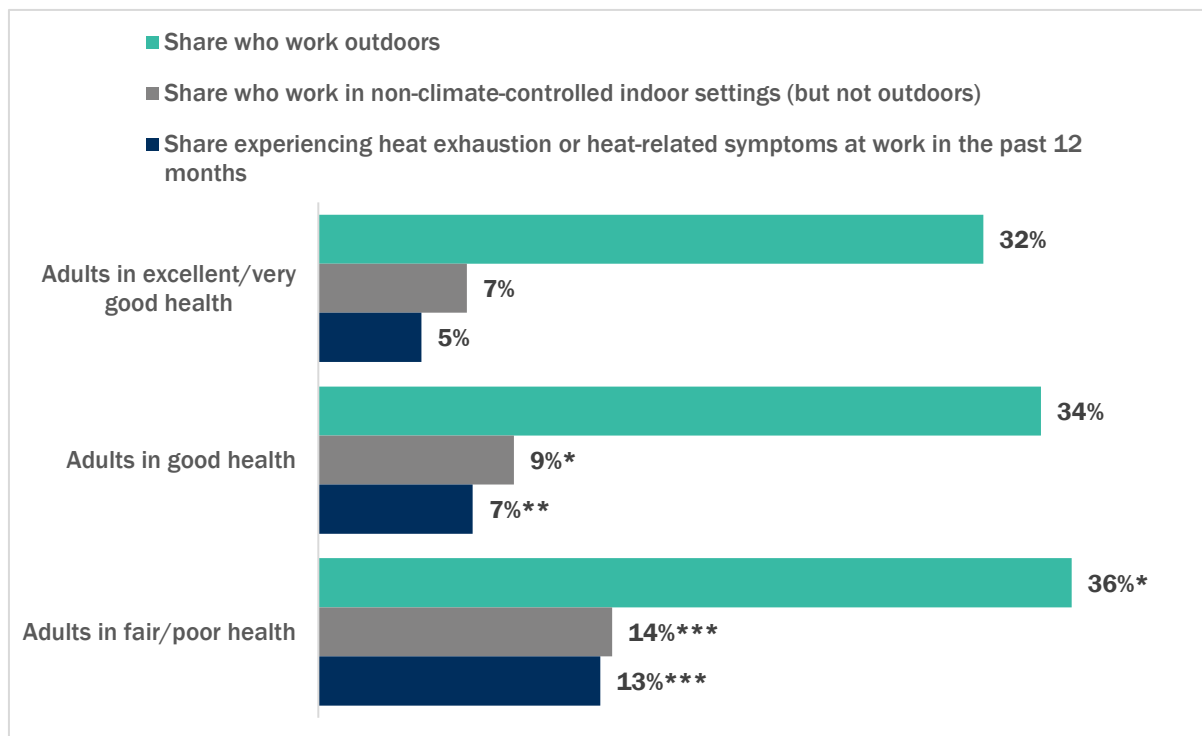
*/**/** Estimate differs significantly from adults ages 18 to 24 at the 0.10/0.05/0.01 level, using two-tailed tests.

Self-Reported Health Status

Despite their greater risk of harm from exposure to extreme heat at work (Kenny et al. 2018),¹⁹ adults reporting fair or poor health status were more likely than those reporting excellent or very good health to work outdoors (36 percent versus 32 percent) and to work indoors in places that are not environmentally controlled (14 percent versus 7 percent; figure 6). They were also more than twice as likely to report heat-related symptoms in the past year at work (13 percent versus 5 percent).

FIGURE 6

Work Environment and Past-Year Heat-Related Symptoms Among Employed Adults Ages 18 to 64, By Self-Reported Health, December 2023



Source: Well-Being and Basic Needs Survey, December 2023.



Notes: Outdoor work refers to always, often, or sometimes working outdoors. Examples of work in non-climate-controlled indoor settings include a warehouse or truck without air conditioning; estimates for this group exclude adults who work outdoors.

*/**/*** Estimate differs significantly from adults reporting excellent/very good health at the 0.10/0.05/0.01 level, using two-tailed tests.

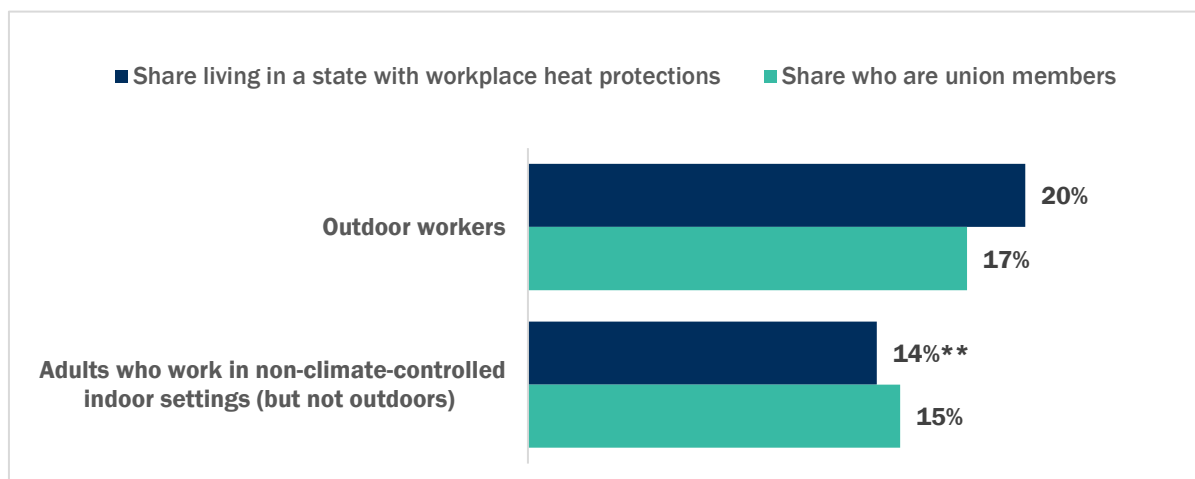
Most Workers Who Are Exposed to Extreme Heat at Their Jobs Are Not Covered by Safety Protections against Extreme Heat through State Workplace Safety Laws or Collective Bargaining Agreements.

One in 5 outdoor workers (20 percent) were living in one of the 5 states that currently have state-level heat protection standards for at least some workers: California, Colorado, Oregon, Minnesota, and Washington (Constible 2024).²⁰ Among adults who worked indoors in places that are not environmentally controlled, 14 percent lived in one of these states.

Additionally, 17 percent of outdoor workers and 15 percent of adults who worked indoors in non-climate-controlled settings were union members (figure 7). Although this was slightly higher than the national rate for working-age adults in our sample (12 percent; data not shown), this means more than 8 in 10 workers potentially facing heat exposure risks at their jobs were unlikely to be covered by a union contract that may include workplace heat protections.

FIGURE 7

Share of Employed Adults Ages 18 to 64 Living in a State with Heat Protections for Workers or Who Are Union Members, By Work Environment, December 2023



Source: Well-Being and Basic Needs Survey, December 2023.

Notes: Outdoor workers refers to adults who always, often, or sometimes work outdoors, either exposed to all weather conditions or under cover (e.g., an open shed). “Work in non-climate-controlled indoor settings” refers

to adults who always, often, or sometimes work in places or vehicles that are not environmentally controlled (e.g., a warehouse or truck without air conditioning) and excludes any adults who work outdoors.

Discussion

This brief identifies which sectors and segments of the workforce are most likely to experience adverse health impacts from exposure to extreme heat at work based on self-reported data from a nationally representative sample of employed adults. Grounded in the lived experience of workers, these findings build on prior research and offer the first national estimates on heat exhaustion and other heat-related impacts for both outdoor and indoor workers.

Consistent with Bureau of Labor Statistics (BLS) data, we find that one-third of workers have regular outdoor exposure,^{21, 22} and our study corroborates the finding that workers in specific industries such as agriculture, mining, and construction are more likely to work outdoors or in non-climate-controlled indoor settings, placing them at greater risk of exposure to extreme heat. We present the first estimates showing that 7 percent of workers reported experiencing heat exhaustion or other heat-related health symptoms because of their jobs in the past year—including 15 percent of outdoor workers and 9 percent of indoor workers whose workplaces are not climate-controlled.

Workers with the highest rates of exposure to outdoor work and consequently higher experiences of heat-related symptoms included low-wage workers (those earning less than \$15 an hour), Hispanic men, noncitizens, younger workers, and adults reporting fair or poor health.

Occupational heat risks have significant public health and economic implications. Even a single exposure to extreme heat leading to heat exhaustion or heat stroke can lead to severe and chronic health issues (Bell, Gasparrini, and Benjamin 2024). Heat exposure also reduces worker productivity and increases absenteeism among workers (Ananian 2023; Amoadu et al. 2023). Workers most at risk for occupational heat exposure include low-wage workers and other marginalized groups, exacerbating health disparities and economic inequities produced by structural racism. Federal and state policymakers can use

this information to design policies to protect workers from extreme heat, establishing heat safety standards that cover all exposed workers and focusing monitoring and enforcement on the workers at highest risk.

Proposed Federal Worker Protections and Potential for A Future Administration to Block Implementation

As policymakers consider the implications of these findings, it is critical to assess both current gaps in worker protections and the potential challenges to implementing comprehensive federal heat safety standards. Despite growing exposure to heat-related occupational hazards across a wide range of workplaces, protections for exposure to heat and heat-related illnesses lag other workplace health and safety hazards. Currently, there is no federal heat-specific workplace standard addressing these risks, and monitoring of heat-related injuries is limited (Rosenthal, Barrientos-Ferrer, and Petosa 2024). In July 2024, OSHA proposed a new rule requiring employers to take specific measures to protect certain indoor and outdoor workers from heat illness, including providing water, rest breaks, shaded areas, air conditioning and ventilation in indoor areas, protective equipment, acclimatization, training, and monitoring for heat-related symptoms, with two heat index thresholds: at 80 degrees Fahrenheit, employers must provide drinking water and break areas, and at 90 degrees, additional measures such as mandatory 15-minute rest breaks every two hours, monitoring for signs of heat illness, and issuing hazard alerts are required.^{23, 24} The proposed federal standard would apply only to employers subject to OSHA's jurisdiction. Workers excluded from the proposed rule include state and local public sector workers in states without OSHA-approved plans and workers covered by other regulatory agencies, such as mining workers.^{25, 26} The rule could still meaningfully expand workplace protections for extreme heat in those workplaces if it were implemented.

However, a future presidential administration could block the final rule providing federal heat-specific workplace standards.²⁷ In addition, legal challenges based on recent Supreme Court decisions limiting the extent of federal agencies' rulemaking authority (Frederick 2024) could provide a pathway to curtailing OSHA's regulatory scope in the absence of new legislation from Congress to more precisely delegate authority.²⁸

State and Local Heat-Related Worker Protections and Prohibitions

In the absence of federal protections, only five states have implemented any workplace heat protections (Constible 2024), while two states have enacted laws that *prohibit* local governments from establishing their own heat safety measures.²⁹ California and Oregon cover outdoor and indoor workers with some exceptions. The protections in Colorado and Washington apply to outdoor workers only, despite evidence that indoor workers, such as those in factories, warehouses, and restaurants, can also face exposure to extreme temperatures, sometimes exceeding 100 degrees Fahrenheit,³⁰ and Minnesota's protections cover indoor workers only. Maryland is set to finalize a new heat safety standard for both indoor and outdoor workers³¹ and a proposed New York bill provides heat safety standards for indoor and outdoor worksites, including vehicles.³²

Given the lack of national protections and limited state protections, county and municipal governments can also take critical steps to protect workers. However, in 2023 and 2024, respectively, Texas and Florida enacted laws to preempt local heat safety ordinances, removing local governments' authority to establish heat protections for workers such as mandatory water breaks for construction workers,³³ even though Texas and Florida are among the states most exposed to extreme heat.³⁴ A recent analysis from Kaiser Family Foundation found the Florida law could disproportionately affect Hispanic and noncitizen immigrant workers,³⁵ who are among those most at risk of heat exposure at work according to our analysis. Some of these gaps can be filled by labor negotiations, such as the agreement between the Teamsters union and UPS in 2023, which resulted in air conditioning requirements although most UPS trucks are not yet equipped.³⁶

Policy Recommendations

- **Expand proposed federal heat protections to exposed workers across all employers and industries.** To enhance protections for workers against heat-related occupational health risks, federal policymakers and agencies could implement the proposed federal heat safety standards to cover all indoor and outdoor workers across all employers and industries—not just those subject to OSHA's jurisdiction, which are covered in the proposed rule.³⁷ Workers left out of the proposed rule include state and local public sector workers in states without OSHA-approved state plans (28 states have OSHA-approved plans that cover these workers), mining

workers who are mostly regulated by the Mine Safety and Health Administration, Coast Guard and Federal Aviation Administration workers, some Department of Energy workers such as nuclear facility workers, and other types of workers.^{38, 39}

- **Address legal challenges to OSHA’s regulatory authority.** Due to the recent Supreme Court decisions limiting the scope of federal agencies’ rulemaking power,⁴⁰ protecting workers in all states may require addressing legal challenges to ensure the regulatory scope of OSHA is maintained.
- **Adopt state-level and local protections.** State and local governments can pass legislation promoting safety measures for addressing heat exposure at work that are tailored to the climate risks and labor market characteristics of specific communities. However, this may not be a sufficient solution for workers in states such as Florida and Texas where state legislation prevents local governments from enacting their own heat safety measures for workers. Protections for workers in these states will almost certainly need to prioritize other policy strategies, such as pursuing litigation to challenge preemptive state laws and supporting expanded federal regulatory efforts by addressing legal challenges and building coalitions supporting them.
- **Promote labor negotiations and other forms of collective bargaining and worker advocacy to address gaps in heat protection.** Policymakers could support a range of collective bargaining strategies to close gaps in heat-related protections that federal standards do not fully cover. In sectors with existing union representation, heat protections can be prioritized in labor negotiations. For example, in industry sectors like transportation, a lack of air conditioning requirements in vehicles could be addressed through collective bargaining agreements. In industries or regions where traditional unions have been weakened, alternative forms of worker power, such as worker centers and informal worker organizations, could play more active roles.
- **Launch comprehensive campaigns to educate employers and workers on heat risks and protections.** Whether or not new federal heat safety regulations are enacted, federal, state, and local governments could invest in awareness campaigns to educate employers and workers about the health dangers and productivity losses from occupational heat exposure. If the new federal heat protections are enacted,

these campaigns could encourage proactive, voluntary action by employers and emphasize the workers' new rights related to federal heat protections when they are implemented.

- **Prioritize monitoring and enforcement for high-risk workers.** Federal policymakers and agencies can focus monitoring and enforcement efforts on workers who are at the highest risk for heat-related health issues (including outdoor workers, low-wage workers, Hispanic men, noncitizens, young adults, and adults in poor health, as shown in this study), with serious penalties for noncompliant employers (Weil 2010).
- **Encourage voluntary employer action to protect workers.** Employers who want to protect their workers can voluntarily adopt and exceed federal and state heat protection guidelines, even where not required by law. By implementing comprehensive heat safety measures—such as providing adequate hydration, shade, rest breaks, and training—employers can protect their workforce from heat-related risks, reduce liability, and demonstrate their commitment to worker safety.

These actions could better ensure that protections are not only consistent but also responsive to the needs of vulnerable populations, such as low-wage workers and workers in high-risk industries. By adopting these measures, federal and state authorities can better address the growing threat of extreme heat and mitigate its disproportionate impact on the most at-risk worker populations.

Conclusion

Addressing occupational heat risks requires a multifaceted approach that involves robust federal and state policies, proactive labor unions, employers, nonprofit advocacy groups, community-based organizations, and active monitoring and enforcement. Beyond these interventions, efforts to raise awareness of heat risks and mitigation measures are important for both employers and workers. Given the concentration of heat risks for low-income workers, Hispanic men, and noncitizens reflected in our study findings, targeted regulatory interventions and protective measures are necessary for vulnerable worker populations, including appropriate language and accessibility considerations.

Heat exposure at work is projected to increase in the long term as the planet warms. As a result, understanding how heat affects the most vulnerable among the workforce will be crucial to informing policies that bolster worker protections and counteract the larger forces exacerbating health disparities and economic inequities.

Data and Methods

This brief draws on data from a nationally representative sample of 7,821 adults ages 18 to 64 who participated in the December 2023 round of the WBNS, and our analysis focuses on the 4,697 adults who reported they were employed at the time of the survey. The WBNS is an internet-based survey designed to monitor changes in individual and family well-being as policymakers consider changes to federal safety net programs. For each round of the WBNS, we draw a stratified random sample (including a large oversample of adults in households with low incomes) from the KnowledgePanel, a probability-based internet panel maintained by Ipsos that includes households with and without internet access. Survey weights adjust for unequal selection probabilities and are post-stratified to the characteristics of nonelderly adults based on benchmarks from the Current Population Survey and American Community Survey. Participants can complete the survey in English or Spanish. For further information on the design and content of the WBNS, see Karpman, Zuckerman, and Gonzalez (2018).⁴¹

The 2023 survey round included new content on adults' employment characteristics, drawing partially on validated questions from other surveys such as O*NET questionnaires, the Current Population Survey, National Health Interview Survey, and the RAND American Working Conditions Survey. For all measures in this brief, we asked respondents to report characteristics of their current main job. For workers with multiple jobs, the main job is defined as the job at which they usually work the most hours. We examined the frequency (always, often, sometimes, or never) with which respondents' main jobs involved the following contexts, activities, and conditions:

- **Outdoor work:** how often adults reported working outdoors, either exposed to all weather conditions or under cover (like in an open shed).
- **Indoor work in places that are not environmentally controlled:** how often adults reported working indoors in a place that is not environmentally controlled (like a

warehouse without air conditioning) or in a vehicle that is not environmentally controlled (like a truck without air conditioning).

- **Exposure to high temperatures:** how often adults reported being exposed to very hot temperatures (above 90° F) at their job.
- **Strenuous work activities:** how often adults reported their job involves tiring or painful positions; heavy lifting; or repeated lifting, pushing, pulling, or bending.

We also estimated the share of workers who reported experiencing heat exhaustion or other heat-related symptoms because of their jobs in the past 12 months. Examples of heat-related symptoms included heavy sweating; cold, pale, or clammy skin; fast, weak pulse; nausea; muscle cramps; fatigue; dizziness; headache; or faintness. We examined frequency of work outdoors or indoors in non-climate-controlled settings, as well as experiences of heat-related symptoms at work by the following characteristics: industry group, hourly pay, race/ethnicity and gender, nativity and citizenship status, age, and self-reported health status.

We also examined the extent to which different groups of workers have union representation, which may increase their ability to negotiate for improved working conditions, and the share of workers living in one of five states that currently have heat standards for at least some workers (California, Oregon, Washington, Colorado, and Minnesota).

The WBNS has limitations, including a low cumulative response rate. The survey weights mitigate but do not eliminate potential nonresponse bias. However, studies assessing recruitment for the KnowledgePanel have found little evidence of nonresponse bias for core demographic and socioeconomic measures (Garrett, Dennis, and DiSogra 2010; Heeren et al. 2008), and WBNS estimates are generally consistent with benchmarks from federal surveys (Karpman, Zuckerman, and Gonzalez 2018). For instance, the 2023 WBNS estimates of the distribution of workers across industries are largely consistent with data from the most recent Current Population Survey Annual Social and Economic Supplement. The sampling frame for the WBNS also excludes or underrepresents certain groups of adults, including those experiencing homelessness, those who have low literacy levels, and those who are not proficient in English or Spanish. These groups may be more

likely than average to work in jobs with high risks of exposure to extreme heat, potentially resulting in underestimation of the share of workers facing these risks.

Other limitations of this analysis include a potential mismatch between the job respondents held at the time of the survey and the job they held in the past year when experiencing heat exhaustion or heat-related symptoms at work: if these respondents switched jobs at some point during the year, it would introduce measurement error in our estimates by industry. In addition, heat-related symptoms are self-reported, and some workers may mistakenly attribute these symptoms to heat exposure at work even if they are caused by other factors. Heat-related symptoms may also be underreported, since the survey was administered in December, but workers would be most likely to have experienced these symptoms in the summer months. Finally, measures of hourly pay and industry category may also be subject to measurement error, especially for adults whose earnings fluctuate and adults who had difficulty identifying the industry category that best matched their job.

Notes

- ¹ Other surveys that include heat exposure information on work environments are conducted at the establishment level, such as the Department of Labor (DOL) O*NET Resource Center (see <https://www.onetcenter.org/overview.html>) and the Bureau of Labor Statistics Occupational Requirements Survey (see <https://www.bls.gov/ors/data.htm>).
- ² People working indoors in places that are not environmentally controlled reported they always, often, or sometimes work in places or vehicles that are not environmentally controlled (e.g., a warehouse or truck without air conditioning).
- ³ “California Indoor Heat Protections Approved and Go into Effect,” California Department of Industrial Relations, July 24, 2024, <https://www.dir.ca.gov/DIRNews/2024/2024-59.html>.
- ⁴ “Biden-Harris Administration Announces Proposed Rule to Protect Indoor, Outdoor Workers from Extreme Heat,” US Department of Labor, Occupational Safety and Health Administration (OSHA), July 2, 2024, <https://www.osha.gov/news/newsreleases/national/07022024>.
- ⁵ “Heat Illness Prevention: Employer Responsibilities, Information for Workers,” Occupational Health and Safety Administration (OSHA), accessed September 13, 2024, <https://www.osha.gov/heat>.
- ⁶ “Overview: Working in Outdoor and Indoor Heat Environments,” Occupational Health and Safety Administration (OSHA), accessed September 13, 2024, <https://www.osha.gov/heat-exposure>.
- ⁷ “Extreme Heat,” Assistant Secretary for Health (ASH), US Department of Health and Human Services, accessed September 3, 2024, <https://www.hhs.gov/climate-change-health-equity->

[environmental-justice/climate-change-health-equity/climate-health-outlook/extreme-heat/index.html](https://www.nrdc.org/stories/indoor-workers-need-protection-extreme-heat-too).

- ⁸ Nicole Greenfield, “Indoor Workers Need Protection from Extreme Heat Too,” NRDC (Natural Resources Defense Council), August 10, 2023, <https://www.nrdc.org/stories/indoor-workers-need-protection-extreme-heat-too>.
- ⁹ “It’s Summer and It’s Hot on the Job,” Bureau of Labor Statistics, June 20, 2024, <https://www.bls.gov/opub/ted/2024/its-summer-and-its-hot-on-the-job.htm>.
- ¹⁰ “32.9 Percent of Employees Had Regular Outdoor Exposure in 2022,” Bureau of Labor Statistics, July 14, 2023, <https://www.bls.gov/opub/ted/2023/32-9-percent-of-employees-had-regular-outdoor-exposure-in-2022.htm>.
- ¹¹ “Occupational Requirements Survey: Civilian Workers,” Bureau of Labor Statistics, accessed September 16, 2024, <https://www.bls.gov/ors/factsheet/pdf/all-civilian-workers.pdf>.
- ¹² “Heatstroke: What Is It, Symptoms, Causes, Treatment & Recovery,” Cleveland Clinic, accessed September 13, 2024, <https://my.clevelandclinic.org/health/diseases/21812-heatstroke>.
- ¹³ The agriculture, construction, and mining industries had small sample sizes, particularly for the mining industry, limiting our ability to assess exposure risks within each industry; adults in the agricultural and construction industries worked outdoors at similar rates.
- ¹⁴ Joe Peck, William Congdon, and Kate Bahn, “Who Is the Low-Wage Workforce?” WorkRise Network, October 2, 2023, <https://www.workrisenetwork.org/features/who-low-wage-workforce>.
- ¹⁵ We were unable to produce reliable estimates for adults of additional races by gender due to limited sample sizes.
- ¹⁶ Nambi Ndugga, Drishti Pillai, and Samantha Artiga, “Climate-Related Health Risks Among Workers: Who Is at Increased Risk?” KFF (blog), June 26, 2023, <https://www.kff.org/racial-equity-and-health-policy/issue-brief/climate-related-health-risks-among-workers-who-is-at-increased-risk/>.
- ¹⁷ Nambi Ndugga, Drishti Pillai, and Samantha Artiga, “Climate-Related Health Risks Among Workers: Who Is at Increased Risk?”
- ¹⁸ Dana G. Smith, “How Heat Affects the Brain: High Temperatures Can Make Us Miserable. Research Shows They Also Make Us Aggressive, Impulsive and Dull,” The New York Times, June 19, 2024, <https://www.nytimes.com/2024/06/19/well/mind/heat-affect-brain-emotions.html>.
- ¹⁹ “Extreme Heat: Heat and Chronic Conditions,” CDC (Centers for Disease Control), Extreme Heat, February 15, 2024, <https://www.cdc.gov/extreme-heat/risk-factors/extreme-heat-and-chronic-conditions.html>.
- ²⁰ California covers outdoor and indoor workers except at correctional facilities; Colorado covers agricultural workers; Oregon covers outdoor and indoor workers with some exceptions; Minnesota covers indoor workers; and Washington covers outdoor workers (Constible 2024).
- ²¹ “32.9 Percent of Employees Had Regular Outdoor Exposure in 2022,” Bureau of Labor Statistics.
- ²² “It’s Summer and It’s Hot on the Job,” Bureau of Labor Statistics.
- ²³ “Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings Rulemaking,” Occupational Safety and Health Administration (OSHA), September 13, 2024, <https://www.osha.gov/heat-exposure/rulemaking>.

-
- ²⁴ “Biden–Harris Administration Announces Proposed Rule to Protect Indoor, Outdoor Workers from Extreme Heat,” US Department of Labor, Occupational Safety and Health Administration (OSHA).
- ²⁵ “State Plan Frequently Asked Questions,” Occupational Safety and Health Administration (OSHA), accessed September 13, 2024, <https://www.osha.gov/stateplans/faqs>.
- ²⁶ “State Plans,” Occupational Safety and Health Administration (OSHA), accessed September 13, 2024, <https://www.osha.gov/stateplans>.
- ²⁷ “OSHA Issues Landmark Proposed Heat Rule for Indoor and Outdoor Work,” Morgan Lewis, July 10, 2024, <https://www.morganlewis.com/pubs/2024/07/osha-issues-landmark-proposed-heat-rule-for-indoor-and-outdoor-work>.
- ²⁸ “DOL Unveils Proposed Heat Illness Prevention Rule as Federal Agency Authority Faces Questions,” Ogletree Deakins, July 8, 2024, <https://ogletree.com/insights-resources/blog-posts/dol-unveils-proposed-heat-illness-prevention-rule-as-federal-agency-authority-faces-questions/>.
- ²⁹ Chris Marr, “Worker Heat Safety Laws Are Latest Focus of Red State Preemption,” Bloomberg Law Daily Labor Report, April 17, 2024, <https://news.bloomberglaw.com/daily-labor-report/worker-heat-safety-laws-are-latest-focus-of-red-state-preemption>.
- ³⁰ Nicole Greenfield, “Indoor Workers Need Protection from Extreme Heat Too.”
- ³¹ Emily Hofstaedter, “As Workers Toil in High Heat, Maryland Poised to Pass New Labor Standards,” WYPR, June 18, 2024, <https://www.wypr.org/wypr-news/2024-06-18/as-workers-toil-in-high-heat-maryland-poised-to-pass-new-labor-standards>.
- ³² Jessica Ramos, “NY State Senate Bill 2023–S1604C,” 2023–2024 Legislative Session, June 2, 2024. <https://www.nysenate.gov/legislation/bills/2023/S1604/amendment/C>.
- ³³ Chris Marr, “Worker Heat Safety Laws Are Latest Focus of Red State Preemption.”
- ³⁴ John Muyskens, Andrew Ba Tran, Anna Phillips, Simon Ducroquet, and Naema Ahmed, “More Dangerous Heat Waves Are on the Way: See the Impact by Zip Code,” Washington Post, August 15, 2024, <https://www.washingtonpost.com/climate-environment/interactive/2022/extreme-heat-risk-map-us/>.
- ³⁵ Nambi Ndugga, Drishti Pillai, and Samantha Artiga, “Florida’s Recent Heat Protection Preemption Law Could Disproportionately Affect Hispanic and Noncitizen Immigrant Workers,” KFF (blog), April 26, 2024, <https://www.kff.org/racial-equity-and-health-policy/issue-brief/floridas-recent-heat-protection-preemption-law-could-disproportionately-affect-hispanic-and-noncitizen-immigrant-workers/>.
- ³⁶ Daniella Genovese, “Some UPS Drivers Still Waiting for Air Conditioning in Trucks as Temperatures Soar Nationwide,” Fox Business, June 24, 2024, <https://www.foxbusiness.com/lifestyle/some-ups-drivers-still-waiting-air-conditioning-trucks-temperatures-soar-nationwide>.
- ³⁷ “Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings Rulemaking,” Occupational Safety and Health Administration (OSHA).
- ³⁸ “State Plan Frequently Asked Questions,” Occupational Safety and Health Administration (OSHA).
- ³⁹ “State Plans,” Occupational Safety and Health Administration (OSHA).
- ⁴⁰ John G. Roberts, Loper Bright Enterprises v. Raimondo, Secretary of Commerce, et al., Certiorari to the United States Court of Appeals for the District of Columbia Circuit, United States Supreme Court, No. 22–

451, Argued January 17, 2024—Decided June 28, 2024,
https://www.supremecourt.gov/opinions/23pdf/22-451_7m58.pdf.

⁴¹ The WBNS instruments are available at “The Well-Being and Basic Needs Survey,” Urban Institute, accessed August 1, 2024, <https://www.urban.org/policy-centers/health-policy-center/projects/well-being-and-basic-needs-survey>.

References

- Amoadu, Mustapha, Edward Wilson Ansah, Jacob Owusu Sarfo, and Thomas Hormenu. 2023. "Impact of Climate Change and Heat Stress on Workers' Health and Productivity: A Scoping Review." *The Journal of Climate Change and Health* 12 (July):100249. <https://doi.org/10.1016/j.joclim.2023.100249>.
- Ananian, Sévane. 2023. "Impact of Heat Stress on Labor Productivity and Decent Work." Penn Global: 2023 Perry World House Global Shifts Colloquium. May 28, 2023. <https://global.upenn.edu/perryworldhouse/news/impact-heat-stress-labor-productivity-and-decent-work>.
- Bell, Michelle L., Antonio Gasparrini, and Georges C. Benjamin. 2024. "Climate Change, Extreme Heat, and Health." *New England Journal of Medicine* 390 (19): 1793–1801. <https://doi.org/10.1056/NEJMra2210769>.
- Berumen-Flucker, Brenda, Michele Kekeh, and Muge Akpinar-Elci. 2022. "Cultural Factors, Migrant Status, and Vulnerability to Increasing Temperatures among Hispanic/Latino Farmworkers: A Systematic Review." *Journal of Agricultural Safety and Health* 28 (1): 49–63. <https://doi.org/10.13031/jash.14592>.
- BLS (Bureau of Labor Statistics). 2020. "ORS Collection Manual." Washington, DC: US Department of Labor, Bureau of Labor Statistics (BLS), Office of Compensation and Working Conditions (OCWC).
- Boyens, Chantel, Michael Karpman, and Jack Smalligan. 2022. "Access to Paid Leave Is Lowest among Workers with the Greatest Needs." Washington, DC: Urban Institute.
- Bukhari, Hassan Adnan. 2023. "A Systematic Review on Outcomes of Patients with Heatstroke and Heat Exhaustion." *Open Access Emergency Medicine* 15:343–54. <https://doi.org/10.2147/OAEM.S419028>.
- Claxton, Gary, Matthew Rae, and Audrey Winger. 2024. "Employer-Sponsored Health Insurance 101." In "Health Policy 101." Edited by Drew Altman. Washington, DC: KFF. <https://www.kff.org/health-policy/101-employer-sponsored-health-insurance/>.
- Colato, Javier, and Lindsey Ice. 2023. "Industry and Occupational Employment Projections Overview and Highlights, 2022–32." *Monthly Labor Review*. Washington, DC: Bureau of Labor Statistics. <https://doi.org/10.21916/mlr.2023.24.s>
- Constible, Juanita. 2020. "On the Frontlines: Climate Change Threatens the Health of America's Workers." New York: Natural Resources Defense Council (NRDC). <https://www.nrdc.org/resources/frontlines-climate-change-threatens-health-americas-workers>.
- — —. 2024. "Occupational Heat Safety Standards in the United States." New York: Natural Resources Defense Council (NRDC). <https://www.nrdc.org/resources/occupational-heat-safety-standards-united-states>.
- Dahl, Kristina, and Rachel Licker. 2021. "Too Hot to Work." Union of Concerned Scientists. August 17, 2021. <https://www.ucsusa.org/resources/too-hot-to-work>.
- Dixon, Rebecca, and Amy Traub. 2024. *Desegregating Opportunity: Why Uprooting Occupational Segregation is Critical to Building a Good-Jobs Economy*. New York: National Employment Law Project.
- Ebi, Kristie L., Anthony Capon, Peter Berry, Carolyn Broderick, Richard de Dear, George Havenith, Yasushi Honda, et al. 2021. "Hot Weather and Heat Extremes: Health Risks." *The Lancet* 398 (10301): 698–708. [https://doi.org/10.1016/S0140-6736\(21\)01208-3](https://doi.org/10.1016/S0140-6736(21)01208-3).
- Farmworker Justice. 2022. "The Climate Crisis and Its Impacts on Farmworkers." Prepared for Farmworker Justice's Environmental Justice Symposium, May 17–18, 2022.

<https://www.farmworkerjustice.org/resource/issue-brief-the-climate-crisis-and-its-impact-on-farmworkers/>.

- Fatima, Syeda Hira, Paul Rothmore, Lynne C. Giles, Blesson M. Varghese, and Peng Bi. 2021. "Extreme Heat and Occupational Injuries in Different Climate Zones: A Systematic Review and Meta-Analysis of Epidemiological Evidence." *Environment International* 148 (March): 106384. <https://doi.org/10.1016/j.envint.2021.106384>.
- Frederick, Susan. 2024. "Supreme Court Throws Out Chevron Decision, Weakening Federal Regulators." National Conference of State Legislatures. June 30, 2024. <https://www.ncsl.org/state-legislatures-news/details/supreme-court-throws-out-chevron-decision-weakening-federal-regulators>.
- Fulcher, Juley. 2023. "Hot Take—Urgent Heat Crisis for Workers: The Demand For Immediate Worker Protections Increases As Dangerous Temperatures Rise." Washington, DC: Public Citizen.
- Garrett, Joe, J. Michael Dennis, and Charles A. DiSogra. 2010. "Non-Response Bias: Recent Findings from Address-Based Panel Recruitment." In Annual Conference of the American Association for Public Opinion Research, Chicago.
- Heeren, Timothy, Erika M. Edwards, J. Michael Dennis, Sergei Rodkin, Ralph W. Hingson, and David L. Rosenbloom. 2008. "A Comparison of Results From an Alcohol Survey of a Prerecruited Internet Panel and the National Epidemiologic Survey on Alcohol and Related Conditions." *Alcoholism: Clinical and Experimental Research* 32 (2): 222–29. <https://doi.org/10.1111/j.1530-0277.2007.00571.x>.
- John, Priyadarshini, and Vivekanand Jha. 2023. "Heat Stress: A Hazardous Occupational Risk for Vulnerable Workers." *Kidney International Reports* 8 (7): 1283–86. <https://doi.org/10.1016/j.ekir.2023.05.024>.
- Karpman, Michael, Stephen Zuckerman, and Dulce Gonzalez. 2018. "The Well-Being and Basic Needs Survey: A New Data Source for Monitoring the Health and Well-Being of Individuals and Families." Washington, DC: Urban Institute.
- Kenny, Glen P., Thad E. Wilson, Andreas D. Flouris, and Naoto Fujii. 2018. "Heat Exhaustion." In *Handbook of Clinical Neurology* 157: 505–29. NLD: Elsevier. <https://doi.org/10.1016/B978-0-444-64074-1.00031-8>.
- Kjellstrom, T., E. Oppermann, and J. K. W. Lee. 2020. "Climate Change, Occupational Heat Stress, Human Health, and Socioeconomic Factors." In *Handbook of Socioeconomic Determinants of Occupational Health: From Macro-Level to Micro-Level Evidence*, edited by Töres Theorell, 71–89. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-31438-5_37.
- Licker, Rachel, Kristina Dahl, and John T. Abatzoglou. 2022. "Quantifying the Impact of Future Extreme Heat on the Outdoor Work Sector in the United States." *Elementa: Science of the Anthropocene* 10 (1): 00048. <https://doi.org/10.1525/elementa.2021.00048>.
- Liu, Jingwen, Blesson M Varghese, Alana Hansen, Ying Zhang, Timothy Driscoll, Geoffrey Morgan, Keith Dear, Michelle Gourley, Anthony Capon, and Peng Bi. 2022. "Heat Exposure and Cardiovascular Health Outcomes: A Systematic Review and Meta-Analysis." *The Lancet Planetary Health* 6 (6): e484–95. [https://doi.org/10.1016/S2542-5196\(22\)00117-6](https://doi.org/10.1016/S2542-5196(22)00117-6).
- McInnes, Judith A, Muhammad Akram, Ewan M MacFarlane, Tessa Keegel, Malcolm R Sim, and Peter Smith. 2017. "Association between High Ambient Temperature and Acute Work-Related Injury: A Case-Crossover Analysis Using Workers' Compensation Claims Data." *Scandinavian Journal of Work, Environment & Health* 43 (1): 86–94. <https://doi.org/10.5271/sjweh.3602>.
- McKenna, Zachary J., Whitley C. Atkins, Josh Foster, Luke N. Belval, Joseph C. Watso, Caitlin P. Jarrard, and Craig G. Crandall. 2024. "Kidney Function Biomarkers During Extreme Heat Exposure in Young and Older Adults." *JAMA* 332 (4): 333–5. <https://doi.org/10.1001/jama.2024.9845>.

- NIOSH (National Institute for Occupational Safety and Health). 2023. "Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments – Revised Criteria 2016." National Institute for Occupational Safety and Health (NIOSH). <https://doi.org/10.26616/NIOSH PUB2016106>.
- Rodgers, Jennifer L., Jarrod Jones, Samuel I. Bolleddu, Sahit Vanthenapalli, Lydia E. Rodgers, Kinjal Shah, Krishna Karia, and Siva K. Panguluri. 2019. "Cardiovascular Risks Associated with Gender and Aging." *Journal of Cardiovascular Development and Disease* 6 (2): 19. <https://doi.org/10.3390/jcdd6020019>.
- Rosenthal, Jill, Rosa Barrientos-Ferrer, and Kate Petosa. 2024. "Extreme Heat Is More Dangerous for Workers Every Year." Washington, DC: Center for American Progress.
- Sokas, Rosemary K., and Emily Senay. 2023. "Preventing Heat-Related Illness among Outdoor Workers — Opportunities for Clinicians and Policymakers." *New England Journal of Medicine* 389 (14): 1253–56. <https://doi.org/10.1056/NEJMp2307850>.
- UN IPCC (United Nations Intergovernmental Panel on Climate Change). 2023. *Climate Change 2023: Synthesis Report*. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. CHE: United Nations Intergovernmental Panel on Climate Change (UN IPCC).
- Varghese, Blesson M., Alana Hansen, Peng Bi, and Dino Pisaniello. 2018. "Are Workers at Risk of Occupational Injuries Due to Heat Exposure? A Comprehensive Literature Review." *Safety Science* 110 (December):380–92. <https://doi.org/10.1016/j.ssci.2018.04.027>.
- Weil, David. 2010. "Improving Workplace Conditions through Strategic Enforcement." Boston University School of Management Research Paper No. 2010–20. Boston: Boston University School of Management Research. <https://dx.doi.org/10.2139/ssrn.1623390>.

About the Authors

Lisa Clemans-Cope is a senior research fellow in the Health Policy Center at the Urban Institute. Dr. Clemans-Cope's research explores environment and climate risks, public health, worker health, and equitable community and economic development. She recently conducted a public health analysis detailing environmental and economic impacts of climate change on health outcomes in the Central San Joaquin Valley of California. Her areas of expertise also include behavioral health with a focus on substance use disorder, health equity, racial disparities, health care and spending, access to and use of health care, Medicaid/CHIP, Medicare, people dually eligible for Medicare and Medicaid, private insurance, federal and state health reform legislation and regulation, and health-related survey and administrative claims data. Her research includes analyses of the Affordable Care Act, Medicaid, Medicaid and Medicare reimbursement rates and drug costs, and health care disparities. Clemans-Cope has published research in the *New England Journal of Medicine*, *JAMA Health Forum*, *Health Affairs*, *Pediatrics*, and *Inquiry*. Clemans-Cope has a BA in economics from Princeton University and a PhD in health economics from the Johns Hopkins Bloomberg School of Public Health.

Dulce Gonzalez is a senior research associate in the Health Policy Center at the Urban Institute. She forms part of a team working on the Urban Institute's Well-Being and Basic Needs Survey. Gonzalez conducts quantitative and qualitative research focused primarily on the social safety net, immigration, and barriers to health care access. Her work has also focused on the impacts of the COVID-19 pandemic on nonelderly adults and their families. Before joining Urban, Gonzalez worked at the Georgetown University Center for Children and Families and at the nonprofit organization Maternal and Child Health Access. Gonzalez holds a BA in economics from California State University, Long Beach, and a master's degree in public policy from Georgetown University.

Michael Karpman is a principal research associate in the Health Policy Center at the Urban Institute. His work focuses on quantitative analysis related to health insurance coverage, health care access and affordability, medical debt, health service use and spending, social determinants of health, and federal and state safety net programs. This work includes overseeing data collection and analysis for the Urban Institute's Well-Being and Basic

Needs Survey. Before joining Urban in 2013, Karpman was a senior associate at the National League of Cities Institute for Youth, Education, and Families. He received his MPP from Georgetown University.

Sara McTarnaghan is a principal research associate in the Metropolitan Housing and Communities Policy Center at the Urban Institute and colead for the Climate and Communities practice area. Her research focuses on the intersection of climate resilience and affordable housing, as well as local and regional approaches to equitable resilience planning and disaster recovery. She examines the connections between the built and natural environments, public policy, and social and economic outcomes, especially for people and communities disproportionately affected by the increasing frequency and severity of climate impacts.

Acknowledgments

This report was funded by WorkRise funder collaborative. We are grateful to them and to all our funders, who make it possible for WorkRise and Urban to advance its missions.

The views expressed are those of the authors and should not be attributed to WorkRise, the Urban Institute, its trustees, or its funders. Funders do not determine research findings or the insights and recommendations of Urban experts. Further information on the Urban Institute's funding principles is available at urban.org/fundingprinciples.

The authors thank Elaine Waxman, Megan Tackney, Beth Jacob, Teresa Kroeger, and Maia Berlow, and Lisa Dubay for their comments on earlier drafts of this brief.

STATEMENT OF INDEPENDENCE

WorkRise is a research-to-action network on jobs, workers, and mobility hosted by the Urban Institute. The Urban Institute strives to meet the highest standards of integrity and quality in its research and analyses and in the evidence-based policy recommendations offered by its researchers and experts. We believe that operating consistent with the values of independence, rigor, and transparency is essential to maintaining those standards. As an organization, the Urban Institute does not take positions on issues, but it does empower and support its experts in sharing their own evidence-based views and policy recommendations that have been shaped by scholarship. Funders do not determine our research findings or the insights and recommendations of our experts. Urban scholars and experts are expected to be objective and follow the evidence wherever it may lead.



WorkRise

www.workrise.urban.org

Copyright ©September 2024. WorkRise, a project of the Urban Institute.
Permission is granted to reproduce this file with attribution to WorkRise.