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Knowledge and Practices to Avoid Heat-Related Illness among Hispanic Farmworkers along the Florida-Georgia Line

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Abstract

Farmworkers who harvest and weed field crops are at increased risk for heat exposure and heat-related illness (HRI). The study objectives were to: (1) train crew leaders to use the OSHA heat safety tool app and evaluate the utility of the app from a crew leader perspective; and (2) characterize heat safety knowledge, preventive practices, and perceptions of HRI risk among Hispanic farmworkers. Before harvest season, six crew leaders completed a two-hour OSHA heat illness prevention training, including evaluation of a heat safety mobile app. Between August and October 2018, 101 Hispanic farmworkers participated in cross-sectional surveys about heat safety. Survey participants responded to questions about HRI prevention, HRI knowledge, and sociodemographics. Crew leaders using the heat safety app rated the app very highly on relevance, functionality, value and privacy. Farmworkers did not report being overly concerned about HRI based on their survey responses. Nevertheless, 19% of farmworkers had experienced non-specific symptoms from working in the heat, such as headache, dizziness, and nausea. In the multivariate linear regression model, farmworkers had lower heat safety knowledge scores if they were H-2A visa holders, female, and only “a little bit concerned” compared to others who were “very concerned” about working in the heat. The results of this study indicate the need for continued

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heat safety training for both crew leaders and farmworkers to reduce the risk of HRI, especially among less experienced farmworkers.

Keywords

Cooling practices; farmworker; heat-related illness; hydration; Hispanic

Introduction

In June 2018, a 24-year-old Mexican farmworker who had been picking tomatoes all day in Colquitt County, Georgia for less than a week in temperatures recorded at 95°F and a Heat Index of over 103 degrees died of heat stroke [1]. The health effects of heat-related illness (HRI) caused by heat stress are a serious risk to farmworker health, hence the importance of heat stress protections and employer-provided training [2]. HRI exists on a continuum, that if left untreated leads to further decline down the HRI cascade [3]. It is common for farmworkers laboring in the summer heat to report symptoms such as headache, sudden muscle cramps, and dizziness [4].

The effects of HRI increases in severity if not recognized, but can be alleviated by rest, shade and hydration. The severity of heat stress and strain begins with a prickly rash and progresses to dizziness and syncope, profuse sweating, thirst, muscle cramps caused by low salt levels, and rapid pulse. Some of these symptoms can be recognized by the workers themselves or their supervisors. Further severity leads to heat exhaustion, characterized by symptoms including a body temperature above 38°C (100°F), extreme thirst, dehydration, fatigue/weakness, nausea/vomiting, headache, lack of coordination, confusion, irritability, rapid pulse, low blood pressure, and low urine excretion. Many of these symptoms can be self-monitored before escalating to heat stroke, including mental delirium, seizures, renal failure, hyperventilation, pulmonary edema, arrhythmia, muscle weakness, lack of perspiration, shock, and intravascular coagulation [5, 6, 7, 8, 9]. Heat stroke can occur when the core body temperature rises above 40°C (104°F) and is potentially life-threatening [3]. In a study with Florida fernery workers, over half of the 18 workers participating in a 3-day biomonitoring protocol exceeded the recommended core body limit of 38°C [10]. One adaptive strategy to mitigate the effects of extreme heat includes going to air-conditioned areas during or after work, yet in one study in North Carolina only two percent of the sample reported using this method [11].

One study examining the mitigation of heat stress by farmworkers argued that the structure of the work environment is incompatible with safe work conditions in high heat environments [12]. For example, farmworkers paid by the piece rate rather than by an hourly wage earn more by taking fewer breaks and working at a faster pace, putting them at risk for dehydration and injury. In a sample of 25 HRI cases recorded from outdoor work (2011–2016) and investigated by the Occupational Safety and Health Administration (OSHA), the median Heat Index was 91°F (range 83°F to 110°F), and 11 of the 14 workers in the sample who died from heat stroke were not acclimatized to working in the heat [2]. The report suggested that when the Heat Index is ≥ 85°F, extra precautions should be taken by

employers to protect outdoor workers, including heat safety training. The case series also identified that workers with comorbidities represented a higher percentage of workers who died, suggesting that these workers should be more closely monitored [13]. Acclimatization may vary by the individual, hence the importance of adequate training for both self-monitoring and supervision. The importance of proper acclimatization is essential to avoid heat-related deaths for workers who have been absent on the job for a time period, are new to crop farm work, or are working in extreme heat [14]. Young, male Hispanic workers also maintain a cultural identity of *machismo*, which might lead them to downplay symptoms of dehydration symptoms or heat cramps, thus limiting peer-to-peer health communication [15]. According to U.S. Bureau of Labor Statistics data, the highest rate of heat-related deaths between 2000 and 2010 occurred in the agricultural industry and among Hispanics [16]. In many cases of HRI, outdoor workers have not built up a tolerance for working in the hot weather by gradually increasing their workload over a period of time [17].

In addition to rest and shade, proper hydration is essential to reduce HRI risk. A large survey study with migrant clinic attendees in Georgia reported HRI symptoms could possibly be reduced by taking more breaks in the shade, having access to medical attention at work and having access to regular breaks [4]. A recent study on kidney function in Florida farmworkers reported that in a sample of 192 farmworkers, 53% were dehydrated pre-shift and 81% post-shift; moreover, 33% of research participants had measurements for kidney function indicators that signaled risk of acute kidney injury, especially in higher heat indices [18]. This research highlights the importance of proper hydration to reduce HRI risk [4].

Up-stream solutions to reduce the problem of HRI in agricultural workers include policy advocacy efforts to establish national heat standards to protect workers and mandatory heat safety education to incoming work crews. In the U.S., there is no national heat standard for HRI to protect farmworkers. California is one of only two U.S. states to have a heat standard for protecting workers with regulations requiring employers to provide access to shade, water, and periodic rest [19, 20]. Heat safety education interventions might include a combination of didactic and technology-assisted education, such as the use of heat safety apps, for example the OSHA heat safety tool app, which provides the Heat Index, and HRI risk reduction tips depending on the outside temperature [21, 22]. The topic of heat safety education and farmworkers has been understudied in the farmworker safety literature, so more research is needed to develop and test the most effective intervention approaches [23].

Along the Florida-Georgia border region, the high temperatures and Heat Index in the summer months places outdoor workers at high risk for HRI. The purpose of the study was to measure the acceptability of the OSHA heat safety tool app by farmworker supervisors and identify factors associated with farmworkers' baseline heat safety knowledge to inform future intervention research which leverages mobile technology. The study also contributes to understanding the training challenges for H-2A guest workers since they represent a growing segment of the crop farmworker workforce in Florida and Georgia [24]. The study objectives were to: (1) train crew leaders to use the OSHA heat safety tool app and assess their perceptions of the usefulness of the app from the crew leader perspective; and (2) characterize heat safety knowledge, preventive practices, and perceptions of HRI risk among Hispanic farmworkers. The farmworker population is very susceptible to the dangers of

prolonged heat exposure due to their occupational status, and in the larger context of a warming planet, both the incidence and severity of health risks will only increase in the future [25].

Methods

Participants – Crew Leaders

Before the harvest season began in April 2018, six crew leaders completed a two-hour OSHA heat illness prevention training [26]. Crew leaders responded positively to the OSHA heat safety training and received assistance to download the Heat Safety Tool app to their smartphones and receive instruction on the how to use the app. Following the OSHA training and instruction on how to use the OSHA heat safety tool app, crew leaders completed a mobile app evaluation rubric two months later that was specifically designed to evaluate agriculture safety apps [27]. The crew leaders ranked the app on relevance, functionality, value and privacy to measure acceptability of the app. Individual criteria under each domain were rated on a scale of 1 “Poor” to 4 “Excellent.”

Participants – Farmworkers

Later in the summer, a mix of H-2A and seasonal farmworkers were recruited at three H-2A camps and one housing unit for seasonal workers to complete the heat safety survey. The H-2A guest visa worker program allows U.S. employers to hire foreign nationals as temporary agricultural workers. Farmworkers received a $10 stipend for survey participation, and crew leaders received a $50 stipend for participating in the training. In addition to the survey data collection, three field observations were conducted in June-July to observe eggplant harvesting, hydration practices and rest periods. The research was approved by the Florida A&M University Institutional Review Board.

Data collection

Survey data collection occurred in farmworker housing units between August and mid-October 2018. The study employed a cross-sectional survey study design. The average high temperature during this period was 92.3 °F (range: 80.1°F – 97.5°F) according to the closest weather station in Valdosta, Georgia. Surveys were administered by two bilingual Spanish-speaking research assistants from the local community.

Measures

Farmworkers responded to survey questions in Spanish related to adaptive strategies for heat stress and heat-related symptoms adapted from surveys used in previous studies in Georgia, North Carolina, and Oregon [4, 11, 28]. Adaptive strategies included changing work hours, changing work activities, taking frequent breaks, wearing hats and light-colored clothing, drinking more water, resting in shaded areas, and going to air-conditioned places during or after work or using other methods to cool down after work. Survey data included work history, crops worked, current work activities including frequency of water consumption and breaks, payment type (hourly, piece rate, or both), usual clothing and headwear, behaviors when working in the heat including cooling methods, level of concern regarding HRI risk, comfort level in taking breaks to drink water, recent work activities, and health history.

Health history questions included chronic disease status, alcohol consumption, smoking status, and height/weight. Questions about heat-related symptoms experienced during the last week included: skin rash/skin bumps; heavy sweating; confusion; dizziness; fainting; hot, dry skin; muscle cramps/spasms; extreme weakness/fatigue; and nausea/vomiting. Knowledge questions included: 1) correct identification that dark colored clothing was a risk for heat stress; 2) proper recognition that the body needed 2 to 14 days to properly acclimatize to the heat; and 3) a three-part question to correctly identify age, prior history of HRI, and being overweight as HRI risk factors. The five-question knowledge scale was scored as 1–3 indicating "low knowledge" and 4–5 as "high knowledge" based on previously published criteria, and is reported in the descriptive statistics for comparison purposes with prior studies in the discussion section; however, for data analysis, the scale was treated as a continuous variable [28, 29]. Demographic characteristics included age, sex, level of education, H-2A visa status, years living in the U.S., housing type, cell phone type and use of apps, language acculturation, and number of seasons working in agriculture.

Analysis

Survey data were entered into a SPSS database and then validity checks were used to correct data entry errors and cleaning (IBM SPSS Statistics Version 25). Statistical analyses were conducted using SAS version 9.4 (Cary, NC). First, univariate analyses of all variables were calculated to characterize descriptive statistics of the study sample. The heat safety knowledge score (0 to 5) was treated as a continuous dependent variable. Independent samples *t*-test was used to compare mean differences of levels of heat safety knowledge by educational attainment (<High School/≥High School), sex (male/female), number of seasons of farm work experience (<3/≥3), past experiences of HRI symptoms (yes/no), and H-2A visa status (yes/no). Following the bivariate findings, multiple regression analysis was used to model predictors of heat safety knowledge using the covariates of educational attainment, sex, number of seasons working in agriculture, level of concern about HRI (Likert scale, 1 = "very concerned"; 2 = "a little concerned"; and 3 = "not at all concerned"), and H-2A visa status. Missing data or responses of "don't know" or "refused" were excluded from all analyses. Missing data were identified in <1% of the sample across questions.

Results

Crew Leader Training

Six crew leaders participated in the OSHA training, three males and three females. The average age of the crew leaders was 41 years old (range 26–69). Four of the crew leaders reported using mobile apps such as Facebook and WhatsApp. According to the app rating rubric, value and privacy were rated the highest with an average rating of 3.8. Functionality had an average rating of 3.5, and relevance had an average rating of 3.6. Therefore, for all domains, the app was highly rated.

Farmworker Survey

Survey data collectors interviewed 101 farmworkers over 19 visits to four farmworker housing units. There were no participant refusals. Survey participants were comprised of a large proportion (74%) of H-2A workers from Mexico because the research was conducted

in an area dominated by a single labor contractor company (Table 1). Most participants were Mexican-born, except for two U.S.-born participants. There were more men (60%) in the sample than women (40%). The average age was 30 years old (range 19–66). Almost 70% of participants lived in barracks type housing, with fewer living in a house (13%) or a trailer (18%). Only 8% of participants reported they spoke English in addition to Spanish, and 10% of participants spoke an indigenous language, primarily Mixtec. Participants who lived in the U.S. year-round reported an average of 8.2 years of residency (range 1–27 years). The majority had a body mass index (BMI) placing them in either the overweight or obese category, calculated from their self-reported height and weight measurements.

In terms of work history, most farmworkers (76%) had three seasons or less working in the fields. The farmworkers had been employed in a variety of tasks including primarily picking, planting, and weeding. A variety of crops were listed including cucumbers, tomatoes, sweet potatoes, broccoli, and green peppers. Since most of the workers were H-2A workers, they were paid hourly, usually about $10.95 per hour, but many also reported being paid a piece rate of $0.40 per box. The workday generally lasted from early in the morning until late or early afternoon. Farmworkers were permitted a 15-minute break in the morning and afternoon and a 30-minute lunch break. When asked where they had been working in the last week, 89% were working in the fields and 11% were working in a packing shed.

Most participants (81%) had a cellphone – primarily Android phones but some had iPhones – and 61% reported using mobile apps. The most common mobile apps mentioned were Facebook and WhatsApp, but other apps included Twitter, Facebook messenger, and Instagram. Only one individual reported using an app for the temperature.

Farmworkers were asked about acclimatization practices when they started working, and 58% reported they began with a few hours of work before starting to work a full day (Table 2). Regarding water consumption, 88% said they were “very comfortable” taking a break to drink water, and 32% said they added something to the water, like hydration salts or flavorings. Most farmworkers reported they drank water every 30 minutes (70%), or every hour (20%) (Table 3). In field observations, some workers carried water bottles in their pockets or attached to their belts, but most were only observed to drink water during a prescribed break, not when they were working. The crew bosses had water coolers on the back of their trucks, which would be nearby whenever it was break time. In the survey, the most commonly ingested beverages besides water were Gatorade (64%), fruit juice (27%), soda (26%), energy drinks (19%), and coffee (12%). Most participants (97%) stated that their employer provided drinks on site. A few participants (16%) stated that they did not want to take a break to drink. Some reasons for not drinking water when feeling hot included the fear of experiencing nausea (8%) or getting sick (3%).

Farmworkers also responded to the issue of lavatory access, and 19% of participants reported that there was no toilet nearby as one of the reasons for drinking less water. However, there were also gender differences in perceptions of toilet access, with only 13% of males reporting there was no toilet nearby compared to 29% of females. When asked about access to shade or ways to stay cool, farmworkers reported using shade under trees (77%), shade structures (20%), fans (13%), and rest stations (10%). Other methods to stay

cool included wearing wet hats or bandanas (11%). Farmworkers also responded to questions about heat prevention methods. These adaptive methods included drinking more water (66%), changing work activities (23%), taking rest breaks in the shade (23%), and changing work hours (21%). Only a small percentage of participants (2%) used a vehicle with air conditioning to cool down. In one field observation, a female worker took her lunch break in the crew leader's air-conditioned truck. Clothing choices helped to protect farmworkers from the sun, and field observations revealed that most farmworkers were covered head to toe in clothing (i.e., long sleeve shirts and pants) and wore hats and gloves, but sunglasses usage was rare. In the survey, 77% of participants reported they either rarely or never wore sunglasses. When asked why, one farmworker reported being uncomfortable and another said they were hard to clean. Baseball caps were ubiquitous among the men, but women wore wide-brimmed hats, baseball caps, or bandanas. Farmworkers reported wearing mainly light-colored clothing. Based on their responses, farmworkers did not appear to be overly concerned about HRI since only 6% reported being "very concerned" about their health risk from working in the heat, and 53% were "not at all concerned."

Approximately 52% of participants had seen a doctor in the last five months and 14% had seen one within the last year, primarily for routine check-ups either in the local migrant clinic or back in Mexico. The most common reasons for not seeking health care were lack of time (12%), English language barriers (5%), lack of appointment times (4%), and lack of childcare (3%). Participants only reported a few health issues which included diabetes (4%), high blood pressure (8%), and being overweight (6%), and they reported taking medications for allergies (8%), high blood pressure (7%), and depression (1%).

Symptoms from working in the heat such as headache, dizziness, and nausea were reported by 19% of participants (Table 4). When asked about heat safety training, 32% responded that they had received some form of training. Farmworkers responded to five knowledge questions about heat safety, and the average score was 3.2 (SD = 1.3). Most farmworkers (94%) answered correctly to the first question that "wearing dark colored clothing" while working outdoors was a risk for heat illness. Less than half of farmworkers (45%) answered correctly that acclimatization to the heat could last between 2–14 days after not having worked recently in the fields.

Bivariate findings identified significant differences in heat safety knowledge scores by H-2A status and numbers of seasons working in the fields. Farmworkers with three or more seasons of farm work experience had significantly higher knowledge scores than less experienced farmworkers ($t = -1.96$, $p < .05$). Likewise, non-H-2A farmworkers had significantly higher knowledge scores than H-2A workers ($t = 4.55$, $p < .001$). Differences in knowledge by sex, educational attainment, heat safety training, and past experiences of heat stress symptoms were not statistically significant. Multiple regression analysis was used to test if the hypothesized covariates significantly predicted knowledge scores. The regression results indicated all predictors explained 29% of the variance ($R^2=.29$, $F(7, 85)=4.98$, $p < 0.0001$). In the multivariate linear regression model, sex ($B = -.79$, $p < .01$), H-2A status ($B = -1.27$, $p < .001$), and level of concern between "a little bit concerned" and "very concerned" ($B = -1.21$, $p < .05$) were significant predictors of knowledge. Farmworkers who were not H-2A visa holders, were male, and were "very concerned" compared to those who

were only “a little bit concerned” about working in the heat had significantly higher knowledge scores (Table 5).

Discussion

This study reports results from a training implementation and survey project to assess heat safety information needs among Hispanic farmworkers, a vulnerable occupational group to heat stress, HRI, and injury. The participant sample was characterized by a large percentage of H-2A workers (75%) and a high percentage who were able to read Spanish well (>96%). The high literacy level of participants increases the validity of the survey findings since surveys were self-administered and then checked for errors and omissions by research assistants. One of the study objectives was to assess the feasibility of heat safety training using the OSHA heat safety tool app. All the crew leaders provided positive evaluations of the HRI prevention training based on the results of the evaluation rubric. Crew leaders rated the app highly, and over 80% of farmworkers owned a cell phone so they could access weather data easily with the app. This finding is similar to a previous finding from focus group research that farmworkers provide positive feedback following receiving training on the app [30]. Therefore, the study provides preliminary evidence that the app is an easy-to-use tool for crew leaders to monitor weather data and check the heat index along with advisories on precautionary measures. All the information in the app is provided in Spanish when the default language for the farmworker is set to Spanish on either an iPhone or Android phone. A recent study comparing weather station data with micro-environmental data in Florida recommends the OSHA app as a reliable method to provide current heat index information to farmworkers and supervisors [31].

According to the OSHA heat illness prevention training, learners need to remember the importance of water, rest, and shade to avoid HRI. In this study, while water was the most highly ingested beverage (89%) and water was ingested at least once every 30 minutes by 70% of the sample, other beverages such as Gatorade, energy drinks, soda, and fruit juices were also commonly ingested. Similar findings were reported in a farmworker survey in Oregon, and Bethel and colleagues recommended more education was needed for both crew leaders and for farmworkers who may prefer these drinks over water [28]. In terms of rest, 62% of farmworkers reported either always or usually taking breaks in the shade. In field observations, workers were observed taking breaks under the packing trailer during the lunch break but not during the shorter breaks. Workers did not report having access to much shade besides trees. These findings about lack of shade for breaks are similar to another survey study in North Carolina with tobacco farmworkers [32]. One crew leader in our study reported that for some crops temporary shade structures would be set up in the fields. Regarding restroom breaks, usually there would be a portable toilet available; however, depending on the size of the field and where the farmworker was harvesting, it might be a long walk to a portable toilet.

Compared to other survey studies with farmworkers, our study identified fewer HRI symptoms reported by farmworkers, with only 28% of the sample reporting any symptoms in the past week. For example, in a North Carolina survey by Kearney and colleagues, 72% of the sample reported at least one type of heat-related symptom, and in the Oregon survey,

64% of the sample reported at least one type of heat-related symptom [28, 33]. However, just as in the Oregon survey, the most common heat-related symptoms reported in our survey were headaches and heavy sweating. The general question about having ever experienced HRI symptoms produced a lower positive response, with only 19% of participants responding “yes”, compared to 27% in the Oregon survey [28]. These results could be partially explained due to the time of year data were collected, with much data collection occurring in September/October, whereas the Oregon survey occurred in July/August and the North Carolina survey occurred in August/September. A different North Carolina survey by Mirabelli and colleagues reported that H-2A workers reported heat-related symptoms less commonly than non-H-2A workers (31% vs. 56%) and adaptive strategies were more common among non-H-2A workers, suggesting that knowledge and practices regarding heat illness might vary by H-2A status [11]. Further research into the relationship between symptom reporting, work arrangements, and employment status is needed to understand these dynamics.

The primary finding from the farmworker survey for HRI knowledge was that farmworkers who were female, had H-2A visa status, and were only “a little bit concerned” about working in the heat were more likely to score lower on the heat safety knowledge scale. A farmworker survey in California by Stoecklin-Marois and colleagues also found a lower percentage of high scorers among females compared to males, suggesting either female farmworkers had less experience in farm work or had less training experiences [29]. In our study, 43% of farmworkers had a high heat knowledge score, compared with 70% in the California study [29]. However, farmworkers in our study had higher knowledge scores than the Oregon study where only 21% of farmworkers had a high score [28]. Another Georgia survey study with migrant clinic attendees reported most farmworkers had never received HRI training [4].

The OSHA heat safety training provides information on recognition of HRI symptoms and corrective action to reduce heat stress, which were also identified in our survey. Weather conditions such as humidity and temperature should be identified and monitored to predict HRI and identify steps needed to reduce stress. These steps include: rotating from more demanding jobs to less demanding jobs, ensuring that workers acclimatize to hot weather conditions, providing water and rehydration every 30 minutes, providing rest periods three times a day in an eight-hour workday, and recognizing severe symptoms which require immediate medical treatment. Workers should also monitor each other for signs and symptoms. Transportation should be provided to toilets, potable water and medical treatment, if necessary. Based on our study findings, Figure 1 offers several recommendations to prevent HRI in farmworkers that should be considered when delivering OSHA heat safety training to farmworkers.

This study had several limitations which affect the generalizability of the findings and comparisons with other surveys. First, the study used convenience sampling at four migrant camps in one area of South Georgia, and most of the workers in the sample were H-2A workers. This limits comparisons with the National Agricultural Worker Survey (NAWS), since NAWS excludes H-2A workers from their sampling [34]. Second, social desirability bias may have affected the responses, causing pre-existing illnesses and heat-related

symptoms or injuries to be underreported. A large surveillance study of farmworker clinic injury data reported that back pain and musculoskeletal injuries were the most frequently reported complaint, and heat stress symptoms were infrequently reported [35]. Third, since some workers reported being paid both hourly and by piece rate, it was not feasible to test this variable as a predictor of heat safety knowledge or as a risk factor for HRI symptoms. The strengths of the study included that we used a previously validated survey and the survey interviewers were members of the community, thus increasing the level of trust between the interviewers and research participants.

Conclusion

Regular training opportunities for farmworkers and crew leaders are recommended to stress the importance of HRI prevention. In addition, it is important to monitor weather conditions with the heat safety tool app to ensure that workers use recommended breaks to recover from mild heat stress symptoms. Acclimatization should become an important lesson as part of farmworker training and incorporated into the OSHA heat safety tool app. Companies and contractors should review their policies to ensure they provide this guidance to farmworkers and crew leaders at the beginning of each harvest season to modify work schedules for the first few weeks for newly hired workers, such as H-2A contract workers.

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- Offer annual HRI prevention training for farmworkers and supervisors.
- Provide recommendations to farmworkers and supervisors related to HRI symptom recognition and corrective action to reduce heat stress.
- Monitor weather conditions to protect workers from HRI.
- Use occupational tools to monitor tasks and provide a rotation from more demanding jobs to less demanding jobs.
- Ensure that workers are properly acclimatized to working in hot weather conditions.
- Provide water and rehydration salt packets (electrolytes), and a personal water container so workers can obtain water every 30 minutes.
- Provide shade and movable shade structures to cool workers.
- Provide rest periods and shade at least 3 times in an 8-hour workday.
- Have emergency medical help available for workers having difficulty with HRI, especially on the hottest days of the summer.
- Provide transportation to workers for bathroom access when portable lavatories are distant from work being performed.
- Monitor workers at breaks and during work for low-severity symptoms.
- Train workers to be able to monitor themselves and to notify supervisor for help.
- Provide suggestions for clothing designed to protect the worker from HRI and the sun.

Figure 1.
Key Points to Include in HRI Prevention OSHA Training for Farmworkers

Table 1.

Participant demographics and work details, Georgia, 2018 (N = 101)

Characteristic	*n*	(%)
Age		
19–29 years	57	(56)
30–39 years	29	(29)
40–49 years	9	(9)
50+ years	6	(6)
Sex		
Male	61	(60)
Female	40	(40)
Health insurance coverage		
Yes	6	(6)
No	95	(94)
H-2A worker		
Yes	75	(74)
No	26	(26)
Place of birth		
Mexico	98	(97)
South America	1	(1)
United States	2	(2)
Education		
Primary school or less	15	(15)
More than Primary School	12	(12)
Graduated High School	49	(49)
>High School	24	(24)
BMI		
Normal (18.5–24.9)	35	(40)
Overweight (25–29.9)	33	(38)
Obese (30+)	19	(22)
Ability to read in Spanish		
Very well	82	(81)
Fairly well	15	(15)
Not very well	3	(3)
Not at all	1	(1)
Self-reported general health		
Excellent	40	(39)
Very good	33	(33)
Good	18	(18)
Fair/Poor	10	(10)

Characteristic	*n*	(%)
Smoking tobacco products		
Every day	2	(2)
Some days	17	(17)
Never	82	(81)
Number of days you had at least 1 alcoholic drink		
1 day	12	(12)
2 days	2	(2)
None	85	(86)
Number of seasons working in agriculture		
1 season	34	(34)
2 seasons	26	(26)
3 or more seasons	40	(40)
In past week, number of days of work		
1–3 days	24	(24)
4–5 days	50	(51)
6–7 days	25	(25)
Payment type for current job		
Piece rate	17	(17)
Hourly	61	(61)
Piece rate and hourly	22	(22)
Most common crops worked in last week *		
Tomatoes	19	(20)
Cucumbers	31	(32)
Sweet potatoes	56	(57)
Most common tasks in last week *		
Picking	62	(61)
Weeding	38	(38)
Planting	21	(21)
Packing	7	(7)
Have a cellphone?		
Yes	82	(81)
No	19	(19)

* Some percentages do not add to 100% because of multiple possible answers to the same question.

Notes: BMI, body mass index. n (%) unless otherwise indicated. When responses do not add up to N=101, there was missing data.

Table 2.

Heat-related illness practices, Georgia, 2018 (N = 101)

Characteristic	*n*	(%)
When you started working, did you start with few hours then increase?		
Yes	59	(58)
No	42	(42)
During past week, take breaks in the shade		
Always	51	(51)
Usually	11	(11)
Sometimes	28	(28)
Rarely	9	(9)
Never	1	(1)
During past week, clothing always or usually worn*		
Light-colored short-sleeved shirt	23	(23)
Dark-colored short-sleeved shirt	3	(3)
Light-colored long-sleeved shirt	80	(79)
Dark-colored long-sleeved shirt	5	(5)
Shorts	5	(5)
Pants	84	(83)
Jacket	24	(24)
During past week, head protection always or usually worn*		
Baseball cap	85	(85)
Wide-brimmed hat	22	(22)
Other hat	3	(3)
Bandana	61	(60)
Hood from sweatshirt	8	(8)
Which of the following are available to keep workers cool?*		
Shade structure	22	(22)
Trees	80	(80)
Fans	12	(12)
Rest station	10	(10)
Building with A/C	2	(2)
Which heat prevention methods did you use at work?*		
Change work hours	21	(21)
Change work activities	23	(23)
Drink more water	67	(67)
Take rest breaks in the shade	23	(23)
Heat knowledge score		
High (4–5)	43	(43)

Characteristic	***n***	**(%)**
Low (<4)	58	(57)
Level of concern regarding health being affected by working in heat		
Very concerned	6	(6)
A little bit concerned	35	(35)
Not at all concerned	53	(52)
No opinion or refused	7	(7)

* Some percentages do not add to 100% because some item categories are yes/no answers to a series of questions.

Notes: n (%) unless otherwise indicated. When responses do not add up to N=101, there was missing data.

Table 3.

Hydration practices, Georgia, 2018 (N = 101)

Characteristic	*n*	(%)
During past week, type of beverages ingested*		
Water	89	(89)
Gatorade	64	(64)
Energy drinks	19	(19)
Fruit juice	27	(27)
Coffee or tea	12	(12)
Soda	26	(26)
Beer	2	(2)
How comfortable were you taking water break?		
Very comfortable	88	(88)
Somewhat comfortable	10	(10)
Neither comfortable or uncomfortable	1	(1)
A little uncomfortable	1	(1)
During past week, how often did you drink water?		
Once every 30 minutes or more	69	(70)
Once an hour	20	(21)
Once every two hours	5	(5)
Once every three hours	3	(3)
Once every four hours	1	(1)
There was a toilet nearby		
Yes	82	(81)
No	19	(19)
I didn't want to take a break to get a drink		
Yes (True)	16	(16)
No (False)	85	(84)
How long is it to walk where there is drinking water?		
Not applicable – I have water with me	8	(8)
Less than a minute	76	(78)
Between 1–3 minutes	7	(7)
Between 3–5 minutes	5	(5)
More than 6 minutes	2	(2)
How long is it to walk to the toilet?		
Less than a minute	52	(53)
Between 1–3 minutes	13	(13)
Between 3–5 minutes	6	(6)
More than 6 minutes	27	(28)

Characteristic	***n***	**(%)**
Did employer have water or drinks for workers at work site?		
Yes	98	(97)
No	3	(3)

*Some percentages do not add to 100% because some item categories are yes/no answers to a series of questions.

Notes: n (%) unless otherwise indicated. When responses do not add up to N=101, there was missing data.

Table 4.

Self-reported frequency of heat-related illness, Georgia, 2018 (N = 101)

Characteristic	***n***	**(%)**
Have ever experienced symptoms from HRI?		
Yes	19	(19)
No	82	(81)
Have you ever received treatment for HRI?		
Yes	15	(15)
No	86	(85)
HRI symptoms reported in last week *		
Dizziness	2	(2)
Skin rash	5	(5)
Muscle cramps	1	(1)
Light-headedness	4	(4)
Headache	14	(14)
Heavy sweating	12	(12)
Extreme weakness	3	(3)
Nausea	3	(3)
Dry skin	1	(1)
Number of HRI symptoms in last week		
0	73	(72)
1	18	(18)
2	5	(5)
≥3	5	(5)

* Percentages do not add to 100% because this item category consists of yes/no answers to a series of questions.

Notes: n (%) unless otherwise indicated. When responses do not add up to N=101, there was missing data.

Table 5.

Summary of multiple regression analyses for variables predicting heat safety knowledge (N = 93)

	Heat Safety Knowledge		
Variable	***B***	***SE B***	**p-value**
Sex			
Female**	−0.79	0.26	0.0035
Male	REF		
Education			
≥ High School	−0.13	0.27	0.6342
< High School	REF		
H-2A Worker Visa Status			
Yes***	−1.28	0.30	<0.0001
No	REF		
Number of seasons of farm work			
≥ 3 seasons	0.17	0.26	0.5092
< 3 seasons	REF		
Have ever experienced symptoms from HRI?			
Yes	−0.53	0.31	0.0875
No	REF		
Level of concern regarding health being affected by working in heat			
A little bit concerned*	−1.21	0.52	0.0230
Not at all concerned	−0.77	0.51	0.1366
Very concerned	REF		
R^2	.29		
F	4.98**		

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.