



Southeastern
Coastal Center
for Agricultural Health and Safety

Heat-related illness (HRI) in Agriculture (Part 1)

DR. JOHN "JUAN" LUQUE
INSTITUTE OF PUBLIC HEALTH



SCCAHS Webinar

Overview

- Heat Stress and Latino Farmworker Laborers
- Survey Findings and Crew Leader Trainings



Introduction

- Agriculture is a hazardous industry
- 1.4 to 2.1 million hired crop workers in US
- 78% of crop workers are foreign-born
- 19% of crop workers are migrant workers
- 70% of crop workers are male
- 18% of crop workers are indirect hires

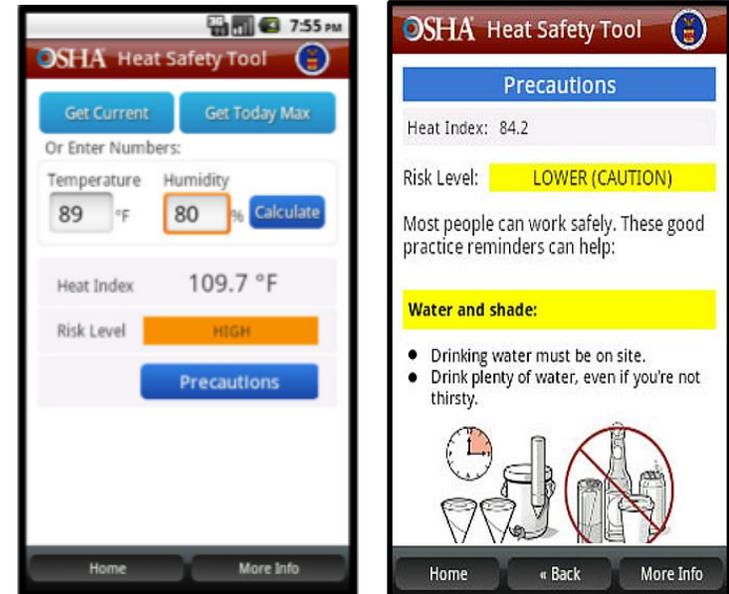
Country Lived in before US if Foreign-born (2011-2014) - NAWS		
Group	Number	%
Mexico	5,239	91.4
Central America	326	5.7
Puerto Rico	89	1.6
Caribbean	27	0.5
South America	9	0.2

Data source: CDC/NIOSH; NAWS Cycles 2011-12/ 2013-14

Background

- Farmworkers at increased risk for HRI
- USDOL, 2000-2010 the highest rate of heat-related deaths were in Ag Industry
- Symptoms include headache, muscle cramps, dizziness
- Alleviate symptoms with rest, shade, hydration
- Structure of work environment as risk factor
- Importance of acclimatization
- Importance of hydration
- OSHA Heat Safety Tool

Data source: CDC/NIOSH



OSHA Heat Safety Tool App

Excessive sweating



No sweating



Cool, pale,
clammy skin

Body temperature
above 103°
Red, hot, dry skin



Nausea or vomiting



Nausea or vomiting

Rapid, weak pulse



Rapid, strong pulse



Muscle cramps



May lose
consciousness



• Get to a cooler, air
conditioned place

CALL 9-1-1

Study Activities and Methods

Phase 1: Focus groups on heat-related occupational hazards, perceptions of risk, adaptations, and water/rest/shade (Fall/Winter 2017, South Carolina)

Engagement of Community Partners in South Carolina (East Coast Migrant Head Start, 2 Free Clinics) to host 5 focus groups

Focus Group Moderator and Co-Moderator facilitated groups and provided Heat Safety Tool app training



Phase 2: Crew leader recruitment and training on Heat Safety Tool app and farmworker survey (Summer/Fall 2018, Lake Park, Georgia)

“I Think the Temperature was 110 Degrees!”: Work Safety Discussions Among Hispanic Farmworkers

John S. Luque ^a, Brian H. Bossak^b, Caroline B. Davila^c, and Jose Antonio Tovar-Aguilar^d

JOURNAL OF AGROMEDICINE

2019, VOL. 24, NO. 1, 15–25

<https://doi.org/10.1080/1059924X.2018.1536572>

Phase 1: Focus Group Demographics (N=29, 5 focus groups)

Item	<i>n</i>	(%)
Sex		
Male	15	(52)
Female	14	(48)
Age		
Mean (Range)	35 (19-60)	
Years in U.S.		
Mean (Range)	12 (1-30)	
Country of Origin		
Mexico	25	(86)
Guatemala	4	(14)

Focus Group Discussion Themes

Farmworker Risks and Protection

- Inexperienced workers, need for training, use of PPE, pesticides

HRI Knowledge, Signs, Symptoms, Treatment

- Temperature precautions, paying attention to physical signs, use of *sueros* and cooling methods such as cold cloths

Water/Rest/Shade

- Issues of water quality, water temperature preferences, length of breaks depended on work arrangements (hourly vs. piece rate)

Access to Healthcare and Health Information

- Internet search to check symptoms, use of free clinics

OSHA Seguridad en el Calor

Enfermedad a Causa del Calor:
Signos y Síntomas

Enfermedad	Signos y Sintomas
Insolación Primeros Auxilios 	<ul style="list-style-type: none">• Piel enrojecida, caliente y seca o sudoración excesiva• Temperatura corporal muy alta• Confusión• Convulsiones• Desmayo
Agotamiento por el calor Primeros	<ul style="list-style-type: none">• Piel fría y húmeda• Sudoración profusa• Dolor de cabeza

Inicio « Regresar Más Info

Survey of Latino Farmworkers and Heat Safety Practices

Study Aims

- Train crew leaders to use the OSHA heat safety tool app and assess their perceptions of the usefulness of the app.
- Characterize heat safety knowledge, preventive practices, and perceptions of HRI risk among Hispanic farmworkers.

Georgia



Participant Recruitment

August-October
2018

Inclusion Criteria

- Farmworker
- Ages 21 and older

Crew Leader Training

6 Crew leaders participated in OSHA Heat Safety training and on Heat Safety Tool App in April 2018 (3 males/3 females), average age 41 years

Crew leaders had experience with apps (Facebook and WhatsApp)

Crew leaders used rubric for rating app on relevance, functionality, value and privacy on scale of 1-4 (“poor” to “excellent”)

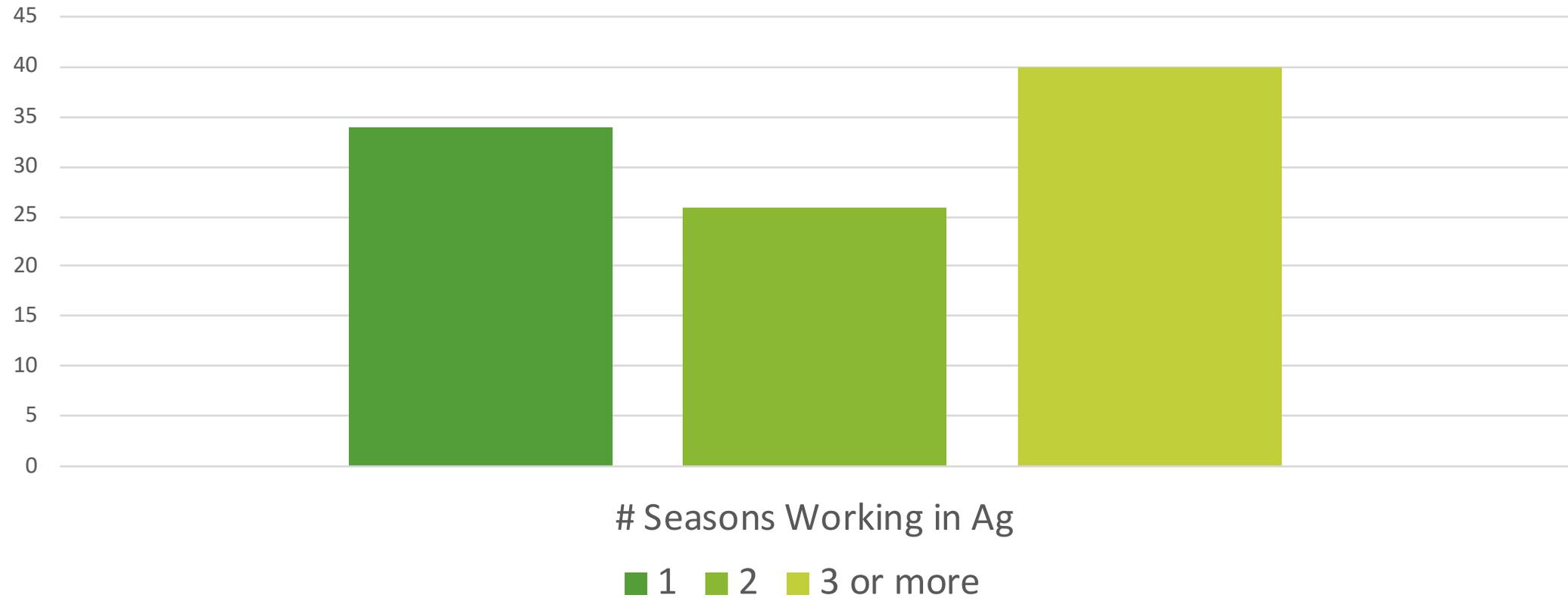
Category	Average Rating
Relevance	3.6
Functionality	3.5
Value	3.8
Privacy	3.8

Reyes et al. (2016) J Agromedicine:21(4):301-9

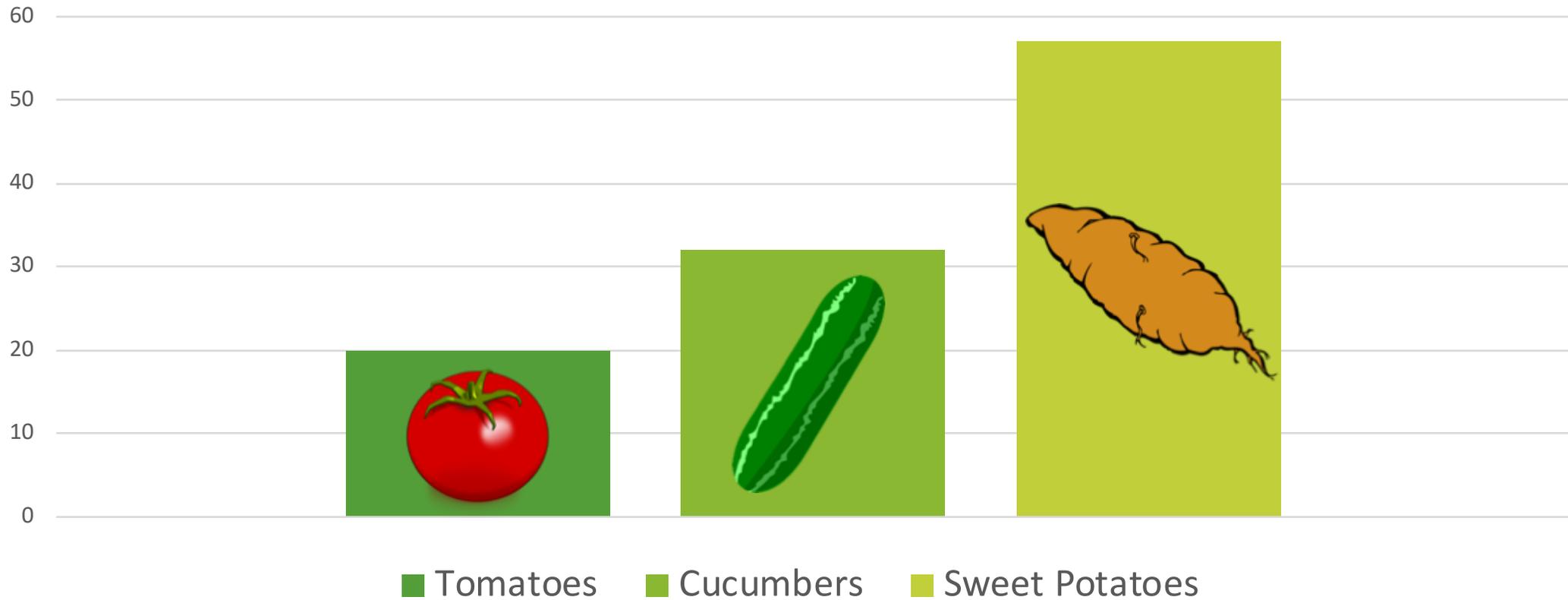
Results – Sociodemographics (n=101)

Characteristic	% of Farmworkers
Age, 19-29	56%
Age, 30-39	29%
Male	60%
H-2A worker	74%
BMI in overweight or obese category	60%
Ability to read in Spanish “well” or “very well”	96%
Country of origin was Mexico	97%
Lived in barracks-style housing	70%

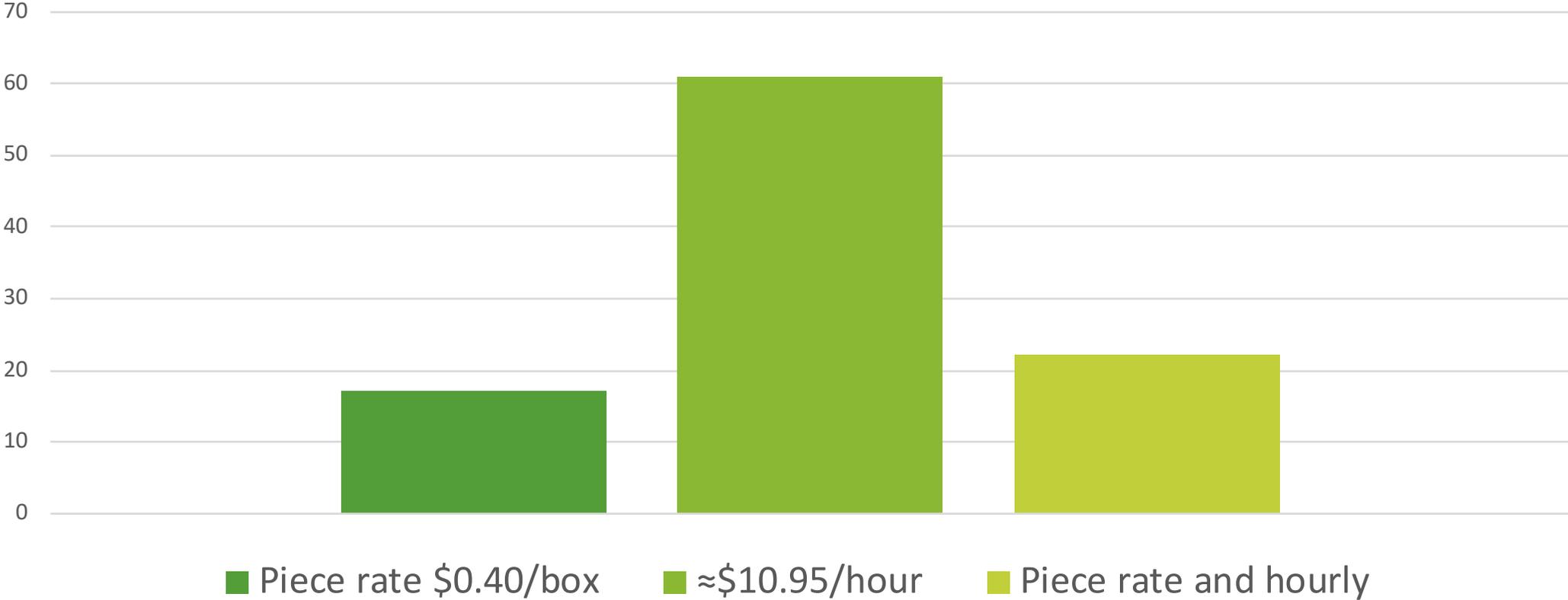
Work Experience



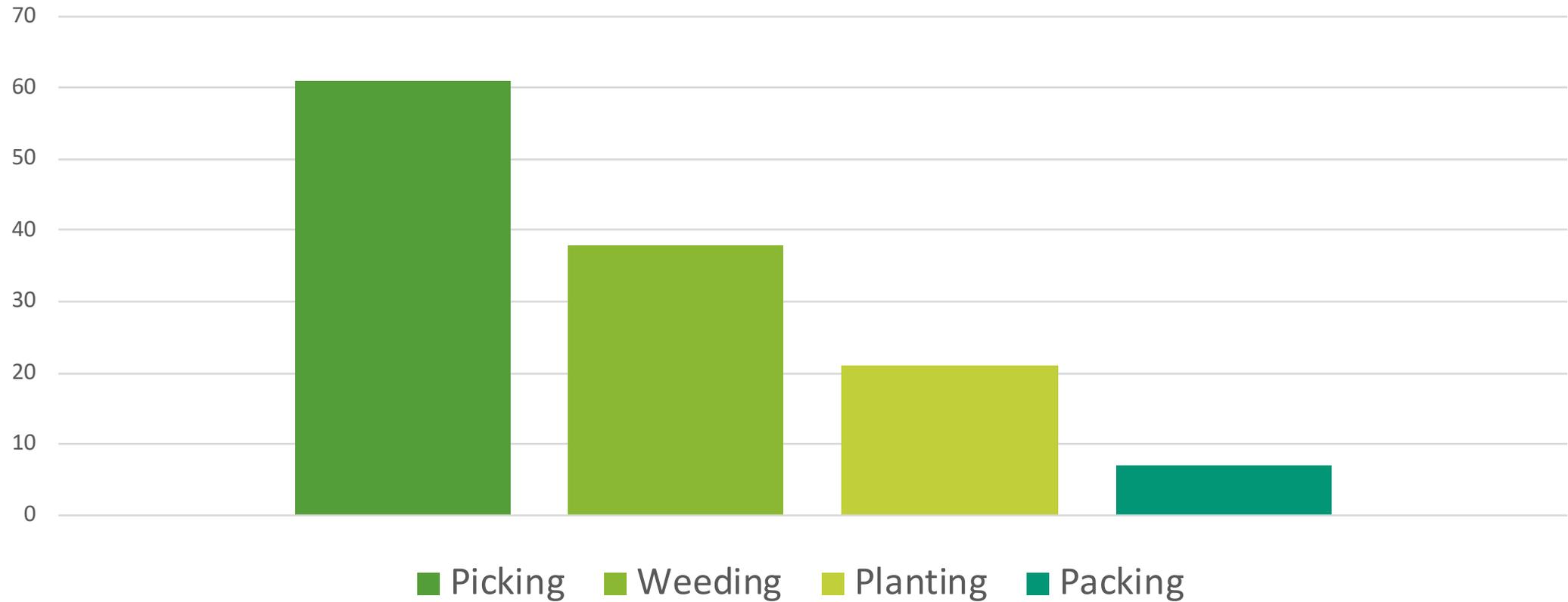
Common Crops Worked in Last Week



Payment Type for Work Performed



Common Work Tasks in Last Week



HRI Knowledge and Practices

Acclimatization

- 58% started with a few hours of work and then increased workload
- 62% said they “always” or “usually” took breaks in the shade in the last week
- 88% said they were “very comfortable” taking a water break

Fluid Preferences

- 32% added something to water, like hydration salts
- 70% drank water every 30 minutes and 20% every hour
- Workers carried water bottles on belts or in pockets
- Reasons for not drinking water: 1) nausea 2) getting sick

- Water – 89%
- Gatorade – 64%
- Fruit juice – 27%
- Soda – 26%
- Energy drinks – 19%
- Coffee – 12%



Shade and Bathroom Concerns

- 19% said there was no toilet nearby
- 77% said shade under trees was available, but only 20% identified shade structures

HRI Adaptive Practices

Heat Stress Prevention

- 66% would drink more water
- 23% would change their work activities
- 23% would take rest breaks in the shade
- 21% would change work hours

Clothing Preferences

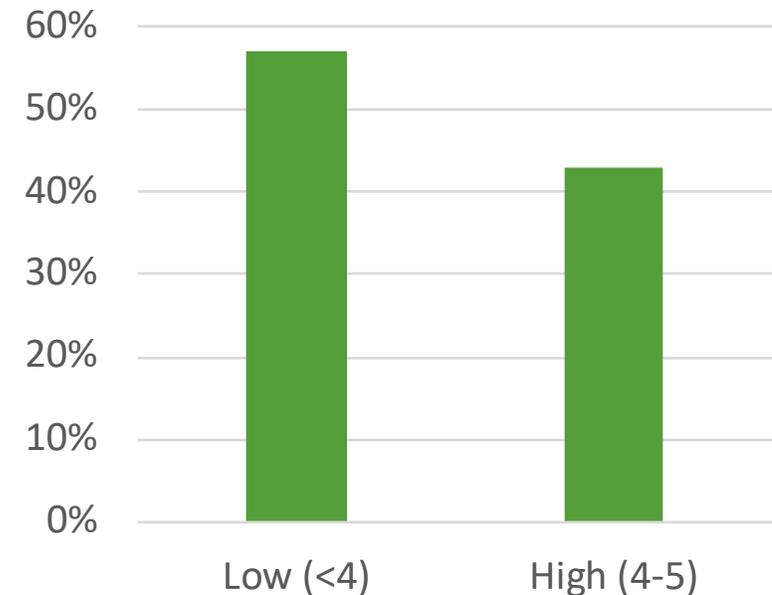
- Workers wore long-sleeved shirts and pants
- Workers wore hats and gloves
- 77% “rarely” or “never” wore sunglasses

Frequency of HRI

- 19% reported symptoms from working in the heat (e.g., headaches, heavy sweating, skin rash, dizziness, nausea)
- 15% reported receiving treatment for HRI



Heat Knowledge Score



Regression Results for Heat Safety Knowledge

Variable	<i>B</i>	<i>SE B</i>	p-value
Sex			
Female	-0.79	0.26	0.0035
Male	REF		
H-2A worker visa status			
Yes	-1.28	0.30	<0.0001
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		
<i>R</i> ²	.29		
<i>F</i>	4.98		

Discussion

- App is an easy-to-use tool for crew leaders to monitor weather data and check the heat index.
- Recent study comparing weather station data with micro-environmental data in Florida recommends the OSHA app as a reliable method (Mac et al. JOEM 2018).
- Primary finding: farmworkers who were female, had H-2A visa status, and were “a little concerned” compared to “very concerned” about working in the heat were more likely to score **lower** on the heat safety knowledge questions.
- H-2A visa holders may be new to farmwork and have less training or experience.
- Stoecklin-Marois et al. (2013) also reported women scored lower on heat safety knowledge than men.



Recommendations



Training

- Offer annual HRI prevention training for farmworkers and supervisors, including downloading heat safety tool.
- Train workers to be able to monitor themselves and to notify supervisor for help.

Monitoring

- Provide recommendations related to HRI recognition and corrective action to reduce heat stress.
- Monitor weather conditions to protect workers from HRI using the heat safety tool app.
- Monitor workers at breaks (and mandate breaks!) and during work for low-severity signs.

Emergencies

- Require emergency medical help resources be available for workers having difficulty with HRI, especially on the hottest days of the summer.

Acknowledgements

“A society will be judged on the basis of how it treats its weakest members.”

- Pope John Paul II

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Study Staff	Collaborators
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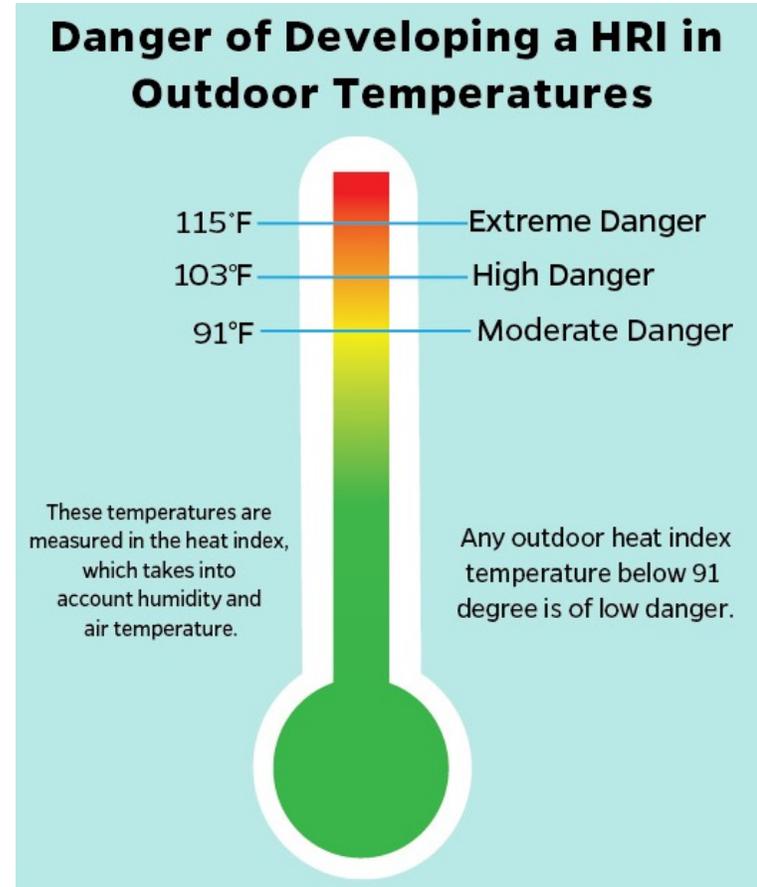
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Heat-related Illness (HRI) in Agriculture: Research findings and educational resources to help prevent HRI

The Problem

- From 2007-2011 in southeastern US:
 - 8,315 occupational HRI Emergency Department admissions*
 - 1,051 occupational HRI hospital admissions*
 - Approximately 16% from workers in crop agriculture*
 - 20x increase in risk of heat-related mortality as compared with other occupational groups*

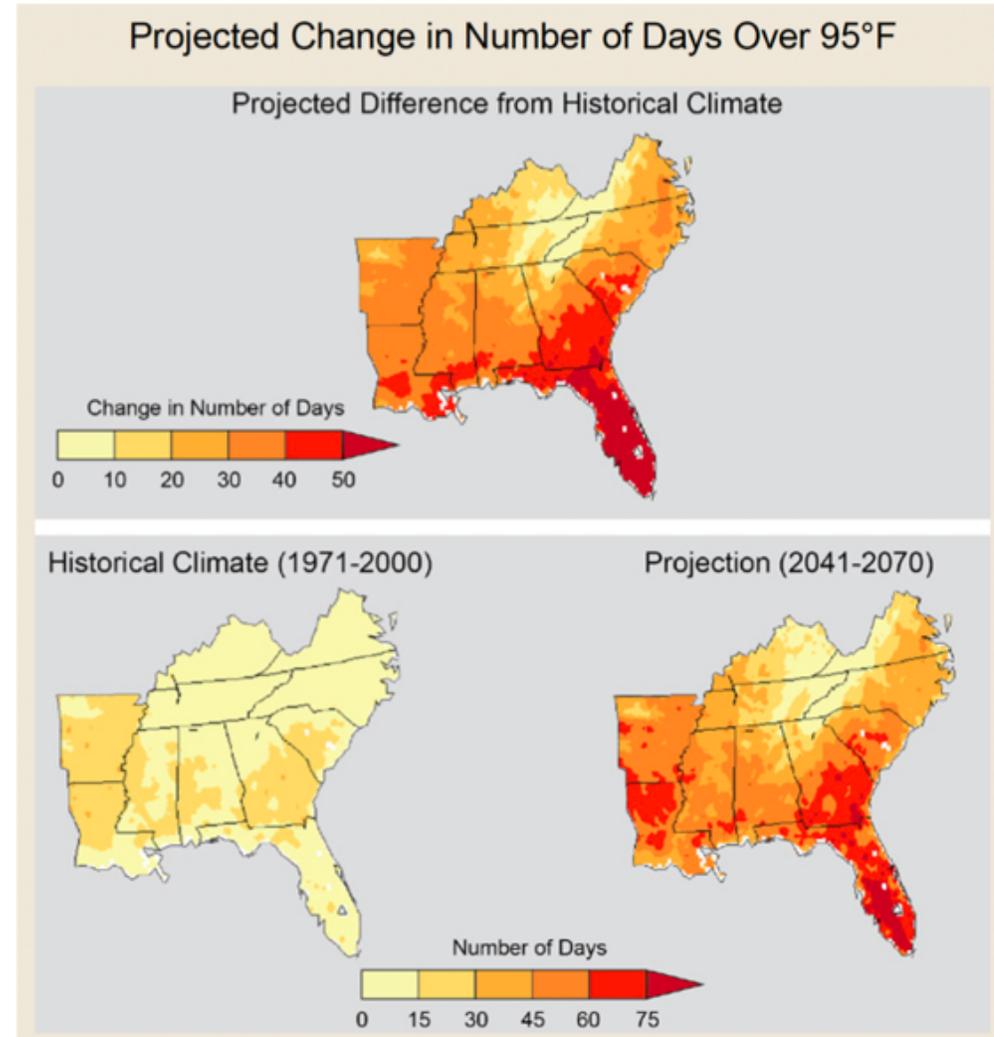


* L Harduar Morano, TL Bunn, M Lackovic, et al. (2015)

The Problem

And it's getting hotter

- Good evidence for heat stress as a contributor to acute injury and accidents.
- May contribute to productivity loss, absenteeism, and quality loss.
- #1 occupational health concern in SCCAHS needs assessment.



From Carter et al. (2014)-CH17; NCA2014

Heat-Related Illness: State of the Science St. Petersburg, FL, October 25-26, 2018

**STATE OF THE
SCIENCE
MEETING**
OCTOBER 25-26 • ST. PETERSBURG, FLORIDA

HEAR FROM A SLATE OF ESTEEMED PRESENTERS ON THE TOPIC OF HEAT RELATED ILLNESS, SHOWCASING RESEARCH AT THE INTERSECTIONS OF HEAT RELATED ILLNESS AND CLIMATE CHANGE.



Heat-Related Illness: State of the Science

St. Petersburg, FL, October 25-26, 2018

Speakers

- **Occupational Heat Stress Exposure, Assessment: Limits on Sustainable Exposures**
 - Dr. Thomas Bernard, Professor, College of Public Health, and Sunshine Education and Research Center (ERC), University of South Florida
- **Acclimatization, Decay, and Re-Acclimatization**
 - Dr. Candi Ashley, Professor, Exercise, Science, University of South Florida
- **Management & Return to Work/Activity Following Exertional Heat Illness**
 - Dr. Rebecca Lopez, Program Director, Athletic Training Professional Program, University of South Florida
- **Attending to Heat Illness & Pesticide Exposure among Farmworkers: Results from an Attention Placebo-Controlled Design**
 - Dr. Joseph Grzywacz, Chair, College of Human Sciences, Florida State University
- **The Girasoles (Sunflower) Study: Exploring the Physiologic Heat Stress Response**
 - Dr. Linda McCauley, Dean, School of Nursing, Emory University
- **Heat Illness Prevention in Athletes**
 - Dr. Eric Coris, Director, Primary Care sports Medicine, University of South Florida
- **Heat Related Illness in a Changing Climate and Demography of Florida**
 - Dr. Vasubandhu Misra, Professor, Earth, Ocean, and Atmospheric Sciences, Florida State University
- **Exertional Heat Illness: Physiology, Pathology, and Modifying Factors**
 - Dr. Michael Sawka, Professor, Biological Sciences, Georgia Tech University

Basic Themes

- Current and future climates
- Outdoor (including farmworkers) experience high levels of heat strain and heat-related illness
- Implications of exposure assessments
- Acclimatization
- Management, training and emergency response
- Directions for future efforts

Two Recommendations

- Provide training on signs and symptoms of heat disorders, and on protective practices.
- Have an emergency response plan.
 - Early recognition of heat stroke
 - Immediate, rapid, aggressive cooling
 - Emergency transport to emergency room



Directions for Future Efforts

- Interventions developed for occupations such as military and athletics have limitations in agricultural settings (safety regulations and cost).
- Training and education may be first mitigation strategy.
- SOS meeting approach was effective way to better understand the mechanisms and evaluation of HRI.



Educational Resources from SCCAHS

- State of the Science white paper
- Heat-related illness magazine insert
- Heat-related illness issue guide (English and Spanish)
- Heat-related illness informational video (English and Spanish)
- Recorded webinars on the topic of heat-related illness

State of the Science White Paper



STATE OF THE SCIENCE MEETING

State of the Science White Paper: Interdisciplinary Perspectives on Heat Related Illness Prevention

Southeastern Coastal Center for Agricultural Health and Safety

Rachel Claire Mitchell, Tracy A. Irani, Farah A. Arosemena, Thomas E. Bernard, Joseph G. Grzywacz, Linda A. McCauley, Valerie Mac, Eric Coris, Rebecca M. Lopez, Candi D. Ashley, Michael N. Sawka, Vasubandhu Misra, Beatrice Pierre, and J. Glenn Morris

March 14, 2019



Executive Summary

Background

Between 2000-2010, 28.6% of deaths due to heat related illness (HRI) in occupational settings occurred in six states in the Southeast. HRI is and will continue to be a major issue affecting outdoor workers. Climate models predict a 2.2°F (1.2°C) rise in temperatures in the continental United States, and that the number of days per year that achieve temperatures above 95 degrees will increase in Florida and the Southeast from 15 days per year from 1971-2000, to over 75 days per year 2041-2070. Additionally, HRI will take a toll on industry in the Southeast, with annual losses in productivity equivalent to \$47 billion predicted by 2090. There is a need for collaborative, multi-disciplinary research to protect worker health and mitigate productivity losses in outdoor industries. The issue of HRI among outdoor workers, including agricultural workers, athletes, and military personnel, will continue to become more prominent. Farmworkers are particularly vulnerable, and are 20 more times more at risk of death due to HRI than other American workers. Farmworkers work long hours outdoors, are paid based on productivity rather than hourly wages, and have low political capital and fewer worker protections than many sectors of the US workforce. There is therefore a need for collaborative, multi-disciplinary research and education approach to protect worker health and mitigate productivity losses in outdoor industries.



Meeting Summary

To address this need, the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) organized the HRI State of the Science meeting, held October 25-26, 2018. The meeting was held in St. Petersburg, Florida. The focus of the meeting was to bring together a slate of eight esteemed presenters on this topic, showcasing research at the intersections of heat related illness and climate as they relate to the health and safety of outdoor workers and farmworkers, as well as athletes and military personnel. This crosscutting, one day meeting brought together researchers from various fields to present current findings and begin the process of developing future research collaborations on this topic. Meeting attendees represented four universities, federal agencies, medical institutions, and consulting organizations.

Key Findings

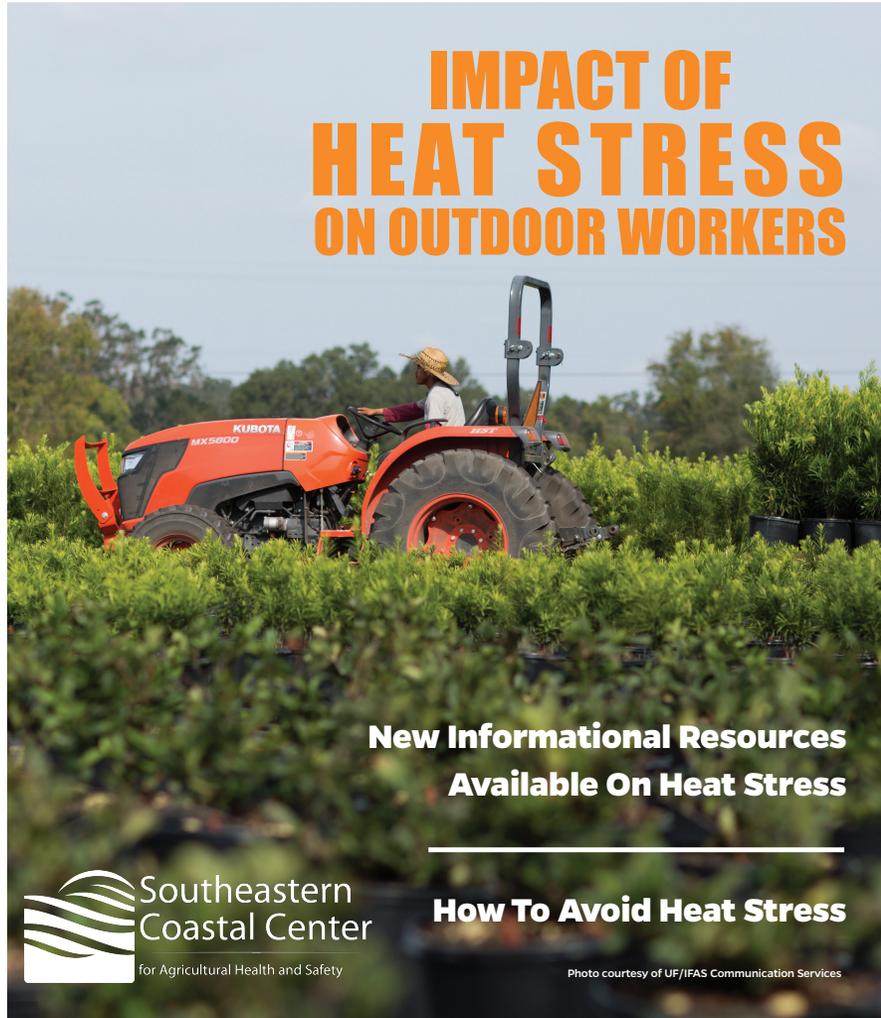
Preventing HRI

The responsibility for preventing HRI lies both with organizations that employ workers, as well as with workers themselves. Many risk factors can be mitigated on both the organizational and individual level to decrease worker susceptibility to HRI.

Organizational Level

On the organizational level, employers can provide appropriate acclimatization periods, work to rest ratio, access to fluid and rehydration, and recognize, treat and manage HRI. Acclimatization refers to the period of time needed for the body to adjust to working in the heat. According to National Institute of Occupational Safety and

Heat-Related Illness Magazine Insert



IMPACT OF HEAT STRESS ON OUTDOOR WORKERS

**New Informational Resources
Available On Heat Stress**

How To Avoid Heat Stress

 **Southeastern
Coastal Center**
for Agricultural Health and Safety

Photo courtesy of UF/IFAS Communication Services

HEAT STRESS AS A TOP OCCUPATIONAL HEALTH CONCERN FOR THE AGRICULTURAL INDUSTRY

The risk of heat-related death is 35 times more likely for agricultural workers than for any other occupational group.

Agricultural industry leaders in the Southeast ranked heat stress as their No. 1 occupational health concern, according to the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS).

Heat stress is common among outdoor workers and particularly among workers who plant and harvest agricultural crops. Approximately 16 percent of occupational heat-related deaths are among workers in crop agriculture. In addition to being fatal, heat stress may also contribute to loss of productivity, worker absenteeism and decline in quality of work.

SCCAHS is part of a Centers for Disease Control and Prevention (CDC) / National Institute for Occupational Safety and Health (NIOSH) Agricultural Health and Safety Initiative and is working to inform agricultural workers of the risks associated with heat stress and how to prevent heat-related illnesses.

The center recently brought together a slate of esteemed speakers on the topic of heat-related illness,

showcasing research at the intersections of heat-related illness and climate change as it relates to the health and safety of outdoor workers and farmworkers, as well as athletes and military personnel. This crosscutting meeting brought together researchers from various fields to present current findings and pave the way for developing future research collaborations on these topics.

Researchers indicated that death from heat-related illness is 100 percent preventable when aggressive cooling takes place. Deaths from heat-related illness occur because of misdiagnoses, lack of care, delay of care, and immediate transport before cooling.

Three of the most common types of heat-related illness are heat cramps, heat exhaustion and heat stroke. Symptoms of **heat cramps** include muscle cramping, pain, thirst, sweating or fatigue. Symptoms of **heat exhaustion** include fainting; heavy sweating; cold clammy skin; or fast, weak pulse. Symptoms of **heat stroke** include body temperatures over 103 degrees; confusion; fast, strong pulse; or hot, red, dry or damp skin.

As temperatures rise, the risk of developing a heat-

3 WAYS TO AVOID HEAT STRESS

1. Workers should be allowed a 5-6 day acclimation period when they begin working in the heat.
2. Outdoor workers should consume about one quart, or approximately two bottles, of water every hour.
3. Workers should be encouraged to drink smaller amounts of water every 20 minutes.



Heat-Related Illness Issue Guide

WHAT RESEARCHERS KNOW ABOUT HEAT-RELATED ILLNESS

The Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) brought together scientists from the University of Florida, Florida State University, University of South Florida, Emory University, and Georgia Tech University for the inaugural Heat-Related Illness State of the Science Meeting in St. Petersburg, Florida, on October 25-26, 2018. The SCCAHS addresses occupational safety and health needs related to agriculture, fishing and forestry in Florida, Georgia, Alabama, Mississippi, South Carolina, North Carolina, Puerto Rico, and the Virgin Islands.

Heat-related illness

The Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) recently brought together a slate of esteemed speakers on the topic of heat-related illness, showcasing research at the intersections of heat-related illness and climate change as it relates to the health and safety of outdoor workers and farmworkers, as well as athletes and military personnel. This crosscutting meeting brought together researchers from various fields to present current findings and pave the way for developing future research collaborations on these topics.

Death from heat-related illness is 100 percent preventable when aggressive cooling takes place. Deaths from heat-related illness occur because of misdiagnoses, lack of care, delay of care, and immediate transport before cooling. Three of the most common types of heat-related illness are heat cramps, heat exhaustion and heat strokes. Symptoms of heat cramps include muscle cramping, pain, thirst, sweating or fatigue. Symptoms of heat exhaustion include fainting, heavy sweating, cold clammy skin or fast weak pulse. Symptoms of heat stroke include body temperatures over 103 degrees; confusion; fast, strong pulse; or hot, red, dry or damp skin. Heat-related illness is the third-leading cause of death among high school athletes.

DEATH FROM
HRI IS **100%**
PREVENTABLE
WHEN AGGRESSIVE COOLING TAKES PLACE

TYPES OF HRI
**CRAMPS
EXHAUSTION
STROKE**

HEAT-RELATED
ILLNESS IS THE
THIRD-LEADING
CAUSE OF DEATH
AMONG HIGH
SCHOOL ATHLETES

QUE SABEN LOS INVESTIGADORES ACERCA DE ENFERMEDADES RELACIONADAS CON EL CALOR

El Centro Costero Sudeste para Salud y Seguridad Agraria (CCSSSA) ha reunido científicos de la Universidad de Florida, Universidad Estatal de Florida, la Universidad del Sur de Florida, la Universidad Emory, y la Universidad Tecnológica de Georgia, para la reunión inaugural del estado de la ciencia de enfermedades relacionadas al calor, en St. Petersburg, Florida, el 25-26 de octubre de 2018. El CCSSSA aborda la seguridad ocupacional y las necesidades de salud relacionadas con la agricultura, la pesca, y la silvicultura en Florida, Georgia, Alabama, Mississippi, Carolina del Sur, Carolina del Norte, Puerto Rico, y las Islas Vírgenes.

Enfermedades relacionadas al calor

El Centro Costero Sudeste para Salud y Seguridad Agraria (CCSSSA) recientemente reunió una lista de oradores respetados sobre el tema de las enfermedades relacionadas al calor (ERC), trabajando en investigación relacionada con la interacción entre ERC y el cambio climático, y su relación con la seguridad de los trabajadores agrícolas, así como la de los atletas y el personal militar. Esta reunión transversal reunió investigadores de varios campos para presentar los descubrimientos actuales y crear el camino para el desarrollo de la investigación y la colaboración para estos temas en un futuro.

Las muertes por ERC son 100 por ciento prevenibles cuando tiene lugar un enfriamiento agresivo. Las muertes por ERC ocurren por errores en el diagnóstico, falta de cuidado, demora en el cuidado y transporte inmediato sin previo enfriamiento. Tres de los más comunes tipos de ERC son calambres por calor, agotamiento por calor y golpes de calor. Síntomas de los calambres por calor incluyen calambres musculares, dolor, sed, sudor o fatiga. Los síntomas del agotamiento por calor incluyen fatiga, mucho sudor, piel fría húmeda y pegajosa, o pulso débil y rápido. Los síntomas del golpe de calor incluyen temperaturas del cuerpo sobre los 103 grados (39.5 grados centígrados), confusión; pulso rápido y fuerte; o piel enrojecida, caliente y seca o húmeda.

LAS MUERTES POR
ENFERMEDADES
RELACIONADAS AL CALOR
SON **100%** PREVENIBLES
CUANDO TIENE LUGAR ENFRIAMIENTO AGRESIVO

TIPOS DE ERC
**CALAMBRES
AGOTAMIENTO
GOLPES DE CALOR**

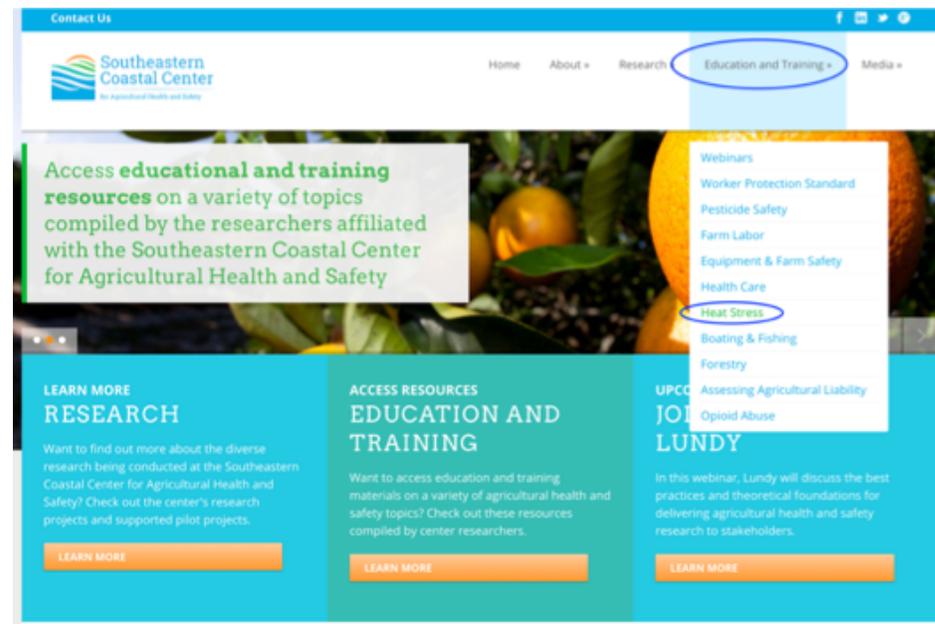
LAS ENFERMEDADES
RELACIONADAS AL
CALOR SON LA
TERCERA-CAUSA DE
MIERTE ENTRE
ATHLETAS EN LA
ESCUELA SECUNDARIA

Heat-Related Illness Informational Video

- English: <https://www.youtube.com/watch?v=iRFqDLWlunc>
- Spanish: <https://www.youtube.com/watch?v=T314mUhu-7g&t=24s>

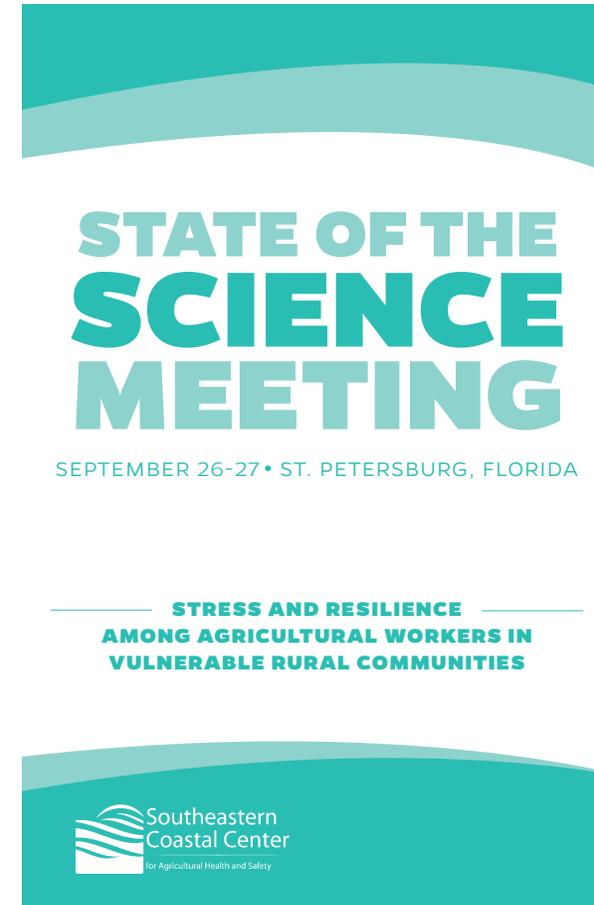
Educational Resources from SCCAHS

- All resources can be found at <http://www.sccaahs.org/index.php/ag-health-safety-topics/heat-stress/>
 - *Or*, visit **sccaahs.org**, hover mouse over **Education and Training** in menu bar, and click **Heat Stress**.



2019 State of the Science Meeting

- Stress and resilience among agricultural workers in vulnerable rural communities
 - Mental health stressors in agricultural workers and communities
 - Mental health stressors affecting vulnerable communities
 - Community and individual resiliency today





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Questions?