



Published in final edited form as:

J Health Care Poor Underserved. 2025 ; 36(2): 590–604. doi:10.1353/hpu.2025.a959115.

Heat Exposure, Rest Breaks, Dehydration, and Heat-Related Illness Among Agricultural Workers in Florida Summer Heat

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Abstract

As the earth's temperatures rise, heat is killing workers. This study of 115 agricultural workers in Florida's hot summers examines heat exposures, working conditions, dehydration, and lack of federal heat protection standards. In the summer, the median heat index in Florida, reflecting temperature and humidity, was 95°F. Some agricultural workers worked in a heat index as high as 131°F. The workers had only two daily breaks, on average, significantly less than the federal recommendations. They drank about a third of the recommended beverage consumption, and 66% finished the workday dehydrated. Over the three summer data-collection days, 11% (29) of study participants experienced one or more serious heat-related illness symptoms on the 260 individual data collection days. This study shows that, contrary to the industry's claim, voluntary worker heat protections are not followed, demonstrating the need for enforceable, required heat protections as planetary warming creates unsustainable risks for outdoor workers.

Keywords

Heat exposure; farmworkers; workplace heat protection; heat-related illness; climate change

As climate degradation creates increasingly hot summers, the health risks to agricultural workers and other outdoor laborers will intensify. The damaging effects of working in the heat have been demonstrated in multiple studies.^{1,2,3,4,5,6,7,8,9} Despite the evidence of heat-exposure damage, national worker heat-exposure protections do not exist. Some states have barred cities and counties from enacting local heat-protection regulations. To

reduce heat-related morbidity and mortality, health advocacy and regulations to protect our workforce are needed.

This study examined working conditions of agricultural workers laboring in the intense Florida summer heat and mild winters, focusing on seasonal patterns of rest breaks and the prevalence of dehydration and heat-related illness (HRI) symptoms. This investigation is a secondary analysis of data collected by a partnership between the Farmworker Association of Florida (FWAF) and Emory University School of Nursing from January 2020 to August 2022, over two winters and three summers.

Between 2004 and 2018, an average of 702 heat-related deaths (415 with heat as the underlying cause and 287 with heat as a contributing cause) were reported in the U.S. annually.¹ Federal data reveal that agricultural workers in the U.S. have a 20–35-fold higher risk of heat-related death compared with the U.S. civilian workforce overall.^{2,10}

The American College of Occupational and Environmental Medicine (ACOEM) Work Group on Occupational Heat-Related Illness describes multiple health problems that can be caused by working in intense heat.³ These include heat stroke, heat exhaustion, heat cramps, heat syncope, heat rash, and dehydration. Furthermore, studies have shown an association between working in high ambient temperatures and kidney damage.^{4,6,9} As climate degradation increases temperatures, outdoor workers will experience more extreme heat exposure and increased risks for heat-related mortality and morbidity.

This problem will intensify. Multiple sources report 2023 and 2024 were the hottest summers on record, in the U.S. and globally.^{11,12} Summer 2023, the U.S. experienced record high rates of emergency department visits for HRI, especially among working-age adults.¹³ Tigchelaar, Batissi, and Spector estimate that the average number of days spent working in unsafe heat conditions will double by mid-century.¹⁴

The Occupational Safety and Health Act (OSHA) standards recognize employers have a “general duty” to keep workers safe, but without specific heat protection regulations, the “general duty” clause has not been sufficient to bring about enforcement of heat protections.^{15,16,17} Although OSHA’s Heat Illness Prevention Campaign’s core message “Water. Rest. Shade.” has been widely disseminated, it is guidance and imposes no requirements.¹⁸ The Biden Administration, in 2021, began efforts to include heat protections in OSHA standards, with the working group submitting its recommendations to the National Advisory Committee on Occupational Safety and Health in April 2023. However, final rulemaking may still take many years.

The National Institute for Occupational Safety and Health (NIOSH) guidelines suggest but do not require that outdoor workers in heat have at least one rest break every two hours and more frequently as the heat index rises.¹⁷ The National Institute for Occupational Safety and Health cautions that physical work strain in environments with a heat index, based on temperature and humidity, over 90 degrees Fahrenheit (°F) creates a risk to the worker, requiring “extreme caution” and should be attenuated with preventive measures, including requiring all workers take a 15-minute rest every hour.^{3,17} Working in a heat index over

100°F is in the danger zone, necessitating more aggressive prevention of heat damage, with a rest of 30 minutes for every 30 minutes worked, frequent hydration, and close monitoring.¹⁷

Five states—Minnesota, California, Oregon, Washington, and Colorado—have passed workplace heat-protection laws.¹⁶ California requires that employers provide outdoor workers with water, shade, and breaks.¹⁹ Two Texas cities, Austin and Dallas, had required employers give 10-minute rest breaks for construction workers every four hours, but in 2023 the Texas legislature removed cities' authority to enforce such regulations.²⁰ For several years, the Farmworker Association of Florida (FWAF) has sought, without success, legislation requiring employers to provide outdoor employees with clean water and 10-minute rest breaks every two hours and to require employer-provided education on HRI. In 2024, Florida legislators passed House Bill (HB) 433, preempting local heat protections for outdoor workers, like the Texas pre-exemption legislation.^{21,22}

Review of literature

Numerous studies have shown the effects of working in extreme heat.^{4,5,6,7,8,9,23} A study of core body temperature (T_c) over three Florida summers found that on an average workday, 49% of participants exceeded core temperature over 100.4°F (T_c38°C) and 10% exceeded 101.3°F (T_c38.5 °C), thresholds established by NIOSH.^{17,23} In a study of 192 farmworkers working in the Florida summer heat, over half (53%) started their workday dehydrated (urine specific gravity USG≤1.02); 81% were dehydrated after a day of work; and one third had acute kidney injury (AKI) at least once during the three summer workdays they were monitored. The odds of AKI increased 47% for each heat index increase of five degrees.⁴ Heat damage may be cumulative over time. A study of fernery workers working in the heat found the prevalence of acute kidney injury increased from 21 to 43% over three years.²⁴

Moyce et al., studying agricultural workers in California, found AKI was associated with accelerated physical workload and core temperature elevations.⁶ Mac et al. found higher heat index and higher physical activity level were linked to more physiological strain, indicated by elevated heart rates and core body temperatures.⁸

Work setting also plays a role in physical activity levels. Mix et al. found fernery workers, who are usually paid for piecework or by volume, had more sustained physical activity than other agricultural workers and did not reduce the intensity of physical activity under dangerously hot conditions.⁵ Similarly, piece-rate work has been associated with increased adjusted odds of AKI (3.02, 95% CI1.44–6.34) in California agricultural workers⁶ and in Florida farmworkers.²⁴

Adding to the heat risks of farmworkers are other health conditions, prevalent among the general population as well as farmworkers. One study with Florida farmworkers found the prevalence of overweight or obesity, elevated blood pressure, and prediabetes to be high (83%, 70%, 60%, respectively), and that these conditions were compounded by limited access to health care.²⁵

Many farmworkers may not be able to cool down significantly after working in the heat. A North Carolina study found the heat indexes in farmworker housing frequently were high.²⁶

The high cost of electricity for air conditioning (when available) and fans in the high heat and humidity limits their use.

A scoping review of 92 articles identified multiple risk factors and protective factors for heat-related health harm.⁹ The risk factors included gender, dehydration, heat strain, wearing inappropriate clothing, workload, piece-rate payment, and hot environmental conditions. Drinking water and electrolyte drinks and taking breaks in shaded or air-conditioned areas were identified as protective and preventive factors.

Few studies have looked at workplace factors that could mitigate some of the physiological strain and heat risks. A small study (n=37) in Washington State found that after training on HRI, some workers reduced the intensity of their physical work and the associated physiological strain.²⁷ A pilot study by Chicas et al. found workers wearing cooling bandanas were less likely to exceed core temperature of Tc38°C.²⁸ Although wearing bandanas is an individual, not workplace, preventive action, it could be incorporated into a workplace protection strategy. This study examined working conditions, alignment of NIOSH-recommendations for breaks, and prevalence of dehydration and HRI in summer and winter in Central Florida.

Methods

Emory University Nell Hodson Woodruff School of Nursing researchers worked with the Farmworker Association of Florida (FWAF) to study heat exposure and its impact on agricultural workers in Florida. Emory University Institutional Review Board approved the study (IRB00112681), which was funded by NIOSH.

Farmworker Association of Florida is a grassroots community-based organization with about 10,000 farmworker members and strong ties in the farmworker community. Most of the staff and the board of directors have been farmworkers or are from farmworker families. Building on the trust and relationships with the farmworkers, community health workers from FWAF recruited a convenience sample of agricultural workers who met the inclusion criteria of being Hispanic, currently working in agriculture, and being ages 18–49, from two FWAF locations in Central Florida in January 2020. Those with Type I diabetes, pregnancy, hypertension treatment, a history of renal disease, or less than a month of working in agriculture were excluded. Data collection was conducted in two FWAF field offices by trained interviewers using the participants' primary language, which was always Spanish. The FWAF offices are in areas where the majority of many farmworkers live or work. This proximity as well as the farmworkers' familiarity with FWAF facilitated participation. After the morning measurements, workers dispersed to their worksites and returned for post-workday measures and interviews. The worksites were not selected by the researchers; the farm-workers went to their usual worksite or where work was available that day, primarily nurseries and ferneries.

Interviewers queried participants in January 2020 and 2021 and once each of three summers (August 2020, July 2021, and August 2022), for a total of 199 winter and 260 summer workdays. Data collection days were based on the season (summer or winter). At the start of

the project, 115 people were enrolled. Over the course of the study, some participants did not have agricultural work on the data collection periods; these visits were excluded from the current analysis (n=37 non-agricultural days from 21 participants). Study retention has been reported elsewhere.²⁹

The first visit data collection, conducted on a non-workday, recorded demographics, work history, and typical workplace conditions. After a workday in each of the five data collection periods, the number and duration of rest breaks and lunch were queried, as were types and quantities of beverages consumed. Heat-related illness symptoms experienced on that workday were queried (heavy sweating, headache, fainting, confusion, dizziness, cramping, nausea/vomiting). The presence of any fainting, confusion, dizziness, cramping, or nausea/vomiting was considered “serious HRI.” Urine samples were analyzed before and after a work shift with an ATAGO meter (PAL-10S digital refractometer, Bellevue, Washington, <https://atagousa.corecommerce.com>) that measured urine-specific gravity (USG) with an accuracy of ± 0.001 and a resolution of 0.0001. As a quality-control measure, distilled water was measured each morning before the start of data collection. Dehydration was defined as USG greater than or equal to 1.02.

The Florida Automated Weather Network (FAWN) monitoring stations, managed by the State of Florida to aid agricultural management, located in the study areas near the worksites collect weather data every 15 minutes throughout the year. The Lu-Romps extended heat index (HI) algorithm based on data-collection day FAWN ambient-temperature measures and relative humidity was used to calculate the maximum, minimum, and median heat index over the workday, individualized for each worker’s location and work hours.³⁰ Hours spent at HI greater than or equal to 90°F and greater than or equal to 100°F were calculated for everyone.

Descriptive statistics such as medians and percentages, season-adjusted and other simple regressions were calculated using either the mixed or glimmix procedures in SAS v9.4 and R package lqmm v1.5.8, adjusting for random effects of repeat measures on the same individual and for household/family connections.³¹

Results

Demographics.

Of the 115 participants who started in the study in 2020, all were Hispanic working in agriculture (inclusion criteria). Eighty-eight (77%) were females (Table 1). This reflects both the composition of FWAF, the farmworker population in the region, and the propensity of women to participate. Of the original 115, 113 participants were observed in at least one of two winter seasons (n=192 observations) and 98 were observed in at least one of three summer seasons (n=231 observations). Workers’ median age was 37, ranging from 18 to 49. Workers had a median of 10 years working in agriculture in the South, ranging from zero to 32 years. Of the 423 workdays, 54% were in plant nurseries, 38% in ferneries, and 8% in other plant-related settings such as landscaping. In the ferneries, the pay is usually piece rate; workers are paid by the number of bundles of ferns they cut, not by the hours worked. Nursery workers are paid an hourly rate.

Training in heat-related illness prevention.

Although training on prevention of HRI is recommended by NIOSH,¹⁷ less than a third (31%) of respondents reported having any training on the HRI prevention (Table 1), most often provided by supervisors or employers and sometimes in combination with pesticide training.

Working conditions: Heat.

The summers were hot. The median for the maximum heat index reported for each individual on their observed summer workday was 103°F, with a range from 90 to 131 degrees. The median temperature among the individual workers was 95° (Table 1), but the range went up to 114 degrees. On the observed summer workdays, workers spent a median of 5.4 hours in the extreme-caution zone with a heat index of 90°F or above and 1.5 hours in the danger zone of 100°F or above. Over two-thirds (68%) of workers labored for four hours or more in the danger zone of 90°F and above. Fourteen percent worked four hours or more in the danger-zone temperatures of 100°F and above. The data also indicate some work was in a heat index of 131°F. Although winter temperatures were usually mild, some days workers labored in heat indices in the upper 80s.

Long workdays, few rest breaks.

The median summer workday was 7.8 hours while winter workdays were slightly longer, 8.5 hours (Table 2). Some workdays were 12 hours long. As reported by the workers, rest breaks were limited. The mean number of breaks was 1.9, including lunch, which typically was lunch and one additional break, for a median total of 45 minutes during the workday. However, 43% of participants had only one break during the workday (lunch or a rest break) or no break. Some of the reasons workers did not take a break were “employer did not provide a break” or “worker paid by piece work and didn’t want to stop working.” Break time increased with the length of the workday, with winter and summer exhibiting identical patterns (Figure 1).

Less than a third (30%) had three or more breaks including lunch, which could approximate one break at least every two hours in a full workday. The number of rest breaks increased very little as the hours of working in extreme-caution and danger-zone heat indices increased (Figure 2). Additionally, it is not known when those breaks were taken during the day and if they were during the hottest times of the day.

Beverage intake, dehydration, and heat-related illness.

Table 3 reports variables associated with beverage consumption, dehydration, and HRI. Employers provided water 85% of the time, but some workers reported it was not clean or not always available. Most commonly, workers brought their own beverages.

In the summer, when the median workday was 7.8 hours, workers drank a median of 70 ounces of beverages per day (median 9.4 ounces/hour). Only four individuals, on one day each, consumed the NIOSH-recommended 24 ounces or more per hour of working in the heat. Additionally, ounces of beverages consumed was not correlated with the number of breaks and duration of breaks (all $p>.05$).

In the summer, 46% of workers started the day dehydrated, with a urine specific gravity (USG) greater than 1.020. In the summer after-work urine samples, 66% of the workers were dehydrated (Table 3).

Serious heat-related symptoms (fainting, confusion, dizziness, cramping, nausea, vomiting) were experienced by 11% of workers in the summer and 9% in the winter (Table 3). These symptoms can also be precursors of heat exhaustion and heat stroke.

Discussion

Observed over three summers, each of these Florida farmworkers was working at least part of their day in extreme environmental heat and humidity that requires extreme caution. However, despite this, recommended risk-reduction strategies were not part of their workday. The workers had only two daily breaks, on average, significantly fewer than NIOSH recommends.^{3,17} This is also less than required in California and Oregon. Workers drank about a third of the recommended amount of beverage consumption. The agricultural industry and other industries with workers in the heat have lobbied against the enactment of federal and state heat-protection standards, countering that heat-protection recommendations are already being followed in the workplace and that regulations would only burden businesses unnecessarily.^{22,32,33} Our findings do not support their contention that recommendations are being followed voluntarily.

Workers endured intense heat for several hours in the summer, with excessive exposure to heat risks. They worked 7.8 hours (median), with some laboring 12 hours, with a median heat index of 95°F and a heat index high of 131°F, with few breaks. Although the summer heat exposures were extensive, workers did not have more breaks in the summer than in the winter. The National Institute for Occupational Safety and Health recommends workers have one break at least every two hours in the heat, 15-minute rest breaks for every hour of moderate work in heat caution temperatures (heat index greater than or equal to 90 degrees F) and 30-minute rest breaks for every 30 minutes of work in danger heat (heat index greater than or equal to 100 degrees F).^{3,17} None of the workers had the number of breaks recommended by NIOSH. Only 28% had three or more breaks including lunch, which might approximate one break every two hours in a full workday. Notably, the number of rest breaks increased very little for workers working in extreme-caution (greater than or equal to 90 degrees F) and danger-zone (greater than or equal to 100 degrees F) heat indices. Furthermore, the timing of the few breaks workers had is unknown; they may not have been during the hottest periods. This pattern of few breaks illustrates the limitation of NIOSH recommendations: the guidance is not followed voluntarily in the workplace. The few rest breaks were likely insufficient for workers to counter the high temperature exposures they experienced.

Rising temperatures and brutal heat expose workers to preventable harm. The National Institute for Occupational Safety and Health recommends workers have training on preventing HRI, in addition to more rest breaks, increased hydration throughout the workday, and additional precautions in high heat-index conditions. Yet only 31% of the workers studied reported ever having had any training on preventing HRI; the quality of

the training is unknown. Training on HRI was often mixed with pesticide training, which can dilute both topics and add confusion regarding which symptoms are associated with heat or pesticides. The majority who were trained were trained by supervisors or employers. The training on HRI may have been insufficient for workers to understand what symptoms to watch for and may not have provided enough feasible strategies to counter the heat. Regardless of training, workers have little ability to control when they can take breaks unless supported by crew leaders and employers. Crew leaders and employers are not required to have training in preventing HRI.

Dehydration reduces the body's ability to release excess heat, contributes to HRI, and strains kidney function.^{3,17} The National Institute for Occupational Safety and Health recommends workers drink ^{24–32} ounces of fluid per hour when working in the heat, 192–256 ounces in an eight-hour workday.¹⁷ The median beverage intake was less than half this amount (68 ounces per day, median 9.4 ounces/hour). Only three workers consumed the NIOSH-recommended 24 ounces or more per hour while working in the heat, only one day each. With the long workdays, high heat, and low fluid intake, almost two-thirds of workers (64%) were dehydrated at the end of the workday. Many workers (45%) start the workday dehydrated, possibly unable to rehydrate sufficiently between one workday and the next. This chronic dehydration may have an enduring impact on kidney function. Multiple studies have reported acute kidney illness among farmworkers.^{4,6,9} The damage can be cumulative, as Chicas. et al. observed increasing AKI over three years among fernery workers.²⁴

Most workers preferred to bring their own beverages, including water. If the employers provide water but it is not convenient, not trusted, not consistently available, does not appear clean, or has a bad taste, the benefits of having water provided are not realized. If cool, good-tasting water could be supplied reliably by employers in clean containers and in convenient locations, with sufficient breaks for drinking the water, and clean, easily accessible toilets, workers might have more ability to rehydrate and reduce HRI.

The finding that 11% of workers experienced at least one serious symptom of heat-related illness (dizziness, nausea, vomiting, confusion, cramping, or fainting) on the data collection days indicates the inadequacy of heat precautions. These symptoms, disconcerting in themselves, can also be signs of developing heat stroke or heat exhaustion. As these were measured for three different summer workdays, it is probable that more workers were experiencing at least one episode of these illnesses over the course of the long summer.

California and Oregon, two of the few states with heat-precaution regulations, specify workers in temperatures over 85 degrees should have 10 minutes of rest every two hours.^{19,34} The Farmworkers Association of Florida has sought legislation for workplace protections, including 10 minutes of break every two hours for several years according to the organization's Pesticide Safety and Environmental Health Coordinator Jeannie Economos (personal communication, 2024). The year the proposed legislation did not move out of committee hearings, the same Florida legislators, concerned about the effects of heat on high school athletes, passed legislation requiring school athletic programs to protect players from HRI by monitoring heat stress, modifying athletic activities, implementing cooling zones, establishing hydration guidelines, and having cardiopulmonary resuscitation

(CPR) training and automated external defibrillator (AED) capabilities onsite during athletic activity (Florida House Bill 7011).³⁵ This was the same year (2023) two farmworkers died while working in the heat. Legislators decided to protect high school students who chose to participate in athletics while denying protections for the outdoor workforce, blocking outdoor-worker heat protection standards at the county level.

Miami-Dade County was developing outdoor-worker heat-protection regulations when Florida legislators in the 2024 legislative session passed a bill to preempt any local heat protections for outdoor workers, blocking the ability of local governments to require workers' heat protections (Florida House Bill 433). Agriculture, building industries, and the Florida Chamber of Commerce pressured legislators to block workplace heat-protection requirements.^{21,22} While industry has resisted heat-protection requirements, especially mandated rest breaks in heat-risk conditions, the evidence indicates that voluntary adherence to guidelines is not occurring. Protecting the workforce as temperatures continue to rise will require a commitment to humane treatment and clear, enforced regulations.

Limitations.

In this real-world situation, multiple factors may have contributed to the findings. Some workdays may be more arduous than others. The heat index varied among the three summer data-collection days. Heat and humidity were measured for the general area but were not measured in the individual's workplace. It is likely that the greenhouses and ferneries were more humid and hotter than the geographically recorded heat indices, especially in work settings under tarps used to retain moisture and heat for the plants. It was also likely hotter for those wearing plastic aprons to protect themselves from the water and chemicals used in the nursery or fernery. Additionally, interrater reliability may have varied among the interviewers. Frequency and duration of breaks, work duration, and HRI symptoms were based on worker recall. Beverage intake was based on worker recall but supported with visual aids of actual containers for container type and size and hydration status by urine specific gravity measurements. An important strength of the data is that data were collected for multiple days over three years and both winter and summer seasons, by trusted interviewers in the workers' language, in the Farmworker Association of Florida office locations. It is possible that by recruiting a convenience sample of participants through FWAF, the study did not include workers who are more isolated.

Conclusions.

The guidelines provided by NIOSH are recommendations, not requirements. This study indicates agricultural workers do not have the recommended protections described in the guidelines, contrary to industry groups' and lobbyists' claims. The few heat precautions to protect the workers were too few and too meager to be helpful. The biggest gap between the recommendations and real practice was in rest breaks, which did not vary between winter and summer despite hours of extreme heat indices in the summer. This underscores the need for regulations and enforcement of the regulations to ensure workers have sufficient breaks when working in high heat and humidity.

Without regulations and enforcement of those requirements, agricultural workers, and likely other outdoor workers will continue to suffer the impact of extreme heat, with increased preventable illness and death. As temperatures continue to rise, protecting the health of the workforce is imperative. Recommendations are insufficient. We need strong, enforced heat-protection regulations for all outdoor workers.

Funding

The research reported in this publication was supported in part by the National Institute of Environmental Health Sciences of the National Institutes of Health (R25ES033452, PI: Castner), the National Institute for Occupational Safety & Health (R01OH011782, PI: McCauley, Hertzberg, Sands), and the National Institute of Nursing Research (K23NR020356, PI: Chicas). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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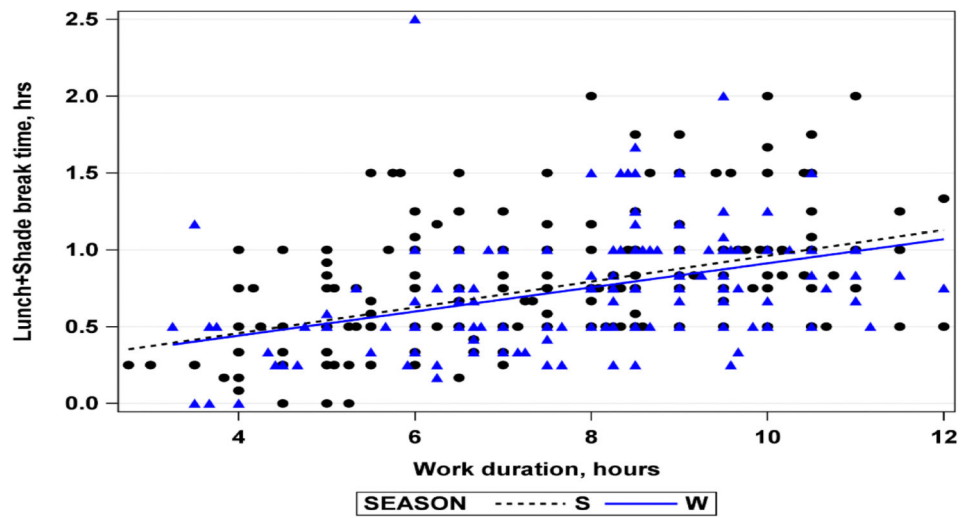


Figure 1.
The relationship between length of the workday and the hours taken as lunch and breaks, by season.

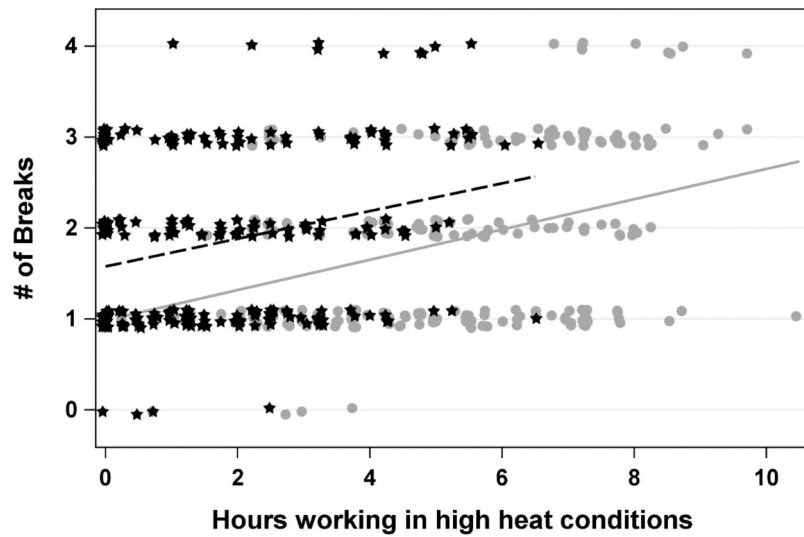


Figure 2.

The relationship of breaks to hours working under extreme heat indices.

Notes: Gray circles= ≥ 90 degrees F, black stars= ≥ 100 degrees F.

Breaks include lunch and additional shade breaks.

Points are jittered for clarity.

Table 1.
DEMOGRAPHICS, WORK EXPERIENCE, AND SUMMER HEAT EXPOSURE AMONG A SAMPLE OF
FLORIDA AGRICULTURAL WORKERS, 2020–2022

Characteristic	n	Median [q1, q3] or %	Min–Max
Demographics ^a			
Female	115	77%	
Age	115	38 [35, 43]	18–49
Experience ^a			
Years in agricultural work	114	11 [4, 17]	1–32
Years in Southern agricultural work	114	10 [3, 16]	0–32
Any training on preventing HRI	113	31%	
Winter heat exposure ^b			
Heat index, individual's maximum	115	69 [63, 76]	48–88
Heat index, individual's median	115	63 [60, 72]	46–84
Summer heat exposure ^b			
Heat index, individual's maximum	105	103 [101, 106]	90–131
Heat index, individual's median	105	95 [92, 98]	77–114
Hours working in heat index $\geq 90^{\circ}\text{F}$ ^c	105	5.5 [3.8, 6.8]	0.3–10.5
Hours working in heat index $\geq 100^{\circ}\text{F}$ ^d	105	1.5 [0, 2.8]	0–6.5

Notes

^aAt baseline visit

^bMaximum and median heat exposure was first calculated for each person's work period, with heat index calculated from 15-minute temperature and humidity readings from the nearest Florida Automated Weather Network monitoring station. 115 participants were observed on 199 workdays in winter and 105 participants observed on 260 workdays in summer.

^cApproximate area on a heat index chart indicating "extreme caution" should be taken.

^dApproximate area on a heat index chart indicating "danger."

Table 2.
WORKDAY LENGTH AND FREQUENCY AND DURATION OF BREAKS AMONG A SAMPLE OF
FLORIDA AGRICULTURAL WORKERS, 2020–2022

Characteristic	N ^a	Median [q1, q3], %, or Mean (se)	Min–Max
Workday duration			
Winter ^b	115	8.5 [7.8, 9.5]	3.3–12
Summer ^c	105	8.2 [6.8, 9.0]	2.8–12
# Breaks (lunch+additional breaks)	115	1.9 (0.1)	0–4
Had <=1 break (lunch or other break) ^d	115	44%	
Minutes of break (lunch+additional breaks)	115	45 [34, 57] ^e	0–150

Notes

^a 115 participants were observed on 199 workdays in winter and 105 participants observed on 260 workdays in summer.

^b 2020, 2021

^c 2020, 2021, 2023

^d On eight days, no lunch or additional break was taken; on 20 days, four were taken.

^e Distribution based on participant's average minutes of break over their observed days.

Table 3.
WATER ACCESS, BEVERAGE INTAKE, DEHYDRATION, AND HEAT-RELATED ILLNESS, BY
SEASON, AMONG A SAMPLE OF FLORIDA AGRICULTURAL WORKERS, 2020–2022

Characteristic	Median [Q1, Q3] or % (n)		
	Reported at baseline visit	Winter ^a	Summer ^b
Employer-supplied water	86%	—	—
Beverage intake, ounces	—	48 [40, 65] min=8, max=208	68 [60, 87] min=12, max=226
Dehydrated, ^c pre-work	—	33%	45%
Dehydrated, post-work	—	31%	64%
Serious HRI symptoms ^d	—	9%	12%

Notes

^a2020, 2021

^b2020, 2021, 2023

^cUrine specific gravity ≥ 1.020

^dFainting, confusion, dizziness, cramping, nausea/vomiting

HRI = heat-related injury