

# FARMWORKER JUSTICE

## HEALTH POLICY BULLETIN

### *Policies in Action to Protect Workers from Heat Stress and Heat-Related Illness*

[www.farmworkerjustice.org](http://www.farmworkerjustice.org)

Spring 2022

### Policy Update

By Tessa Pulaski, Legal Fellow, Farmworker Justice

Among all weather-related hazards in the workplace, heat is the leading cause of worker deaths. As a result of their work conditions, agricultural workers face higher rates of heat illness and death than other workers. The U.S. does not currently have a federal standard to protect workers from harmful heat conditions.

### Federal Overview

On October 27, 2021, the Occupational Safety and Health Administration (OSHA), part of the U.S. Department of Labor (DOL), published an Advance Notice of Proposed Rulemaking (ANPRM) for Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings.<sup>1</sup> After reviewing comments from interested stakeholders, OSHA will issue a proposed regulation with request for comment before issuing a final rule. The notice is part of the Biden Administration's recently announced inter-agency effort to address extreme heat.<sup>2</sup>

Legislation has also been introduced in Congress to address heat illness. The "Asunción Valdivia Heat Illness and Fatality Prevention Act of 2021" would require OSHA to issue a federal standard for heat stress protections tailored to the specific hazards of the workplace and with meaningful participation of workers.<sup>3</sup> The standard would require that workers who are exposed to high heat be guaranteed paid breaks in cool or shaded environments and access to water for hydration. Additionally, employers would be required to create emergency response procedures for employees suffering from heat illness, provide training on heat stress in a language that workers understand, and implement acclimatization plans to ensure workers can adjust to their working conditions. The bill would also mandate that employers utilize engineering and administrative controls to limit heat exposure (i.e., ventilation and/or protective clothing, where applicable) and maintain records on all heat-related illness and deaths. Lastly, the bill would prohibit retaliation or discrimination against a worker for reporting violations of this standard or exercising any other rights under the bill.

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<sup>1</sup> Heat injury and illness prevention in outdoor and indoor settings, <https://www.federalregister.gov/documents/2021/12/03/2021-26269/heat-injury-and-illness-prevention-in-outdoor-and-indoor-work-settings-extension-of-comment-period>.

<sup>2</sup> Statement by President Joe Biden on mobilizing the administration to address extreme heat. The White House. Sept. 19, 2021. <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/20/statement-by-president-joe-biden-on-mobilizing-the-administration-to-address-extreme-heat/>.

<sup>3</sup> S.1068 - 117th Congress (2021-2022): Asuncion Valdivia Heat Illness and Fatality Prevention Act of 2021, <https://www.congress.gov/bill/117th-congress/senate-bill/1068>.

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## States with Heat Standards

California was the first state to adopt a standard to protect outdoor workers from heat exposure in 2005.<sup>4</sup> The standard, “Heat Illness Prevention in Outdoor Places of Employment,” currently provides a framework to prevent, track, and address heat related illness.

The Oregon Occupational Safety and Health Division (Oregon OSHA) adopted temporary emergency rules for employees who work outdoors in extreme heat in 2021.<sup>5</sup> The workplace protections were activated any time the heat index reached 80 degrees and included provisions guaranteeing easily accessible shade, rest breaks and employer-provided drinking water. The Oregon emergency rule expired at the end of 2021, but Oregon is in the process of drafting a new permanent heat standard.<sup>6</sup> Shortly after the Oregon standard was enacted, Washington State passed emergency heat rules for farmworkers<sup>7</sup> to strengthen its existing standard. Washington and Oregon are both working to create permanent protections based on the emergency rules.<sup>8</sup>



Photo credit: Kay Chernush

On January 31, 2022, Colorado’s Department of Labor and Employment issued final regulations on agricultural labor conditions.<sup>9</sup> The regulations include several provisions to protect farmworkers from extreme heat. The regulations will become effective on May 1, 2022.

## Other State Efforts

There are ongoing legislative and regulatory efforts in other states to protect outdoor workers from heat exposure. In Maryland, lawmakers passed a bill (HB 722) that requires regulators to issue standards for protections from heat exposure for outdoor workers by October 1, 2022.<sup>10</sup> The bill was signed into law in May 2020. Nevada also began a rulemaking process in 2020 to adopt a heat stress standard and has issued a proposed rule.<sup>11</sup> The rule must be finalized by the Division of Industrial Relations and approved by the Legislative Commission before it goes into effect. In Florida, legislation was introduced in both the Senate and the House (SB 732<sup>12</sup> and HB 887<sup>13</sup>) to protect outdoor workers from extreme heat. Although the Senate bill passed the Senate Agriculture Committee in a unanimous vote, no action was taken in the House.<sup>14</sup> In Virginia, Safety and Health Codes Board members voted six to five in December 2021 to end the process started two years earlier to enact heat safety rules for outdoor workers.<sup>15</sup>

Farmworker Justice continues to monitor federal and state policy related to heat stress. Visit [FJ’s website](#) for information and updates.

<sup>4</sup> 3 CCR § 3395

<sup>5</sup> Oregon OSHA, “Oregon OSHA adopts emergency rule bolstering protections for workers against the hazards of high and extreme heat,” Jul. 8, 2021, <https://www.oregon.gov/newsroom/Pages/NewsDetail.aspx?newsid=64105>.

<sup>6</sup> Guy Burdick, “Oregon OSHA Proposes Heat, Wildfire Smoke Rules,” Feb. 22, 2022, <https://ehsdailyadvisor.blr.com/2022/02/oregon-osha-proposes-heat-wildfire-smoke-rules/>.

<sup>7</sup> Daisy Zavala, Hal Bernton, “Washington state to release emergency heat rules for farmworkers as advocates demand added protections,” Jul. 12, 2021, <https://www.seattletimes.com/business/agriculture/washington-state-to-release-emergency-heat-rules-for-farmworkers-as-advocates-demand-added-protections/>.

<sup>8</sup> Alex Brown, “Scorching Heat Is Killing Workers. Some States Are Stepping In,” Aug. 23, 2021, <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2021/08/23/scorching-heat-is-killing-workers-some-states-are-stepping-in>.

<sup>9</sup> 7 CCR 1103-15.

<sup>10</sup> Md. Labor and Employment Code Ann. § 5-1201.

<sup>11</sup> Proposed Regulation of the Division of Industrial Relations of the Department of Business and Industry. LCB File No. R053-20. January 25, 2021. <https://dir.nv.gov/uploadedFiles/dirnvqov/content/Governance/R053-20P%201-25-21.pdf>.

<sup>12</sup> Heat Illness Prevention, SB 732, 2022 Session (Flo. 2022). <https://www.flsenate.gov/Session/Bill/2022/732/?Tab=RelatedBills>.

<sup>13</sup> Heat Illness Prevention, HB 887, 2022 Session (Flo. 2022). <https://www.flsenate.gov/Session/Bill/2022/887>.

<sup>14</sup> Id.

<sup>15</sup> Alex Brown, “Virginia Nixes Effort to Issue Heat Safety Rules for Workers,” Dec. 9, 2021, <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2021/12/09/virginia-nixes-effort-to-issue-heat-safety-rules-for-workers>.

# Idaho's Environmental Justice Non-Profits Working Towards Safety Conditions for Farmworkers Working in the Heat

By Irene Ruiz, Bilingual Community Organizer, Idaho Organization of Resource Councils

According to the National Weather Service, Idaho had some of the most extreme heat that has been recorded in recent history.<sup>16</sup> The average high temperature in July was 98 degrees Fahrenheit in the Treasure Valley, Idaho's most populated area. Idaho's farmworkers are the backbone of the state's agricultural industry. As essential workers, they work through all kinds of weather conditions, including extreme heat. With the lack of rules and regulations regarding heat exposure to protect farmworkers, non-profit organizations are working on building campaigns and supply drives to provide workers with some relief in Idaho.



Photo credit: Ricardo Godina

The Idaho Immigrant Resource Alliance (IIRA), which consists of eleven non-profits, was created in 2020 to support immigrant, farmworkers, and Latinx communities in Idaho during the pandemic. When one of IIRA's members heard about the death of a farmworker in Oregon, it prompted IIRA to start mobilizing to raise funds and supplies to provide Idaho's farmworkers relief from the heat. They were able to collect around \$22,000 in donations along with coolers, ice packs, Gatorade, water, food, and sunscreen. These items were distributed in Southern Idaho as well as Fort Hall Reservation in the Bannock County area. IIRA also partnered with the U.S. Department of Labor to hold a webinar in Spanish on how to protect workers from the heat. During the webinar, a viewer commented that they never heard of the precautions that could be taken to protect themselves from exposure to extreme heat. Maria, an Idaho farmworker, said that at times she did not have the proper equipment to work in extreme heat. Unfortunately, workers lack proper personal protective equipment as well as adequate information in their preferred language.

The Idaho Organization of Resource Councils (IORC), a small non-profit, works on environmental justice issues. Visión 2C Resource Council (V2C), part of IORC, is the first Latinx environmental justice chapter in Idaho. V2C plans to spread awareness about the dangers of heat exposure through education and partnerships with other organizations and agencies. It is important for V2C to highlight the voices of farmworkers in the state and ensure they are part of the planning process.

People shouldn't have to fall ill or die to get food on our tables. We must support organizations who are working towards a safe working environment. Idaho is lucky to have amazing organizations that will make sure this happens. IORC, IIRA, and V2C along with all organizations hope that their efforts will create change to protect farmworkers from heat stress and other climate events that affect outdoor workers.



Photo credit: Ricardo Godina

<sup>16</sup> Ariana Piper, NWS says Boise recorded the warmest July on record in 2021, (Boise, ID, Channel 2 Idaho News), August 1st, 2021 <https://idahonews.com/news/local/nws-says-boise-recorded-the-warmest-july-on-record-in-2021#:~:text=According%20to%20the%20National%20Weather,in%20July%20was%2098.6%20degrees.>



## Heat-Related Illness on the Rise: The Clinical Perspective

Claire Hutkins Seda, Senior Writer & Editor, and Amy K. Liebman, MPA, Director of Environmental and Occupational Health, Migrant Clinicians Network

Extreme heat kills more people each year than hurricanes, floods, tornadoes, and lightning combined.<sup>17</sup> Agricultural workers are particularly vulnerable to heat-related illnesses: they are exposed to the sun in the fields and they have limited ability to alter job duties when a heat wave strikes, as the crops still need tending and harvesting regardless of the temperature. Due to poverty and the precarious and temporary nature of their work, they may continue working even as symptoms progress and they have few courses for redress if heat exposure situations turn dangerous.

The current path of climate change, unless drastic and quick action is taken, will have dire consequences on agricultural workers. Climate change is already increasing the number of dangerous heat events, and regions that have not historically experienced severe heat waves are now at risk. Consequently, in coming years, heat-related deaths will increase substantially among agricultural workers.

Heat-related illnesses for agricultural workers often occur at temperatures under 100 degrees Fahrenheit, particularly among new agricultural workers who have not acclimated to the heat. For community health workers, outreach workers, and other clinicians, heat-related illnesses necessitate a greater focus in all regions of the country so that agricultural workers are aware of the increasing risk due to the climate crisis.

Heat-related illness occurs when a body's internal temperature has increased and the body is unable to cool itself. As the heat of the body increases, the severity of heat-related illness grows. There are several stages of heat-related illness:

**Heat rash, cramps, or fatigue:** These health concerns typically occur in warm or hot weather but when the body is not at a dangerous heat level. Similar symptoms like rash and cramping may occur with simple exertion on the job. Pain in the stomach, legs, or arms is also common. Heat rash, cramps, and fatigue are warning signs of the body. Workers are recommended to rest in the shade to avoid advancement into more serious states of heat-related illness.

**Heat exhaustion:** While the skin may remain cool and moist from sweat, the body temperature is rising to more dangerous levels when a worker experiences heat exhaustion. Heavy sweating, headache, nausea or vomiting, dizziness, light-headedness, weakness, increasing thirst, and a faster heartbeat are common symptoms. Again, the body is pushing the worker to stop and rest, to get the body temperature down. Workers must stop work, rest in the shade, and hydrate to prevent advancement to heat stroke.

**Heat stroke:** Internal temperature is at 104 degrees Fahrenheit or higher. At this temperature, workers often experience confusion or delirium. Workers often stop sweating when experiencing heat stroke. Seizures, unconsciousness, and death may occur. Heat stroke is deadly and constitutes a medical emergency.

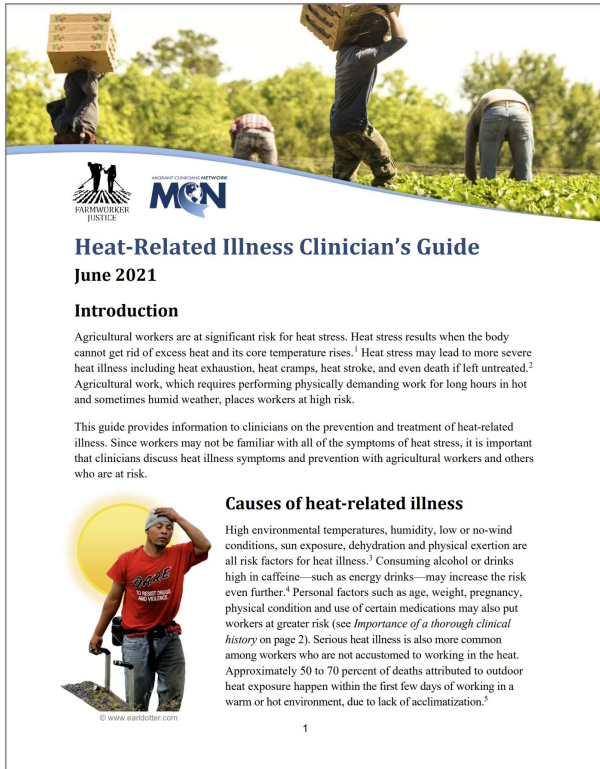


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<sup>17</sup> U.S. Environmental Protection Agency, and Centers for Disease Control and Prevention. *Climate Change and Extreme Heat: What You Can Do to Prepare*. EPA 430-R-16-061. October 2016. <https://www.cdc.gov/climateandhealth/pubs/extreme-heat-guidebook.pdf>.

<sup>18</sup> Mac VV, Tovar-Aguilar JA, Flocks J, Economos E, Hertzberg VS, McCauley LA. *Heat Exposure in Central Florida Fernery Workers: Results of a Feasibility Study*. *J Agromedicine*. 2017;22(2):89-99. doi: 10.1080/1059924X.2017.1282906.

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Key factors to avoid heat-related illness at each of its stages include hydration, shade, and rest. Hydration is particularly critical for agricultural workers. A 2017 study indicated that many agricultural workers arrive at work already dehydrated,<sup>18</sup> increasing their risk of heat-related injury at work. Further, without a federal heat standard, employers may not be providing sufficient water, shade, and breaks to hydrate.

Other factors may increase a worker's risk of heat-related illness. The use of personal protective equipment for application of pesticides may reduce a worker's ability to cool down. Masks and respirators, to reduce the spread of COVID-19 or the inhalation of wildfire smoke, may also contribute to risk of heat stress. Humidity and wind also influence risk on a given day.

Many resources exist to assist clinicians in identifying and informing agricultural workers who may be at risk for heat-related illness. Migrant Clinicians Network (MCN) hosts regular webinars on heat-related illness – including the 2021 webinar *It's So Hot And It's Dangerous! The Role Of Community Health Workers In Preventing Heat-Related Illness*,<sup>19</sup> also available in Spanish.<sup>20</sup> In 2021, MCN and Farmworker Justice partnered to create a *Heat-Related Illness Clinicians' Guide*,<sup>21</sup> also available in Spanish,<sup>22</sup> which further details the recognition and management of

heat-related illnesses among agricultural workers.

For more information on heat-related illness, including resources for clinicians and workers, visit [MCN's Heat-Related Illness](#) page.

<sup>19</sup> Migrant Clinicians Network (MCN). *It's so hot and it's dangerous! The role of community health workers in preventing heat-related illness*. (Webinar) May 25, 2021. <https://www.migrantclinician.org/webinar/its-so-hot-and-its-dangerous-role-community-health-workers-preventing-heat-related-illness>.

<sup>20</sup> MCN. *¡Hace mucho calor y es peligroso! El papel de los promotores de salud en la prevención de enfermedades causadas por el calor*. (Seminario Virtual) 25 de mayo de 2021. <https://www.migrantclinician.org/webinar/hace-mucho-calor-y-es-peligroso-aprenda-como-los-promotores-de-salud-pueden-ayudar-prevenir>.

<sup>21</sup> Farmworker Justice, and MCN. *Heat-Related Illness Clinician's Guide*. June 2021. <https://www.migrantclinician.org/toolsource/resource/heat-related-illness-clinician%E2%80%99s-guide-june-2021.html>.

<sup>22</sup> Farmworker Justice, y MCN. *Guía del proveedor de servicios de salud para enfermedades relacionadas con el calor*. Junio de 2021. <https://www.migrantclinician.org/es/toolsource/resource/qu%C3%ADa-del-proveedor-de-servicios-de-salud-para-enfermedades-relacionadas-con-el-calor>.

<sup>23</sup> MCN. *Heat-related Illness*. <https://www.migrantclinician.org/issues/heat>.

# EYE ON FARMWORKER HEALTH

*A summary of important recent developments in research on issues affecting the health and safety of agricultural workers.*



## Heat-Related Illness Among Latinx Child Farmworkers in North Carolina: A Mixed-Methods Study

**Authors:** Arnold TJ, Arcury TA, Sandberg JC, Quandt SA, Talton JW, Mora DC, Kearney GD, Chen H, Wiggins MF, Daniel SS.

**Source:** *New Solutions: A Journal of Environmental and Occupational Health Policy*; 2020

U.S. law allows children as young as 10 years old to be hired to do farm work outside of school hours with parental permission. At age 16, children can hold any farm job for unlimited hours.<sup>24</sup> There were between 30,000 and 79,325 child farmworkers in the country annually between 2005 and 2016. These estimates are based on data from the National Agricultural Workers Survey (NAWS) and the Childhood Agricultural Injury Survey.

For this study, researchers interviewed Latino child farmworkers in North Carolina to assess the prevalence of heat-related illness (HRI) symptoms. They also sought to determine how personal characteristics, work conditions and protective behaviors may affect child farmworkers' experiences of HRI. Interviews were conducted with child farmworkers between the ages of 10 and 17 who self-identified as Hispanic or Latino, and who were fluent in either English or Spanish. Signed youth and parental consent were obtained for all participants prior to the interviews.

Two types of interviews were conducted in the study: semi-structured, in-depth interviews and baseline survey interviews. Thirty child farmworkers took part in the semi-structured interviews. These children had worked in agriculture in the last 12 months. In addition, 202 child farmworkers who had worked in agriculture in the last three months were recruited for the baseline survey interviews. The data analysis for this group was limited to the 165 participants who reported having worked in extremely hot weather in the last year.

The hour-long semi-structured interviews were used to collect information from the children on their experiences and perceptions of doing farm work in hot weather—including symptoms of HRI they had experienced—and how they protect themselves from the heat. Meanwhile, the survey interviews asked participants about their experiences of HRI symptoms and how they attempted to protect themselves. They also collected demographic information and data on work experience, pay structure (*i.e.* paid by the piece, hourly or a combination of the two); who received the pay (parents or children), and type of housing (trailer or house). The questions were adapted from surveys originally developed for adult farmworkers and piloted with a different group of youth to ensure the appropriateness of the content, language and wording. The questions on HRI symptoms asked for “yes” or “no” answers to a list of symptoms.

The responses to in-depth interviews were transcribed and coded, with the answers related to working in the heat then categorized primarily into five topics: “farm work experience,” “work-related risk behavior,” “occupational injury,” “work organization,” and “safety culture.” For the survey interviews, researchers performed statistical analyses to determine whether there were associations between participant characteristics and HRI, and between protective behaviors and HRI.

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Photo credit: Adobe Stock

<sup>24</sup> United States Department of Labor, Wage and Hour Division. *Child labor bulletin 102: child labor requirements in agricultural occupations under the Fair Labor Standards Act.* 2016. <https://www.dol.gov/whd/regs/compliance/childlabor102.pdf>.



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**Results:** Seventeen boys and thirteen girls between the ages of 10 and 17 years old took part in the in-depth interviews. Sixteen (16) of the 30 participants were seasonal workers living in North Carolina, eleven (11) migrated for work with their parents, and three (3) migrated without their parents. The most common crops in which the participants work were tomatoes, tobacco and blueberries. Heat and other negative work conditions were frequently mentioned in the participants' responses.

Heat was the most frequently cited negative aspect of farm work. Multiple participants referred to pressure from supervisors to continue working at a rapid pace despite the heat. Several participants referred to aspects of acclimatization, reflecting awareness that being unaccustomed to the heat increased workers' risk. Some participants who had done agricultural work in Florida and Texas felt they had worked in even worse heat conditions in those states.

The child farmworkers' experience regarding rest breaks and hydration differed markedly. While some participants described being able to take rest breaks as needed and being able to leave work early when conditions were too hot, or at least having some flexibility regarding breaks and sufficient opportunities for hydration, others described an environment in which they were discouraged from taking breaks even when they felt stressed or near fainting. Sometimes they were discouraged from taking breaks by other workers. Some of the participants indicated that drinking water was not always available in the fields, or the water available was not clean. Some of them stated that drinking too much water was bad for their stomach, which led them to drink sodas at least some of the time.

The HRI symptoms most frequently experienced by participants were dizziness, headaches and nearly fainting. Some of the children spoke of seeing other farmworkers faint in the heat, something one of them reported seeing with some frequency.



Photo credit: Adobe Stock

Participants in the survey interviews were between the ages of 10 and 17 years and 64.2 percent male. Seasonal workers comprised 86.1 percent; the rest were migratory workers. The percentage of participants paid under the different pay structures were: hourly - 63.6 percent; piece rate - 25.5 percent; combination of hour and piece rate - 6.7 percent; and four percent did not know their pay structure. The most common crops they worked in were tobacco, berries, sweet potatoes and tomatoes. The most common tasks they worked in were topping tobacco, harvesting or picking, and pulling weeds or cultivating.

HRI symptoms were common among the participants; 47.8 percent of those who had worked in extremely hot conditions in the previous 12 months reported at least one symptom, and 22 percent experienced at least two symptoms. Among those working in extreme heat, 29.1 percent reported experiencing dizziness, 21.8 percent experienced muscle cramps, 17.6 percent experienced hot, dry skin, 8.5 percent experienced nausea or vomiting, 6.1 percent experienced confusion, and 1.8 percent had experienced fainting.

A large majority (90.9 percent) drank extra water to prevent HRI, 87.9 percent took rest breaks in the shade, 55.8 percent took extra breaks, 43 percent started work earlier or left earlier in the afternoon, 34.6 percent went to air-conditioned places during breaks or after work, and 10.9 percent were able to perform less demanding work tasks or work in the shade.

Of the personal characteristics recorded in the study, only age was significantly associated with HRI. The likelihood of having experienced HRI was higher among older participants: 60.8 percent of 16 to 17 year olds had experienced HRI symptoms, compared to 44.2 percent of 14 to 15 year olds and 23.5 percent of 10 to 13 year olds.

Participants who reported protective behaviors were less likely to report experiencing HRI symptoms. The greatest difference was observed among those who took extra breaks, 62.0 percent of whom did not report experiencing any HRI symptoms. Meanwhile, only 39.7 percent of those who did not take extra breaks reported not experiencing symptoms. However, those going to air conditioned places during breaks or after work were significantly more likely to report having had at least one HRI symptom (59.6 percent vs 41.7 percent). The child farmworkers also indicated that HRI symptoms were common among other workers.

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At the time of this study there were no other studies quantifying the prevalence of HRI symptoms among child farmworkers. Comparisons to studies of adults are difficult due to methodological differences between studies and physiological differences between adults and children. However, the researchers noted that the prevalence of HRI symptoms among the child farmworkers was somewhat higher than in a number of similar studies of adult farmworkers. While 47.9 percent of child farmworkers had experienced one or more symptoms of HRI, four studies from Georgia and North Carolina cited by the authors found that 28 to 40 percent of adult farmworkers reported experiencing HRI symptoms.

Child farmworkers demonstrated an awareness of how to prevent HRI, but whether they were able to successfully take measures to protect themselves depended to a great extent on the actions of supervisors or employers. Older children in particular may be under greater pressure to work at an adult pace, which may be at least partly responsible for the greater incidence of HRI symptoms among older children. Contrary to studies of adult farmworkers, children in this study who were paid by the piece rate had lower incidence of HRI symptoms (38.1 percent) than those paid hourly (51.4 percent.) The authors suggest two possible explanations: children paid by the piece rate do not feel as much financial pressure as the adults to work at a dangerous pace, or that those paid by the hour are made to work faster and prevented by their employers from taking breaks. Several children in the study who were paid hourly reported not being allowed to take breaks. The results of the study highlight the high incidence of HRI among child farmworkers and the need to address the risks they face in the workplace.



## Work Adaptations Insufficient to Address Growing Heat Risk for U.S. Agricultural Workers

**Authors:** Tigchelaar M, Battisti DS, Spector JT

**Source:** *Environ Research Letters*; 2020;15(9):094035. doi:10.1088/1748-9326/ab86f4

Farmworkers are more vulnerable to the health effects of heat because they must carry out heavy workloads outdoors in high temperatures, while also facing a range of socioeconomic factors—such as poverty, migrant status, and barriers to healthcare access—that make them more vulnerable to the effects of heat stress.

This study estimated the number of days farmworkers in the U.S. will spend working in unsafe heat conditions under two different climate change scenarios: 2°C and 4°C of warming, and compared the figures to those observed in the present-day climate. The present day scenario was based on data for the period 1979-2013.

The researchers used county-level employment data from the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) to calculate the maximum number of workers in the categories of crop production (NAICS code 111) and support activities for crop production (NAICS code 1151) during the May–September growing season. They arrived at the county-level figures by averaging monthly employment levels from 2009 to 2018. One limitation is that the QCEW excludes owners, unincorporated self-employed workers, unpaid family members and agricultural workers not covered by state unemployment

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insurance. Therefore, it excludes approximately half of all agricultural workers, according to the BLS. However, the researchers considered the QCEW to be the best available data at the county level.

QCEW data and the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index—which includes many of the socioeconomic factors making agricultural workers more vulnerable to heat stress—were overlaid. Next, they calculated past exposure to extreme heat, defined in the study as the 95th-percentile of the daily maximum heat index (HI) during the growing season and the frequency of three-day heat waves above this level. They used daytime surface air temperature and relative humidity data from the National Centers for Environmental Prediction (NCEP) North American Regional Reanalysis (NARR) for the period 1979-2013 to calculate daytime 3-hourly heat indices (HI) and estimated daily mean, minimum, and maximum HI at the county level over the growing season.



Photo credit: Kay Chernush

The authors used data from 19 models in the Coupled Model Intercomparison Project 5 database to determine patterns of monthly mean temperatures in relation to annual mean temperatures for the period 2006 – 2100, and the changes in temperature associated with a 2°C and 4°C global mean warming scenarios. The late 20th century was used as a baseline to calculate the changes in temperatures. Projections were also made regarding changes in humidity. Applying these results to the 1979-2013 climate data, they estimated the daily mean, minimum, and maximum HI for the 2°C and 4°C warming scenarios.

The authors calculated threshold limit values (TLVs) for heat stress under a baseline scenario and multiple adaptation scenarios. The adaptation scenarios involve changes in work practices to reduce heat stress. A TLV is a guideline

value developed by the American Conference of Governmental Industrial Hygienists (ACGIH). According to the ACGIH, “exposure at or below the level of the TLV... does not create an unreasonable risk of disease or injury.” It assumes that workers are acclimatized to the heat, hydrated, and healthy. The study authors adapted the TLVs to assume sun exposure and to take into account the HI and work conditions in the individual scenarios.

The baseline scenario assumes, based on the literature, that workers are acclimatized and perform work activities in a 90% work/rest cycle at a moderate metabolic rate (300 Watt), spend breaks in the shade, and wear double-layer protective clothing. This baseline scenario results in a TLV of 83.4°F. Other scenarios assumed different combinations of adaptations that included working at a slower pace with a low metabolic demand, reducing work effort to a work/rest cycle of 50% (*i.e.* working half of the time), wearing breathable clothing, and taking breaks in an air-conditioned environment. These adaptive measures are associated with higher TLVs, meaning that workers can work in conditions of higher HI without adverse health effects. Daily mean HIs were compared to the TLVs to calculate the number of days in which agricultural workers experienced unsafe heat levels during the growing season. These calculations were carried out for the present and future climate scenarios (2°C and 4°C warming.)

**Results:** The average agricultural worker experienced heat extremes of 94.7°F HI between 1979 and 2013, with heat extremes being highest in the South, southern Midwest, central California, and the coastal Southwest. In the 2°C warming scenario, the heat extremes will reach 101.4°F HI. In the 4°C warming scenario, most workers would experience heat extremes above 115°F HI (classified by OSHA as a “very high/extreme” risk level.)

Present-day heat extremes in the 20 counties with the most agricultural workers range from 78.1 to 109.2°F. In the 2°C warming scenario, the heat extreme in Imperial County, California would exceed 115°F HI (very high/extreme); while five other counties would be in the “high” risk category (105 to 115°F HI), and 10 counties would be in the “moderate” risk category (90 to 105°F HI). Only four of the top 20 counties for agricultural employment would remain below the OSHA risk level of 90°F HI (three of these are in Washington and one in Oregon). In the 4°C warming scenario, two of the top 20 counties will have heat extremes in the “very high/extreme” category—Imperial County, California and Hillsborough County, Florida—and five will have

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extremes in the “high” category. Twelve counties will be in the “moderate” category and only one—Chelan County, Washington—will be below the OSHA risk levels.

In the present-day scenario, 24 of the 233 counties with more than 500 crop workers experience heat extremes in the “high risk” category (105 to 115°F). In the 2°C warming scenario, half of the 233 counties would have such heat extremes. With 4°C warming, most of the U.S. east of the Rocky Mountains will have summertime heat extremes classified by OSHA as very high/extreme (>115°F HI).

Multi-day heat events, which currently occur once or twice a year in most counties, will occur five times more often in a 2°C warming scenario. In a 4°C warming scenario, all counties will have multi-day heat events between two and ten times per year. As heat waves get longer in the Southeast, an apparent decrease in the number of heat events occurs due to consecutive heat waves merging into single events.

The researchers also calculated the number of days the mean HI exceeded the ACGIH TLV, an indicator of the number of days workers would experience unsafe heat levels. In the present day, the average agricultural worker experiences 21 unsafe working days each summer. However, that number increases to 39 with 2°C warming and to 62 with 4°C warming. Counties with high numbers of days above the TLV are at present mostly in southern California and the Southeast.

Of the top 20 counties for agricultural employment, Riverside, California has over one month of unsafe days, while Imperial, California and Hillsborough, Florida have over three months of such days. With increasing warming, this phenomenon begins to affect counties at more northern latitudes; at 2°C warming the number of counties with at least one month of unsafe heat increases to seven with the addition of Kern, Merced, and Stanislaus counties in California and Benton county in Washington. At 4°C warming all of the 20 top counties will have at least one unsafe working day. In the southernmost U.S., all days in the growing season will exceed the TLV.

In the different adaptation scenarios, wearing single layer clothing was the most effective adaptation for reducing worker exposure to unsafe heat levels, followed by reducing the pace of work. Wearing single layer instead of double layer clothing reduced the average worker’s exposure to unsafe heat levels from 39 days down to 13 in a 2°C warming scenario, and from 62 days down to 26 in a 4°C warming scenario. In one of the scenarios involving two adaptive measures, resting more and resting in air conditioning, eliminated the risk of experiencing unsafe heat levels, even with 4°C warming.

The study’s authors acknowledge that some of the most effective work adaptations—such as wearing more breathable, single-layer clothing—may not be practicable in the agricultural workplace, where workers need to protect themselves from hazards such as pesticides and sunburn. Other effective practices include a slower work pace and reduced work effort. However, these will have an effect on farm productivity, worker earnings and/or labor costs unless other changes are made to cropping patterns or work practices. Practices such as improved PPE use, changes in rest practices and adjusted work hours can help reduce health risks to agricultural workers. Over the longer term, other controls that are not dependent on individual behavior will be necessary as temperatures continue to rise. One of these controls is the improvement of farmworker housing conditions to mitigate the effects of rising nighttime temperatures. But even practices such as wearing better PPE depend on factors outside the control of individuals—namely, technological advances to produce breathable PPE that can still protect against other workplace hazards. Ultimately, wide-ranging action to mitigate climate change and to address social vulnerability factors will be needed to protect the health of workers. The authors emphasize that agricultural workers must be included in transdisciplinary collaborations to adapt the food production system to the reality of climate change.





## Knowledge of Heat-Related Illness First Aid and Self-Reported Hydration and Heat-Related Illness Symptoms in Migrant Farmworkers

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**Source:** Workplace Health & Safety; 2021 Jan;69(1):15-21. doi: 10.1177/2165079920934478



Photo credit: David Bacon

Knowledge of heat-related illness (HRI) first aid is important because agricultural workers are often exposed to high temperatures and work in rural areas where the response time for emergency services tends to be longer than in urban areas. This cross-sectional pilot study assessed knowledge of first aid procedures for HRI among migrant agricultural workers in Georgia.

The researchers approached 66 migrant agricultural workers who participated in the 2018 Farmworker Family Health Program (FWFHP), which provides healthcare every summer to agricultural worker families in Central Southern Georgia. The study was prompted by the death of a worker who participated in the 2018 FWFHP.

Agricultural workers were recruited and surveyed while they visited a FWFHP mobile worksite clinic. The survey was conducted during the FWFHP clinic's visits to four different farms. The workers answered a 15-minute survey that collected demographic data, as well as data on their work environment, prevalence of HRI symptoms, hydration practices, and knowledge of HRI first aid. The questions were translated into Spanish by a certified translator and bilingual nurse scientists administered the survey. Workers were compensated for their participation with an evaporative cooling bandana and instruction on its correct use.

The researchers adapted the Questionnaire for Heat Related Illness Among Migrant Farmworker Populations in Southern Georgia by Fleischer et al. (2013). The survey collected data on whether workers had experienced any of the following HRI symptoms during the workday: heavy sweating, headache, nausea or vomiting, confusion, dizziness, fainting, or sudden muscle cramps. Workers were also asked what types of liquids they drank during the day for hydration and in what amounts. To help workers estimate the amount of liquid they drank, they were shown bottles of different sizes. Knowledge on HRI first aid was determined through pilot questions based on NIOSH guidelines for occupational heat exposure safety.

The average age of the workers in the study was 28.75 years. Eighty-two percent were born male/identified as male and 100 percent identified as Hispanic or Latino. Ninety-five percent spoke Spanish as their primary language and 5 percent spoke an indigenous language. The workers all worked on field crops and had spent an average of 2.74 years working in the U.S. Payment arrangements varied: 45 percent were paid a combination of piece rate and hourly pay, 42 percent were paid by the hour, 12 percent by contract, and 1 percent by the piece rate. The maximum daily heat index was 84.45°F and the relative humidity was 85.53 percent.

**Results:** The most reported HRI symptom was heavy sweating (50 percent of workers), followed by cramps (25 percent), headache (22 percent), dizziness (10 percent), and nausea (3 percent). None reported having experienced confusion or fainting during the workday. Sixty-eight percent of workers reported experiencing one or more symptoms of HRI, 27 percent reported experiencing two or more, and 12 percent reported three or more. Workers who reported drinking water had, on average, 72.95 ounces of water during the workday; those who reported drinking sports drinks drank an average of 34.25 ounces, those who

*(continued on page 12)*



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drank soft drinks had an average of 23.20 ounces, and those who drank energy drinks had an average of 13.10 ounces. Water consumption was lower than the 32 ounces per hour recommended by the Occupational Safety and Health Administration (OSHA) for people working in high temperatures.

Knowledge-based questions assessed workers' ability to identify HRI symptoms and proper first aid procedures. When presented with a list of symptoms, 77 percent of workers were able to correctly identify at least three HRI symptoms, 35 percent identified at least six symptoms, while seven percent identified at least nine of the ten symptoms on the list. Only 27 percent answered correctly when asked about the time needed for workers to become acclimatized to working in the heat. Forty-five percent knew that a person could suffer heat stroke and still sweat; 50 percent knew to call 911 for emergency help; and 95 percent knew that a co-worker feeling irritable or dizzy should be made to take a break and remain accompanied for the duration of the break. Forty-two (42) percent knew they should not encourage a co-worker who was feeling irritable or dizzy to quickly drink large amounts of water and leave them alone, coming back later to check on them. Seventy-eight percent knew not to tell such a co-worker to push through and continue working; and zero percent knew the co-worker should not simply be given water and told to rest in a shaded spot by themselves.

Ninety-seven percent of the participants knew that a co-worker showing signs of heat stroke should be accompanied until emergency medical services arrive; and 100 percent knew the worker should be moved to a shaded area. However, far fewer knew how to correctly cool down a person suffering from heat stroke. Only 23 percent knew they should not wait before attempting to cool down the person, and 33 percent knew that the person should be cooled down quickly with cold water and towels, or an ice bath. Seventy percent knew on which part of the body to place cool towels or ice to cool down someone suffering from heat stroke.

The study showed that agricultural workers had insufficient knowledge of how to recognize symptoms of HRI and provide first aid. Therefore, interventions to address the risk of heat stress in the workplace must go beyond prescribing rest, water, and shade. They also need to train workers on how to recognize HRI symptoms and provide first aid as necessary in the critical time window before emergency medical help arrives. It is also necessary to make available first aid supplies to attend to an ill co-worker. Furthermore, employers and crew leaders must also be trained and must maintain a safety culture that is supportive of first aid efforts.

The authors intend to use the results of the study to create an HRI training program for farmworkers, crew leaders and employers in South Georgia, which will be developed and tested with the FWFHP before it is made available to clinics throughout the state of Georgia.