2020/2021 Annual Report

Southeastern Coastal Center for Agricultural Health and Safety

For More Information

Contact the Southeastern Coastal Center for Agricultural Health and Safety at http://sccahs.org

Suggested Citation

Southeastern Coastal Center for Agricultural Health and Safety. (2021). *2020/2021 Annual Report*. *SCCAHS2018-05*. Gainesville, FL: University of Florida/Southeastern Coastal Center for Agricultural Health and Safety.

Funding

This document was supported by the Grant No. 5 U54OH011230-05-00, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services. The entire cost of the development and publication of this document was financed with federal funds. This document was prepared with support from the $10 million CDC/National Institute for Occupational Safety and Health (NIOSH) grant, which funds the Southeastern Coastal Center for Agricultural Health and Safety (sccahs.org).

Contents

Section I – Who We Are

Center Summary

The **Southeastern Coastal Center for Agricultural Health and Safety** (SCCAHS) explores and addresses the occupational safety and health needs of people working in agriculture, fishing, and forestry in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Puerto Rico, and the U.S. Virgin Islands. The University of Florida is the lead institution of this center, partnering with the University of South Florida (USF), Florida State University (FSU), Florida A&M University (FAMU), Georgia Southern University (GSU), Emory University, and the University of the Virgin Islands. These universities are working together on a range of interdisciplinary research and educational projects designed to promote occupational health and safety among the 240,000 farms — estimated by U.S. Department of Agriculture — to be operating in the region, their operators, families, employees, and contractors, as well as those in the forestry and fishery industries.

Our Focus Areas

- Coastal fishery worker safety and health
- Heat stress and related illness
- Pesticide/herbicide exposure
- Opioid epidemic impact on farming communities
- Disaster vulnerability of migrant and seasonal farmworkers
- Feasibility of using electronic health records to describe the health of migrant and seasonal farmworkers, inform research and measure impact of interventions.
- Geospatial Analysis of agricultural worker and fisher health: Partnering to map regional clinical indicators and neighborhood environments
- Development and implementation of training programs
- Innovative approaches to foster research to practice

Goals of the Center

- Provide occupational safety and health education and training to the agriculture, fishing, and forestry workforce.
- Bring evidence-based, safety and health programs, developed through the other NIOSH-funded agricultural centers into the southeastern coastal region.
- When appropriate, translate programs into Spanish, and assist in supporting multilingual training efforts throughout the region.
- Conduct research to practice projects focused on:
  - Evaluating whether safety and education materials produce changes in safety behaviors.
  - Documenting hazards and risks in fishery workers; testing training materials aimed at reducing injuries.
  - Utilizing remote sensing technology to map pesticide uses.
  - Looking at heat stress tolerance.
- Conduct further research and applied projects based on needs as they arise.

Key Personnel

Planning and Evaluation Core

Center Administration

J. Glenn Morris, Center Director
University of Florida, jgmorris@epi.ufl.edu

Andrew Kane, Deputy Director
University of Florida, kane@ufl.edu

Tara Sabo-Attwood, Senior Advisor
University of Florida, sabo@phhp.ufl.edu

Joan Flocks, Emerging Issues Program Director
University of Florida, flocks@law.ufl.edu

Farah A. Arosemena, SCCAHS Program Manager, Co-Director Pilot/Feasibility Program
University of Florida farah.arosemena@ufl.edu

Evaluation Program

Sebastian Galindo, Evaluation Program Director
University of Florida, sgalindo@ufl.edu

Glenn Israel, Co-Investigator
University of Florida, gdisrael@ufl.edu

David C. Diehl, Co-Investigator
University of Florida, dcdiehl@ufl.edu

Cassandra Ward, Evaluation Coordinator
University of Florida, misscassw@ufl.edu

Haaris Saqib, Graduate Research Assistant
University of Florida, hsaqib@ufl.edu

Outreach Core

Tracy Irani, Outreach Core Director
University of Florida, irani@ufl.edu

Ricky Telg, Public Issues Education (PIE) Director
University of Florida, rwtelg@ufl.edu

Ashley McLeod-Morin, Director of Communications
University of Florida, ashleynmcleod@ufl.edu

Angela Lindsey, Co-Investigator
University of Florida, ablindsey@ufl.edu

Lisa Lundy, Co-Investigator
University of Florida, lisalundy@ufl.edu

Martie Gillen, Co-Investigator
University of Florida, mgillen@ufl.edu

Key Personnel

Research Core

Occupational Health and Safety Surveillance of Gulf Seafood Workers
Andrew Kane, Research Project PI
University of Florida, kane@ufl.edu

Melvin Myers, Consultant
Emory University, melvinmyers@charter.net

Robert Durborow, Consultant
Kentucky State University, durburow@kysu.edu

Extent of Agricultural Pesticide Applications in Florida Using Best Practices
Gregory Glass, Research Project PI.
University of Florida, gglass@ufl.edu

Jane Southworth, Co-Investigator
University of Florida, jsouthwo@geog.ufl.edu

PISCA: Pesticide & Heat Stress Education for Latino Farmworkers That is Culturally Appropriate
Joseph Grzywacz, Research Project PI
Florida State University, jgrzywacz@fsu.edu

Antonio Tovar-Aguilar, Co-PI
Farmworkers Association of Florida, tonytovar@hotmail.com

Melinda Gonzales-Backen, Co-Investigator
Florida State University, mgonzalesbacken@fsu.edu

Thomas Bernard, Consultant
University of South Florida, tbernard@health.usf.edu

Heat Stress and Biomarkers of Renal Disease
Linda McCauley, Research Project PI
Emory University, linda.mccauley@emory.edu

Vicki Hertzberg, Co-Investigator
Emory University, vhertzb@emory.edu

Valerie Mac, Co-Investigator
Emory University, valerie.mac@emory.edu

Using Social Marketing to Prevent HRI and Improve Productivity Among Farmworkers
Paul Monaghan, Research Project PI
University of Florida, paulf@ufl.edu

Fritz Roka, Co-Investigator
Florida Gulf Coast University, froka@fgcu.edu

Maria Morera, Co-Investigator
University of Florida, mmorera@ufl.edu

Key Personnel

Research Core

Agricultural chemical exposure impact on kidney function in farmworkers

Christopher Vulpe, Research Project PI
University of Florida, cvulpe@ufl.edu

Nancy D. Denslow, Co-Investigator
University of Florida, ndenslow@ufl.edu

Stephen Roberts, Co-Investigator
University of Florida, smroberts@ufl.edu

Pilot/Feasibility Program

Pilot study of the acute psychological and health impacts of Hurricane Irma in UFAS extension workers

Lynn Grattan, Pilot Project PI
University of Maryland, LGrattan@som.umaryland.edu

Uncovering patterns of mental, physical, and occupational health issues among migrant farmworkers with different socio-cultural networks: A pilot study among Haitian and Mexican farm workers in Immokalee, FL

Gülcan Önel, Pilot Project PI
University of Florida, gulcan.onel@ufl.edu

Chronic low back pain in seafood workers: a pilot intervention study to identify modifiable work and movement solutions

Kim Dunleavy, Pilot Project PI
University of Florida, kdunleavy@phhp.ufl.edu

Pilot study of mobile app monitoring to prevent heat-related symptoms among Hispanic farmworkers

Juan Luque, Pilot Project PI
Florida A&M University, john.luque@famu.edu

Understanding the scope of the opioid epidemic for agricultural industries

Heidi Radunovich, Pilot Project PI
University of Florida, hliss@ufl.edu

A novel approach (sweat patches) to monitoring pesticide exposure in farmworkers

Gregg Stanwood, Pilot Project PI
Florida State University, gregg.stanwood@med.fsu.edu

Agro-ecological practices in the face of climate change: Resilience, sustainability, and preparedness in Puerto Rico

Antonio Tovar-Aguilar, Pilot Project PI
University of Florida, atovar@ufl.edu

Key Personnel

Pilot/Feasibility Program

Field evaluation of N95 filtering facepiece respirators against airborne dust and microorganisms during cotton harvest
Atin Adhikari, Pilot Project PI
Georgia Southern University, aadhikari@georgiasouthern.edu

A pilot study to assess personal PM2.5 exposure and respiratory virus Infections among farmworkers in the Southeast
Eric Coker, Pilot Project PI
University of Florida, eric.coker@phhp.ufl.edu

Developing an integrated decision support tool and network for WPS respirator compliance in Florida agricultural industries
Maria Morera, Pilot Project PI
University of Florida, mmorera@ufl.edu

Exploring mental health and natural disasters in agricultural communities in Puerto Rico
Marysel Pagán-Santana, Pilot Project PI
Migrant Clinicians Network, mpagan@migrantclinician.org

Section II – Planning and Evaluation Core

Administration

Overview

Led by Dr. J. Glenn Morris, Administration manages the overall activities of the Center to ensure the administrative structure (Figure 1) works synergistically to accomplish the following, 1) the coordination and integration of the Core Center grant components and activities; 2) oversight of the utilization of funds, including funds for pilot and feasibility studies; and 3) support active interaction among the Director, Core leaders, research project Principal Investigators, relevant institutional Division of Sponsored Programs personnel and the CDC/NIOSH Program Officer/Grants Management Specialist.

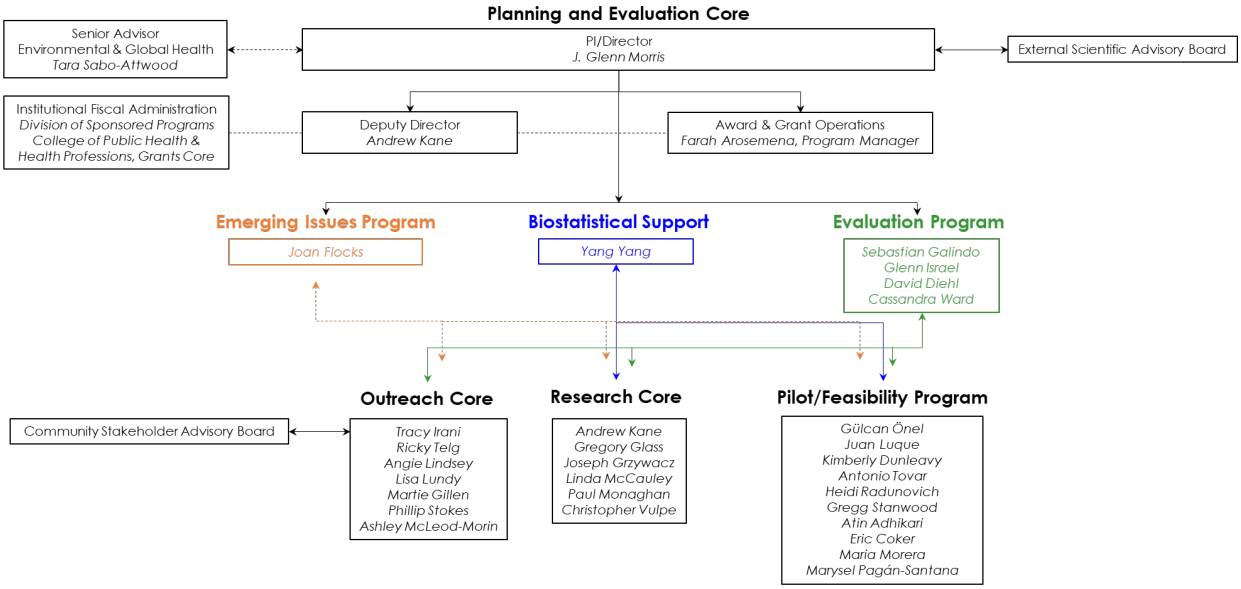


FIGURE 1. Organizational Chart, Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS)

Key Accomplishments in 2020-2021

Throughout Year 5, Administration provided project coordination for faculty/staff to manage their programs and research studies – guiding decisions and allocating resources where most strategically needed. The administration component of the Planning and Evaluation Core fulfills many organizational objectives, bringing together internal collaborators, such as biostatisticians, data managers/analysts, evaluation/content area specialists, budget management and information technology, with external collaborators who include study investigators, pilot awardees, and advisory board members.

The roles of data management, analysis, and administration were reviewed during the monthly IOC meetings and bi-quarterly PI-to-PI/Program Director meetings, specifically in monitoring the quality of the data and adherence to study protocols and procedures, standard and ad hoc reporting, and working with biostatisticians to generate analysis data sets as Research Core and Pilot projects matured.

2021 – 2022 Supplement: Year 5 Extended

A prospective gap year became a rising concern in Years 4 and 5, as a late release of the 2021 U54 Ag Center funding opportunity announcement was expected; delaying the competitive renewal earliest anticipated start date to 2022. Once the NIOSH solution for a supplement was apportioned, the SCCAHS team mobilized to create opportunities that would best merge with the vision for a renewed 5-year cycle. A new collaborative and coordinated approach that the Internal Operating Committee prioritized was a focus on surveillance. Two projects were designed that targeted electronic health records and waste-water based epidemiology. The projects developed for the Year 5 extended supplement are expected to provide a stronger baseline profile of the state of farmworker and fisher health so that we can improve on impact evaluation and better design activities and projects that have the greater potential to lead to the prevention of injury and disease.

Although projects in the Research Core offer active, population-based surveillance, Administration is exploring the geographic distribution of chronic disease/injury and associated cultural, occupational, environmental health and built-environment factors of Florida farmworkers. Establishing a surveillance program that partners with UFs One Florida, Federally Qualified Health Centers (FQHCs) and the Florida Department of Health will facilitate the preliminary collection of EHR data to a centralized data repository. The data collected will help investigators and the Community Stakeholder Advisory Board identify priority areas of concern and innervate the selection criteria for the pilot/feasibility program and the renewal application.

- Developed renewal electronic health records (EHR) surveillance opportunities with William Hogan, MD, MS, Director of Biomedical Informatics, Clinical Translation Science Institute. Dr. Hogan will work with the Center and participating Federally Qualified Health Centers to embed EHR from farmworkers and fishers into the UF Health Integrated Data Repository (IDR), a large-scale database that collects and organizes information from across UF Health's clinical and broader research enterprises. The IDR will enable the Center to identify the state of the health of Southeast U.S. farmworkers and fishers and support stronger measurement of health impact from Ag Center interventions implemented.

- Developed renewal wastewater-based epidemiology (WBE) surveillance approaches with Tara Sabo-Attwood, PhD, SCCAHS Senior Advisor and Chair/Professor of Global Environmental Health. WBE is a rapid and cost-effective technique that measures human metabolic excretion products in wastewater as indicators of the health of a population. This tool provides near real-time information on a community scale about health, lifestyle behaviors and wellness without the need for individualized testing/monitoring. This approach has been successfully used to determine population level exposures to chemicals of concern (i.e. pesticides, metals), mental health (i.e. suicide mortality, depression), antibiotic resistance, and pathogen transmission. WBE has also been applied to estimate illicit drug consumption that include drug targets of common concern (i.e. cocaine, amphetamine, hydrocodone) and the emergence of new psychoactive substances. Measuring biological products that are excreted into sewer systems as a measure of 'health' has several advantages over routine public health/epidemiology methods and approaches, such as surveys; (1) wastewater analysis is not subject to response/non-response bias; (2) trends can be determined over short time frames and therefore can serve as an early warning or hot spot locator; (3) identification of true drugs of pathogens are determined by molecular approaches rather than recollection/belief; (3) contemporary non-targeted chemistry approaches can identify new emerging drugs; It is important to note that comparing data obtained from WBE with data obtained through other indicators (i.e. surveys, medical records) is an important area of continued work.

Surveillance

The Center has made surveillance a priority in Year 5 and is laying the foundation to have a stronger baseline profile of the state of farmworker and fisher health so that we can improve on impact evaluation and better design activities and projects that have the greater potential to lead to the prevention of injury and disease. Although projects in the Research Core offer active, population-based surveillance, the Center is exploring the geographic distribution of chronic disease/injury and associated cultural, occupational, environmental health and built-environment factors of Florida farmworkers. Establishing a surveillance program that partners with UFs One Florida, the Florida Department of Health and Federally Qualified Health Centers will help support outreach, the pilot/feasibility program and the renewal application to identify and examine emerging patterns in agricultural/fisher worker health. Ongoing activities include,

- Florida state-wide data repository of farmworker housing sites and inspection results.
- Mapping farmworker housing sites with built environment factors and Florida Department of Health inspection report variables for a more comprehensive view of health risk/vulnerability of agricultural workers who reside in employer-owned housing.
- Systematic review of literature to identify promising interventions (addressing built-environment) that strengthen public health recovery and adaptation based on the most current evidence.
- Submitted a proposal to the National Center for Farmworker Health to rapidly leverage the Center and our Southeast network partnerships with regional non-profit, community-based organizations, as well as national organizations, to co-develop and disseminate educational material and embed a surveillance component to measure the prevalence of antibodies to SARS-CoV-2 among farmworkers.

Covid-19 Pandemic

COVID-19 continued to have an impact on Center activities into Year 5. Although research activities were given a greenlight to restart by October 2020. Studies were not able to regain momentum until after December 2020 when the COVID-19 vaccine began to roll out. Outreach activities remained focused on education and health promotion for vaccine uptake and evaluation created opportunities with Center's nationwide to explore the impact of COVID on extension agents.

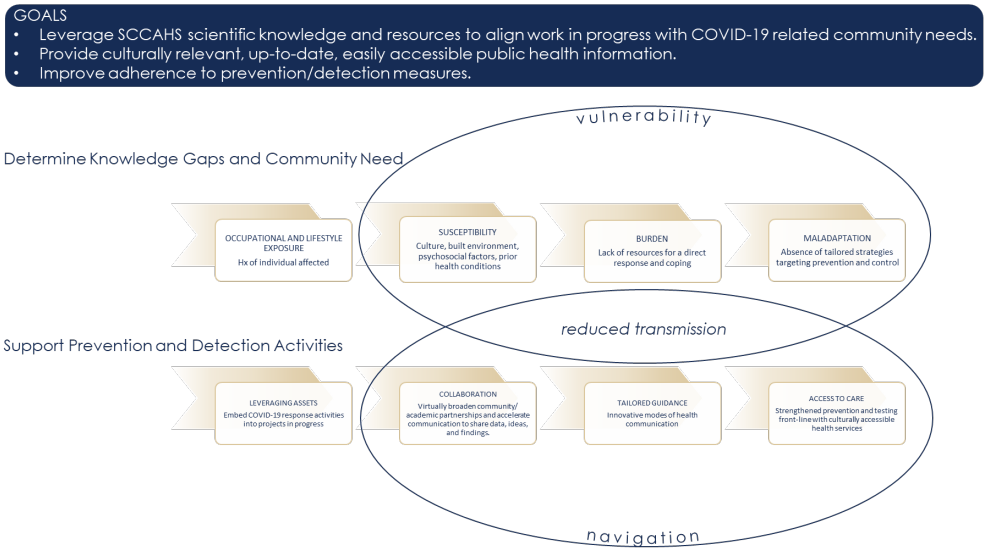


Figure 2. Adaptations to facilitate essential action: Implemented strategies to mitigate the COVID-19 impact on SCCAHS

However, the CDC/NIOSH flexibilities allowed SCCAHS to mobilize and respond to the emerging needs of our Southeast communities. Throughout the crisis the Planning and Evaluation Core supported a Center-wide strategic plan (Figure 2) to partner and invest in activities to explore the differential burden experienced by farmworker/fisher communities and agricultural extension workers, create a repository of outreach materials to improve access to fundamental COVID-19 knowledge and prevention strategies, and to enhance testing of our Southeast underserved,

under-resourced populations. SCCAHS key personnel have played leadership roles in the response to better understand the 2019 Novel Coronavirus, have initiated research partnerships and have collaborated in the set-up of a high-volume testing facility for SARS CoV-2 that served as a base for testing and associated outreach programs in farmworker and fisher community settings.

Emerging Issues

Overview

The Emerging Issues Program (EIP) assists SCCAHS in addressing new, emerging and re-emerging problems within their region. EIP works within the center to maintain connections with all projects, cores, advisory boards and other stakeholders to identify, prioritize, and address issues that appear during the life of the center. The tasks of the EIP include: identifying new AgFF worker safety and health issues in the region; prioritizing these issues; addressing prioritized emerging issues through small investments; and referring other emerging issues to appropriate resources.

Key Accomplishments in 2020-2021

Effort during Year 4 reflects the specific aims as initially stated. The EIP continues to work within the Center, maintaining connections will all projects; cores; advisory boards; and other stakeholders to identify, prioritize, and address issues that appear during the life of the Center. The activities to date demonstrate progress within each of the program's four primary tasks.

Task 1. Identify new agriculture, forestry and fishing worker safety and health problems in the SCCAHS region.
Task 2. Prioritize emerging issues.
Task 3. Address prioritized emerging issues through small investments.
Task 4. Refer other emerging issues to appropriate resources.

Identify, Prioritize and Address Arising Concerns

The unique design of EIP allows SCCAHS to streamline the identification of new occupational health and safety issues, map their geographic/demographic span, assess the significance of the problem(s), and respond accordingly. EIP work coincides with the Pilot/Feasibility Program to target relevant, real-time need for research and encourage new investigators to apply for pilot funding to address emerging issues; contributes to the Outreach Core by promoting SCCAHS at meetings and conferences and participating in the development of materials; and, when necessary, rapidly funds programs to improve the health and well-being of disproportionately affected communities. In the past, examples of emerging issues identified and addressed by the program have included:

- Health status of temporary agricultural guest workers.
- Heat-related illness and kidney disease.
- Health impacts of sugarcane burning in Florida.
- Revised Worker Protection Standard respirator requirements.
- Domestic violence and reproductive health of farmworker women.
- Post-disaster housing and other needs in farmworker communities.

Joan Flocks, Director, plays an integral role in exploring critical community concerns. EIP is credited with providing a better understanding of the nature and cause of farmworker health disparities so that research PIs and the Outreach Core can work synergistically to address health and safety concerns. During Year 5 the COVID-19 pandemic EIP was able to utilize its critical groundwork to quickly reach regional at-risk and vulnerable farmworker/fisher populations. From April 2020 to the present, the EIP has worked with community-based, worker-focused

organizations in their efforts to respond to the impacts of COVID-19 and to build capacity around the disparate health impact the pandemic has had on these populations. EIP efforts have included organizing and sponsoring testing and vaccination initiatives; working with organizations to purchase and distribute personal protective equipment (PPE); developing culturally appropriate educational material; organizing informational sessions between medical experts and farmworkers; working with other Ag Centers on producing NIOSH guidance documents for the agricultural industry; presenting research on COVID-19 and farmworkers at professional conferences; and publishing research in professional journals.

Through collaborative efforts with EIP, SCCAHS was able to support the efforts of the following community partners during the COVID-19 pandemic:

Southeast Georgia Communities Project, Inc.
The Southeast Georgia Communities Project (SEGCP - https://segcp.org/) is located in 3 of the 4 poorest counties in Southeast Georgia with high concentrations of LatinX residents working mainly as agriculture workers. The mission of the organization is to serve these communities by promoting self-empowerment in the areas of health and education. Volunteers accomplish these goals by serving as liaisons and translators for workers; providing health education workshops; conducting outreach to help communities navigate social and medical services; and providing support services through a food pantry, clothing closet, utility and prescription assistance program, and transportation.

During the COVID-19 pandemic SCCAHS supported volunteers who distributed 1,500 bags containing COVID-19 information in English and Spanish, face masks, and hand sanitizer throughout four counties. Due to the easy spread of COVID, farmers frequently requested for SEGCP to work with liaison in charge of worker's needs to organize the dissemination of prevention and virus summary fact sheets and supplies.

Florida Institute for Community Studies, Inc.
The Florida Institute for Community Studies (FICS - https://www.ficsinc.org/) partners with communities across Florida to help them achieve their goals through research, education, training, social services, and the arts. During the COVID-19 pandemic, SCCAHS support FICS work in the Wimauma area of Hillsborough County, home to many of the county's farmworkers. FICS distributed disinfecting wipes, bleach, paper towels, hand sanitizer, baby wipes, garbage bags, laundry detergent, and 1,000 disposable masks, gloves at the La Estancia Apartment complex, which is designated farmworker housing. Additionally, FICS recognized the impact the pandemic had on farmworker children whose education had been disrupted. At the summer youth camp that FICS coordinates, the organization provided sanitizing cleaner for supplies; bilingual tutoring services; and personal school supply kits for each child receiving tutoring and learning supervision, including notebooks, reading logs, pencils, erasers, highlighters and pencil cases

Franklin's Promise Coalition
Franklin's Promise Coalition (https://franklinspromisecoalition.wildapricot.org/) is a group of organizations and individuals working together to address community issues in and around Franklin County of North Florida. The group sponsors a number of projects, including the Conservation Corps of the Forgotten Coasts, which has the broad goal of working with young people to positively impact their lives and their community. During the COVID-19 pandemic, SCCAHS supported Franklin's Promise as they deployed the Conservation Corps to respond to the crisis in their coastal community.

Hispanic Health Initiatives
Hispanic Health Initiatives (HHI - http://www.hhi2001.org/) is a 20+ year old nonprofit that addresses unmet health needs of Hispanics and other medically disadvantaged populations of Central Florida through the efforts of volunteers. It has a specific goal of educating these populations, so they are better able to make informed decisions about health, wellness, and care options. During the COVID -19 pandemic, SCCAHS provided emergency funding for HHI to conduct community outreach and distribute PPE to residents in Orange, Seminole, Osceola, and Volusia counties. HHI launched a grassroots Community Health Worker (CHW) COVID-19 awareness, education, outreach and prevention campaign during the month of June in Central Florida (Orange, Osceola, Seminole and Volusia Counties) to help the community understand the importance of following CDC's guidelines and protocols in an effort to encourage adherence. HHI also assembled "hygiene prep" bags containing: a digital thermometer, hand sanitizer, gloves, mask, and a package of tissues for CHWs to use as outreach tools to help explain the use of each item as it related to CDC's guidelines.

Farmworker Association of Florida, Inc. (FWAF)
The Farmworker Association of Florida (FWAF - https://floridafarmworkers.org/) was established in 1983 and is a community-based, non-profit with more than 10,000 Haitian, Hispanic, and African American members and five offices in the state of Florida. Their goal is to work with farmworkers by building power to respond to and gain control over the social, political, economic, workplace, health, and environmental justice issues that impact their lives. SCCAHS supported FWAF train-the-trainer events on pesticide exposure and heat-related illness that resulted in updating an original training program, instructing additional Community Health Workers on the program, and training 22 participants in workshops. SCCAHS also supported FWAF in training two university student assistants working on heat-related illness research projects about Community Based Participatory Research. During the COVID-19 pandemic, SCCAHS supported FWAF's production of culturally appropriate educational videos that provided farmworkers with information related to the virus and to vaccination efforts.

Rural Women's Health Project
The Rural Women's Health Project (RWHP - https://www.rwhp.org/) serves immigrant farmworkers and rural communities in North Florida by strengthening their understanding of critical health, occupational, and family issues. With support from SCCAHS, RWHP worked with Madres Sin Fronteras to conduct trainings for 24 farmworker women in the local area on domestic violence and reproductive health. During the COVID-19 pandemic, the RWHP provided and evaluated COVID-19 information in the form of audio, video, and print materials in various indigenous languages, including Spanish, Kiche, Mam, Mixteco Alto, and Q'anjob'al. Through a SCCAHS-facilitated collaboration with Walgreens, RWHP also hosted vaccination clinics for farmworker and rural communities in the North Florida area. At one vaccination event in Marion County, more than 100 horse farm workers were vaccinated.

Ancillary Project Funds

H-2A Temporary Agricultural Workers - EIP continues to research the impact of the significant increase of H-2A workers and a forthcoming manuscript, "Historical and Current Insights on Environmental Health and Agricultural Guestworkers" will be published in *Ecology Law Quarterly* later in 2021.

Heat-related Illness - EIP continues to promote SCCAHS extensive research on heat-related illness (HRI) among agricultural workers by supporting R2P efforts by SCCAHS researchers. In Year 5, EIP collaborated with SCCAHS and other investigators in applications for continued research in monitoring and intervention related to HRI. EIP continues to contribute to the literature in this area and consults regularly with ongoing HRI researchers affiliated with SCCAHS.

Publications and Presentations

Publications

Houser M, Mac V, Smith D, Chicas R, Xiuhtecutli N, **Flocks J,** Elon L, Gamez Tansey M, Sands J, McCauley L, Hertzberg V. "Inflammation-Related Factors Identified as Biomarkers of Dehydration and Subsequent Acute Kidney Injury in Agricultural Workers." *Biological Research for Nursing* 23:676-688, 2021.

Lauzardo M, Kovacevich N, Dennis A, Myers P, **Flocks J**, Morris J. "An Outbreak of COVID-19 Among H-2A Temporary Agricultural Workers." *American Journal of Public Health* 111:571-573, 2021.

Chicas R, Xiuhtecutli N, Dickman N, **Flocks J,** Scammell M, Steenland K, Hertzberg V, McCauley L. "Cooling Interventions Among Agricultural Workers: Qualitative Field-Based Study." *Hispanic Health Care International* 19:174-181, 2021.

Mac V, Elon L, Mix J, Tovar-Aguilar T, **Flocks J**, Economos E, Hertzberg V, McCauley L. "Risk Factors for Reaching Core Body Temperature Thresholds in Florida Agricultural Workers." *Journal of Occupational and Environmental Medicine* 63:395-402, 2021.

Mac V, Elon L, Smith D, Tovar-Aguilar T, Economos E, **Flocks J**, Hertzberg V, McCauley L. "A Modified Physiological Strain Index for Workplace-based Assessment of Heat Strain Experienced by Agricultural Workers." *American Journal of Industrial Medicine* 64:258-265, 2021.

Flocks J. "The Potential Impact of COVID-19 on H-2A Agricultural Workers." *Journal of Agromedicine* 25(4): 367-369, 2020.

Presentations

"An Overview of Farmworker Issues in a COVID Environment" *Presentation for Class XI of the Wedgworth Leadership Institute*, Gainesville, FL, August 17, 2021.

"Environmental Justice" *Florida Natural Resources Leadership Institute – Justice, Equity, Diversity, and Inclusion Discussion Series,* Online, June 17, 2021.

"Facing the Sun: Farmworkers and Heat Impacts" *University of Florida Institute of Food and Agricultural Sciences Extension Symposium*, Online, May 5, 2021.

"Essential Workers" (panel) with Claudia Polsky, Mike Wilson, Estella Cisneros, and Fernando Torres. *University of California Berkeley Environmental Law Quarterly Symposium*, Online, April 16, 2021.

"An Outbreak of COVID-19 among H-2A Temporary Agricultural Workers in Florida" (lightning talk) *Agricultural Safety and Health Council of America Safety Summit*, Online, March 22-24, 2021. https://www.accelevents.com/e/ASHCASafetySummit.

"Forgotten Essential Workers: How Farmworkers Face More Environmental Justice Issues Amidst the Pandemic" (panel) with Kent Pinkerton, Fernando Serrano, Guadalupe Luna, and Margarita Garcia. *University of California Davis School of Law Symposium*, Online, February 25, 2021.

"Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS)" *Environmental Protection Agency's Virtual Farmworker Community Visit*, Online, October 28, 2020.

Occupational Pesticide Exposure and Pregnancy Health in Vulnerable Workers" *Florida Local Section of the American Industrial Hygiene Association,* Online, October 16, 2020.

"Environmental Justice Panel" (panel) with C Zimring, T Thomas-Burton, and H Young. *Gators Going Green,* Online, October 8, 2020.

"Climate Change and Health: Understanding and Action" (panel) with JG Morris and L Chacos. *League of Woman Voters of Alachua County,* Online, August 26, 2020. https://www.facebook.com/watch/live/?extid=KsGIX3ufYDDYjjzZ&v=344960079868984&ref=watch_permalink

Evaluation Program

Overview

A formal monitoring and evaluation strategy is an interwoven component of SCCAHS. The Evaluation Program provides a framework for longitudinal, center-wide evaluations to assess the processes, outcomes, and impact of program and core activities; assists the leadership team in developing and implementing evaluation plans/logic models; and provides timely reporting as well as accountability information to the sponsoring agency.

The Evaluation Program aims to 1) Engage stakeholders to maintain a responsive and focused evaluation program; 2) Collect relevant monitoring and evaluation data from the center as a whole, the Outreach Core, and individual research projects; 3) Analyze and interpret data to establish the quality and effectiveness of the center as a whole, the Outreach Core, and the individual research projects; 4) Report and share evaluation findings and recommendations with key stakeholders; and 5) Maintain an open line of communication and engagement with other Ag Centers across the country.

The Evaluation Program provides leadership and guidance to connect program activities and goals for strengthened PI evaluation capacity and improved quality measurement. As research projects near completion and center efforts have reached the estimated point of producing intended outcomes, the evaluation program turned a significant portion of energy on assessing the impact of our Center during its first cycle to allow the evaluation team to have a better perspective of what has been produced since the Center's inception and develop materials that can provide an aerial view highlighting products, outcomes, and impact.

- The team joins the PI-to-PI/Director meetings to review ongoing work through the lens of each project's logic model – assisting PIs/Director's in connecting their short-term outcomes with broader long-term goals.

- The Evaluation Program continues to build a culture of evaluation that internally is broken down into simpler set of steps, beginning with brief indicator reporting forms that help guide the PI-to-PI meetings and externally links NIOSH Ag Centers core evaluation strategies.

- SCCAHS Impact Assessment: Developing a Common Evaluation Framework

- NIOSH: Heat Related Illness (HRI) Logic Model Development. The collaboration with NIOSH leaders and other Ag Centers to develop a cross-center logic model using contribution analysis as an approach to impact assessment

- Extension and Stakeholder COVID-19 Impact Evaluation

- Strategic planning is an ongoing Year 5 process that will expand the SCCAHS network, by identifying priorities and developing a feasible strategy to take the Center to its next level (from initiation/development to establishment and consolidation). This includes building strategic relationships and collaborations with other universities, organizations, and professionals in agricultural health and safety.

Key Accomplishments in 2010-2021

Monitoring

The evaluation program met with the Outreach core monthly to share updates, work in partnership on research initiatives and activities, and obtain feedback on evaluation instruments designed to assess SCCAHS outreach activities. Several survey instruments (below) were developed to evaluate new and ongoing outreach activities attended by internal and external stakeholders, including monthly webinars and the annual State of the Science Meetings. Outreach evaluation instruments:

- 2020 State of the Science Meeting 2020 (2)
  Immediate post-survey (distributed to attendees 9/11 and 9/18, 2020)

- CSAB/Stakeholder needs assessment
  Distributed to CSAB members and existing stakeholders prior to annual CSAB meeting (March 11, 2020)

Additionally, key findings from the COVID-19 Extension impacts study served to inspire and inform the creation of a series of free Mental Health First Aid Certification Trainings that were sponsored by the Center, organized by the Outreach Core, and conducted by an external partner, Meridian Behavioral Healthcare, Inc.

Research findings from these activities will allow the identification of outcomes from outreach activities including communication preferences, knowledge/use of outreach materials (trainings/resources), new partnerships and collaborations, quality and relevance of activities, research topics the Center should prioritize in the next 5-year cycle, and the opportunity to conduct more in-depth follow-up evaluations with voluntary respondents. The information obtained allows for the evaluation of the effectiveness, outcomes and impact of Outreach Core activities and inform project planning for both programs now and as the Center prepares for reapplication.

Needs Assessment

Participatory monitoring and evaluation activities were regularly carried out throughout Year 5 including, but not limited to, gathering relevant data (internal and external), participating in monthly Internal Operating Committee and Evaluation Communication and Outreach meetings, and regularly engaging in opportunities to interact with stakeholders. A needs assessment survey was administered prior to the 2021 Community Stakeholder Advisory Board (CSAB) Meeting to obtain feedback from the CSAB members and other stakeholders. The results were shared during the CSAB meeting and included responses from an array of Center stakeholders as well as members of the board.

COVID-19 Response

Expanding the SCCAHS network, building partnerships and supporting key audiences in response to the COVID-19 pandemic, SCCAHS's Evaluation Program led regional and national efforts aimed at assessing the impacts of this public health emergency on regional stakeholders and audiences served by the CDC/NIOSH Agricultural Safety and Health Centers. Findings from these efforts have, and will continue to, generate evidence-based information to inform the development of education, communication, and research strategies and products by SCCAHS, its peer Centers across the nation, and partner organizations.

COVID-19 Vaccine Subcommittee. Beginning in December 2020, the evaluation team led a COVID-19 Vaccine Subcommittee focused on identifying factors influencing COVID-19 vaccination decision-making of relevant audiences in the agriculture, fisheries, and forestry (AFF) sectors (placing special emphasis on farmworkers, fishers, and rural residents). Members of the subcommittee include internal and external specialists serving 12 states/territories in the Southeastern US.

In addition to individual-level attributes, this subcommittee is also exploring the operational strategies identified by each state and/or territory to accomplish its COVID-19 vaccination public health goals by conducting systematic desk reviews of the distribution plans that can affect access to the vaccine by these groups. A modified thematic analysis approach with a priori (deductive) coding is being used to conduct the literature reviews using the qualitative data analysis software NVivo. SCCAHS interns were trained in the use of the software and the analytical procedures. The reports produced for each state or territory plan analyzed during this activity, paired with information collected regarding vaccination decision making factors will be shared with Center and the COVID-19 Vaccination Subcommittee to ensure the inclusion of the different audiences it serves in the states' vaccination plans; develop and provide strategies to enhance the operationalization of the plans in regards to reaching those audiences; and, facilitate the implementation of the plans through its different networks of partner organizations.

The information obtained through Subcommittee efforts will serve to inform the Center and partner organizations to develop relevant resources based on current needs/barriers, as well as to provide recommendations to key stakeholders aimed at increasing the access to the vaccine for these audiences. In addition, this collaborative effort supports the Evaluation Program's overarching goal to strategically build relationships and partnerships with other Centers, universities, professionals and community groups in agricultural health and safety.

Extension COVID-19 Impacts. To further assess the how Extensional personnel, six new instruments were designed by the evaluation team. This research initiative expands on a previous study conducted in the spring 2020 and serves to expand our understanding of existing perceptions on how the pandemic has impacted their personal and professional lives, as well as the audiences they serve. Topics explored in this study include: COVID-19 prevention and vaccination, personal/professional needs and challenges (including expanded assessment of effects on mental health), healthcare access and sociodemographic information. The target audiences for this study include Extension faculty, staff, and volunteers across the SCCAHS and the Southeast Center for Health and Injury Prevention (SCAHIP) regions:

1. Extension faculty/staff (2) – e.g., administrators, state specialists, county agents - Previous respondents: follow-up for Extension professionals that responded to the initial survey – reduced questions - New faculty/staff (did not participate in the initial study)
2. UF IFAS Family Nutrition Program staff
3. UF/IFAS Expanded Food and Nutrition Education Program (EFNEP) staff
4. UF/IFAS Master Gardener Program volunteers
5. UF/IFAS 4-H volunteers

The questionnaire was distributed from February 2021 to March 2021. Data collected provided Ag Safety and Health Centers and Extension leadership with information that can be used for planning and development in addressing the needs of extension professionals and volunteers and enhance their frontline response to the communities they serve now.

Three groups of undergraduate students at the University of Florida participated in internships with the evaluation program. Members of the evaluation team provided mentorship that introduces students to: operations of a multidisciplinary research center, collaborative research teams and activities, academic research methods, data analysis and dissemination options, and impacts of the COVID-19 pandemic on audiences served by SCCAHS. Products resulting from working with interns include narratives, figures, and tables summarizing the findings. These outputs are built upon either with or by the evaluation team to produce official reports, publications, presentations, and other sharable products/resources that help SCCAHS faculty and staff better understand and communicate the impacts of the pandemic and other threats on different demographic sub-sets to inform the development of appropriate and relevant responses. Overall, students are provided specialized experiences based on their interests and exposed to working in professional settings through their internship with the centers' evaluation program. This fulfills an important service of a research center such as SCCAHS to help future professionals and leaders develop the required skills to work effectively with others and succeed in academic settings.

Stakeholder COVID-19 Impacts. Data collected in an online questionnaire distributed to evaluate the impacts of the COVID-19 pandemic on SCCAHS stakeholders over the Summer in 2020 were analyzed in year 5 and shared with members of Outreach for dissemination. A summary and figures were created to inform and guide discussions for the Annual Community Stakeholder Advisory Board meeting in March 2021, conducted by the Outreach Core.

A report on the findings from the COVID-19 vaccine perception listening sessions conducted by SCCAHS and SCAHIP was shared with the COVID-19 vaccine subcommittee. Follow-up survey data collection was concluded. Final analysis will provide the Evaluation Program with information to help expand Center and Extension administration knowledge of perceptions and experiences of key partners working/volunteering within UF/IFAS Extension. Results will be disseminated beyond Extension so that all stakeholders benefit from Center outputs and outcomes (i.e., trainings, webinars, intermediate and long-term outcomes/changes etc.). Relevant reports and manuscripts are currently in development.

Survey instruments designed by the evaluation team related to assessing the impacts faced by Extension professionals and volunteers in the region due to the COVID-19 pandemic continue to be revised, internally shared, and utilized in different areas/audiences including partner Ag Safety and Health Centers and the UF Microbiology department. Findings contributed to a National Science Foundation presentation to share findings. The sondeo method and instruments used to gauge vaccine perceptions was also adopted by our neighboring center, SCAHIP to conduct listening sessions and shared intentions to continue utilization of sondeos in the future.

Contribution Analysis

NIOSH: Heat Related Illness (HRI) Logic Model Development. The collaboration with NIOSH leaders and other Ag Centers to develop a cross-center logic model using contribution analysis as an approach to impact assessment continued throughout year 5. The evaluation program team attended meetings regarding this effort and contributed to clarifying the vision of the project, instrument design and responding to feedback by making proper adjustments to the SCCAHS HRI logic model and evidence table.

SCCAHS Impact Assessment: Developing a Common Evaluation Framework. Progress was also made towards the development of a common evaluation framework with contribution analysis

as a foundation element of the approach. Led by graduate student July Nelson, significant progress was made on conducting the systematic literature reviews that are a key part of the framework development. Through the use of NVivo to conduct qualitative data analysis many factors and relationships including a strategic approach to visually mapping findings, have been identified in the thematic areas of interest: HRI, pesticide exposure, and mental health related issues among AFF workers.

The addition of information derived from the completion of literature reviews alongside consulting existing expert teams for three major problems affecting the health and safety in the SE coastal region (pesticide exposure, heat related illness, and mental health) allow for the identification of impact pathways. This process of evaluating impact provides a keener view on current efforts and gaps that can be filled through research to work towards greater outcomes by SCCAHS and partner Ag Centers in mitigating morbidity and mortality from occupational health and safety hazards.

External Evaluation

A major task undertaken by the evaluation team was to design and host an external evaluation to gauge program quality and efficiency, identify strengths and weaknesses, and serve to inform strategic planning efforts. The information derived from this effort provides information for use in the final year of the current grant cycle and the upcoming renewal proposal. Below are summarized phases, from preparation to next steps, of the external evaluation learning review process:

- Recruited experts from within the team's professional network having no known affiliation to SCCAHS, but who had a greater understanding of large-scale multidisciplinary research centers. Research PI's and primary representatives from the Outreach and Planning and Evaluation Cores of SCCAHS committed 30-60 minutes to provide a brief presentation and engage in discussion with the panel during the external review meetings.
- While securing panelists and presenters for the external review, student interns working with the evaluation program were guided to review official SCCAHS annual reports to compile information later used to develop logic models for each of the thematic research areas of importance identified in the 2019-2023 NIOSH Strategic Plan. The models were embedded in a briefing book that also contained relevant information on the Administration and Planning Core, Outreach Core and Research Core. Such as specific aims/goals extracted from the initial proposal for panelists to review prior to the two-day evaluation event.
- One month after the two-day virtual event the team of external evaluators shared a thorough report reflecting their findings and recommendations. This report was shared in individual meetings with Administration and Outreach to discuss findings and consider strategic planning options. An invitation to meet individually with the evaluation program was disseminated and follow-up discussions convened.
- The findings and recommendations from an unbiased group of experts produced from the external review provided useful information for the renewal application.

Next Steps

As the Center moves into a NIOSH supplement year, the Evaluation Program will focus on three activities to continue meeting overarching program goals:

1. Maintain established monitoring and evaluation activities by collecting relevant data, participating in monthly IOC and ECO calls and regularly engaging with the Administration, Outreach and Research cores.

2. Design and implement additional evaluation activities focused on assessing the impact of our Center during its first cycle. This will allow the evaluation team to gauge program quality and efficiency, identify strengths and weaknesses, and serve to inform strategic planning efforts for the upcoming grant renewal application. The first step in this process will be to review annual reports that have been produced since the Center's inception and develop materials that can provide an aerial view highlighting products, outcomes, and impact.

3. Strengthen collaborations with the Evaluation Programs of other AgFF Safety and Health Centers. In addition to continuing to participate in regularly scheduled cross-center meetings, opportunities will be pursued including continuing to share ideas, resources and instruments that can evaluate/support audiences across the US and developing new co-publications.

Publications and Presentations

Galindo, S., Sampson, S., & Ramos, A. (2020). Agricultural Centers Roundtable – Impacts of COVID-19 on Extension Agents. 2020 State of the Science Meeting focused on Global Pandemics and the Agricultural Workforce: Research and Policy Implications, Virtual, Sept 18. http://www.sccahs.org/wp-content/uploads/2020/09/SOS-Impacts-of-Covid-19-on-Extension-Session7-compressed.pdf.

Gorucu, S., Weichelt, B., Diehl, D., & Galindo, S. (2021). An Overview of Agricultural Injuries in Florida from 2015-2019. *Journal of Agricultural Safety and Health*, 27(3): 135-146. doi: 10.13031/jash.14533

Heflin C, Swissa A, Israel Glenn, and Gorucu, S. (2021). Trusted Information Sources amidst the COVID-19 Pandemic: Extension Professional Worry, Stress and Preparedness. International Society for Agricultural Safety and Health (ISASH) Virtual Conference: June 21, 2021.

Israel, G. D., James, H. E., & Gariton, C. E. Anxiety disorders among Extension Professionals' during the COVID-19 Pandemic. Paper presented at the virtual annual meeting of the Southern Rural Sociological Association, February 2021.

Israel, G. D., Diehl, D. C., Galindo, S., Ward, C., Ramos, A. K., Harrington, M., & Kasner, E. J. (2020). Extension Professionals' Information Use, Protective Behaviors, and Work-Life Stress During the COVID-19 Pandemic. Journal of Extension, 58(6), 5.

Sampson, S., Mazur, J., Israel, G., Galindo, S., & Ward, C. (2020). Competing Roles and Expectations: Preliminary Data from an Agricultural Extension Survey on COVID-19 Impacts. Journal of Agromedicine, 1-6.

Section III – Research Projects

Pesticide & Heat Stress Education for Latino Farmworkers That is Culturally Appropriate

PD/PI: Joseph Grzywacz
Co-PD/PI: Antonio Tovar-Aguilar

Overview

Farmworkers, the majority of whom are Latino immigrants from Mexico, experience elevated rates of occupational injury and illness. Chronic low-dose exposure to pesticides and extreme heat and humidity are major sources of poor occupational health outcomes. Recent revisions to the EPA's Worker Protection Standard (WPS-r) and growing concern about heat-related illness (HRI) necessitate the creation of safety education curricula that to minimize pesticide exposure and the deleterious effects of exposure to heat and humidity. Use of community health workers or *promotoras de Salud* (*promotoras*) is common in farmworker occupational health, but few WPS or HRI curricula have been developed for dissemination by *promotoras*, and there is scant evidence that *promotoras* are equally effective as "professional educators" who often have college degrees or highly specialized training in the cognate material. The growing concern over heat illness and recent revisions to the U.S. Environmental Protection Agency (EPA) Worker Protection Standard focused on pesticide exposure training led to PISCA's work on a new safety education tool.

PISCA's overall goal is to reduce the burden of poor occupational health outcomes among Latino farmworkers resulting from pesticide exposure and heat illness. To achieve this goal the proposed project has built a community-advocate-university partnership to accomplish three primary aims –

1. Create reproducible, culturally- and contextually-appropriate curricula for Latino farmworkers targeting pesticide exposure (suitable for meeting employer requirements under the revised WPS) and heat-related illness (HRI).

2. Determine the effectiveness of the developed pesticide and HRI curricula implemented by professional educators in promoting advocated safety behaviors.

3. Identify the comparative effectiveness of promotora-based implementation of developed pesticide and HRI curricula relative to the use of professional educators.

Key Accomplishments 2020-2021

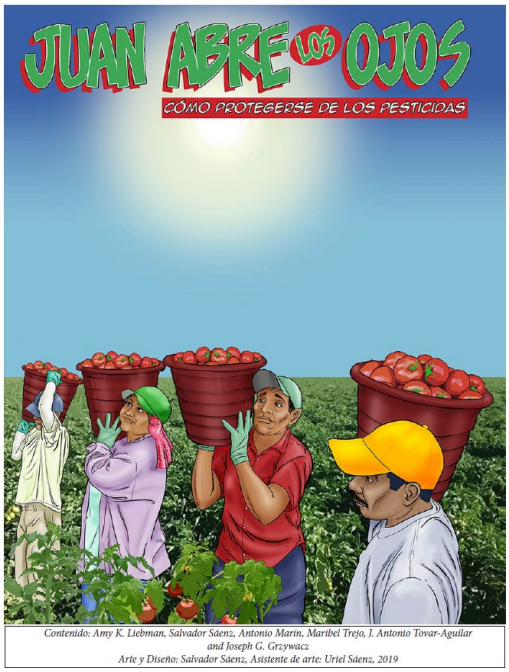
The PISCA project continued to complete outputs related to each specific aim. Regarding the first aim, we continued distributing our EPA-Approved Worker Protection Standard Training materials: Over 400 copies of the English or Spanish versions of the PISCA WPS training materials have been downloaded from the Migrant Clinicians Network website, and over 1,400 copies of the supplementary comic books have been downloaded or distributed. Further, our team was invited to participate in the annual Pesticide Applicator and Certified Training conference to emphasize the importance of cultural tailoring in training. We are happy report the results of second phrase of the project have been accepted for publication and available for review in prepublication format. These results demonstrate the superiority of the culturally tailored PISCA WPS training over treatment as usual, including demonstrating that only the PISCA training resulted in corresponding increases in pesticide-related safety behaviors among farmworkers.

These findings have been used by a subcommittee of EPA's Pesticide Program Dialogue Committee to generate recommendations for future enhancements to the WPS. Finally, we have completed recruitment, data collection, and data entry from the third phase of the project which relates to the third and last aim. Analyses are underway and we expect to submit a manuscript based on these data by early spring. More specific details about project activity, by specific aim, follows next.

Specific Aim 1. Create reproducible, culturally- and contextually – appropriate curricula for Latino farmworkers targeting pesticide exposure; suitable for meeting employer requirements under the revised Worker Protection Standard (WPS), and heat-related illness (HRI).

Nearly 600 elements of the PISCA WPS training have been downloaded from the Migrant Clinicians Network website. What follows is a deliberate count of each training component.

ITEM	***BRIEF DESCRIPTION***	***# OF DOWNLOADS***
WPS TRAINING POWERPOINT (ENGLISH)	*English version of the fully tailored WPS training in PowerPoint format. This training contains all the content necessitated by the Revised Worker Protection Standard (WPS) and has been approved by the EPA as such.*	*153*
WPS TRAINING POWERPOINT (SPANISH)	*Spanish version of the EPA-Approved fully tailored WPS training in PowerPoint format*	*112*
WPS TRAINING FLIPCHART (SPANISH)	*Spanish version of the EPA-Approved fully tailored WPS training in Flipchart format. The flipcharts are only available in Spanish, and come in two sizes: A1 for large group presentations, and A2 for small group, "in the fields" presentations.*	*116*
WPS FACILITATOR GUIDE (ENGLISH)	*The English facilitator guide for the EPA-approved content in the PISCA WPS training. The facilitator guide can be used with either the PowerPoint presentation or the two sizes of flip charts available to support training.*	*85*
WPS FACILITATOR GUIDE (SPANISH)	*The Spanish facilitator guide for the EPA-approved content in the PISCA WPS training. The facilitator guide can be used with either the PowerPoint presentation or the two sizes of flip charts available to support training.*	*131*
		597



Juan Abre los Ojos como Protegerse de los Pesticidas, *the supplementary comic book created by the PISCA team (see illustration), has been downloaded 342 times from the Migrant Clinician's Network. Additionally, approximately 625 hardcopies have been distributed at community events and agricultural expos over the past year.*

Additionally, PISCA project staff were invited by Michigan State University, in partnership with the Migrant Clinicians Network, to present at the 2021 Pesticide Applicators Certification and Training meeting in Denver, CO. The workshop, which was delivered live and virtually simultaneously, emphasized the importance of recognizing key elements of culture in the design and delivery of instructional materials related to pesticide safety. Approximately 300 individuals participated in the conference *(in-person or remotely). The citation for this presentation is listed below in "Publications & Presentations."*

PISCA is currently developing a learning management system to disseminate the PISCA curricula broadly, while maintaining quality control over the use of the materials. Specifically, the learning management system will train users is competencies of adult education as it relates to the immigrant farmworker population. Then scaffolding from these competencies, the learning management system will train users in the execution of the PISCA curricula – the goal of which is to help end-users understand why the curricula covers the material the way it is covered. For example, because many immigrants adhere to the principal of humoral medicine (i.e., hot/cold theory), effective delivery requires appreciation of this fact and how it contradicts specific pesticide safety behavior (i.e., showering immediately after work). Effective trainers need to understand that the advocated behavior violates cultural beliefs about the causes of illness and convey that understanding in a manner that shows respect for those beliefs.

Once the learning management system is prepared, the team will test the effectiveness of the self-paced training.

Specific Aim 2. Determine the effectiveness of the developed pesticide and HRI curricula implemented by professional educators in promoting advocated safety behaviors.

Final analysis of the Phase II data from the PISCA Project indicated:

- PISCA's EPA-Approved Worker Protection Standard training performed comparably to the EPA-Certified video in improving farmworkers knowledge of pesticides (i.e., routes of pesticide exposure, strategies to reduce occupational exposure to pesticides, possible health effects of pesticide exposure)
- The knowledge gained from PISCA's EPA-Approved Worker Protection Standard Training was retained across three months. By contrast, the knowledge gained by workers under the EPA-Approved video training was lost after three months: their three-month knowledge scores were comparable to their pre-training scores.

- At the three-month follow-up, farmworkers trained with PISCA materials reported more behaviors that minimize pesticide exposure than farmworkers trained with the EPA-Approved video.

These results have been accepted for publication by the Journal of Occupational and Environmental Medicine (08/24/2021) and were made available for pre-publication on 08/27/2021. This paper was presented at the Annual Meeting of the American Public Health Association as part of the Occupational Safety and Health section's program on 10/26/2021. The citation for the paper and presentation are included under "**Publications & Presentations.**"

The results of this paper were used by a subcommittee of EPA's Pesticide Program Dialogue Committee to generate recommendations for future enhancements to the WPS. Those recommendations were delivered to the PPDC on 10/28/2021.

Specific Aim 3. Identify the comparative effectiveness of promotora-based implementation of developed pesticide and HRI curricula relative to the use of professional educators.

This phase of the project was most impacted by the COVID-19 crisis. Nevertheless, in August we finished recruitment, intervention, and data collection. All data have now been entered and we are currently analyzing those data. We anticipate completing data analysis by the end of the year, and submitting a manuscript containing those findings my early spring 2022.

COVID-19 Response

The PISCA team works closely with the farmworker community, which has been heavily hit by the COVID-19 crisis. Below we highlight some the recent efforts undertaken by members of the PISCA project to support the immigrant Latino farmworker community during this difficult time.

1. Across the year, beginning in May through this writing, PISCA partnered with Second Harvest Food Bank and helped deliver over 800 boxes of food for immigrant Latino farmworker households in Echols County, GA.
2. Similarly, in partnership with the Echols County Sheriff's department, the PISCA team helped deliver over 500 bags of food directly to the homes of immigrant Latino farmworkers.
3. This fall as children were heading back to "in person" school, the PISCA team partnered with two other organizations and provided knapsacks with school supplies to 94 children from farmworker households.
4. Across the year the PISCA team coordinated COVID-19 vaccination clinics that have served over 500 farmworkers in Echols County, GA. Most recently, on October 13th and 14th of 2021, over 200 (N=214) farmworkers who recently arrived on an H-2A visa were vaccinated.

During the shutdown (fall of 2020) and reduced pace of research (winter 2020 through summer 2021), PISCA investigators partnered current students and colleagues, including those responsible for the fielding of the National Agricultural Workers Survey (NAWS), to develop several manuscripts. That activity is represented under the Manuscripts subsection of "Publications and Presentations."

Publications and Presentations

Publications

Van Lith, T., Quintero, A., Johns, S., & Grzywacz, J.G. (2021). Promoting kindergarten readiness using Early intervention art therapy with Latinx farmworker children. The Arts in Psychotherapy, 73, 101753. https://doi.org/10.1016/j.aip.2020.101753

Smith-Appelson, J.L., Reynolds, J.R., & Grzywacz, J.G. (2021). Assessing the extreme loneliness of immigrant farmworkers. Sociological Inquiry, 91, 696-717. https://doi.org/10.1111/soin.12428

Carlos Chavez, F.L., Gonzales-Backen, M.A., & Grzywacz, J.G. (2021). Work, stressors, and psychosocial adjustment of undocumented Guatemalan adolescents in United States agriculture: A mixed-methods approach. Journal of Research on Adolescence. Published online https://onlinelibrary.wiley.com/doi/epdf/10.1111/jora.12640

Grzywacz, J. G., Gonzales-Backen, M., Liebman, A., Trejo, M., Gudino, C. O., Trejo, M., Economos, J., Xiuhtecutli, N., & Tovar-Aguilar, J. A. (2021). Comparative Effectiveness of Training Alternatives for the EPA's Worker Protection Standard Regulation Among Immigrant Latino Farmworkers. *Journal of occupational and environmental medicine*, 10.1097/JOM.0000000000002368. Advance online publication. https://doi.org/10.1097/JOM.0000000000002368

Manuscripts In-Progress

Smith, C.A. & Grzywacz, J.G. (in progress). Healthcare utilization among farmworkers: An Exploration of the National Agricultural Workers Survey. In preparation for submission to the Journal of Rural Health.

Grzywacz, J.G., Gabbard, S., Fung, W., Georges, A., Salvatore, A.L. & Carroll, D.J. (in progress). Social determinants of farmworker health: Evidence from the U.S. National Agricultural Workers Survey. In preparation for submission to the American Journal of Industrial Medicine.

Salvatore, A.L., Gabbard, S., Fung, W., Georges, A., Carroll, D.J., & Grzywacz, J.G. (in progress). Individual, job and employer level factors and compliance with the U.S. EPA's Worker Protection Standard: Findings from the National Agricultural Workers Survey. In preparation for submission to the American Journal of Public Health.

Presentations

Ramos, A.K., Greer, A., Salzwedel, M., Crawford, K., Corwin, C., & Grzywacz, J.G. (March, 2021). Recommendations for efficient rollout of COVID-19 vaccine in the agricultural sector. Poster presentation at the Agricultural Safety and Health Council of America, Annual Safety Summit (Virtual).

Grzywacz, J.G., Greer, A., Salzwedel, M., Crawford, K., Corwin, C., & Ramos, A.K. (April, 2021). Recommendations for efficient rollout of COVID-19 vaccine in the agricultural sector. Oral Presentation at the 2021 Planting Seeds of Partnership Virtual Conference, Co-Sponsored by the Central States Center for Agricultural Safety and Health and the Great Plains Center for Agricultural Safety and Health.

Trejo, M., & Marin, A.J. (July, 2021). Sociocultural dimensions and accessibility in instructional design. Workshop presentation at the Pesticide Applicator and Trainer Certification meeting. Denver, CO.

Grzywacz, J.G., Gonzales-Backen, M., Liebman, A., Trejo, M, Xiuhtecutli, N., Economos, J., Marin, A.J. & Tovar-Aguilar, J. A. (October, 2021) Comparative effectiveness of training alternatives for the EPA's Worker Protection Standard Regulation among Immigrant Latino Farmworkers. Oral presentation at the Annual Meeting of the American Public Health Association. Denver, CO.

Using Social Marketing to Prevent HRI and Improve Productivity among Farmworkers

PD/PI: Paul Monaghan
Co-I: Maria Morera
Co-I: Fritz Roka
Co-I: Antonio Tovar

Overview

Ongoing heat-related illnesses (HRI) and fatalities among Florida farmworkers underscore the need to identify economic incentives to occupational heat safety implementation in agriculture. Although culturally- and linguistically- responsive safety promotion interventions have proven effective in delivering important agricultural safety information to diverse farmworker populations, workplace barriers, such as piece-rate pay and limited access to rest breaks, continue to discourage HRI preventive practices. Three key problems limiting greater investment in heat safety are: i) insufficient documentation of the comparative effectiveness of competing models of farmworker safety promotion, ii) a paucity of observational data linking safety behaviors to health outcomes, and iii) a lack of translation between health outcomes and industry benefits.

The overall goal of this research project is to elucidate factors linked to organizational demand for farmworker safety. The project is guided by the following three aims:

1. Utilize social marketing research to educate and motivate field supervisors and piece rate harvesters to follow HRI recommendations, including through culturally appropriate social media platforms to reinforce behavior adoption in the field.

2. Determine the effectiveness of the social marketing approach in comparison to existing HRI educational programming currently used in Extension and employer-based models of safety promotion.

3. Establish the relationship between hydration interventions, changes in safety culture and productivity levels by measuring output per worker in order to incentivize investment in farmworker safety.

Key Accomplishments in 2020-2021

Implementation and Evaluation of Heat Safety Intervention

Field research with agricultural workers employed in the production of fresh vegetables and herbs was conducted as part of the project's aims to promote heat safety behaviors through a culturally-appropriate intervention and determine the impact of the approach on levels of hydration. The research also investigated the role of hydration on productivity. Using a quasi-experimental research design, instruments and procedures developed and validated in 2019, and social marketing techniques coupled with a heat safety curriculum created by a NIOSH-funded project at SCCAHS, survey and biological data were collected from four labor crews receiving either the intervention or monitoring only for comparison. The fieldwork was conducted in Clewiston, Florida during May 2021 in partnership with a specialty crop grower and a farmworker association.

Sampling and Recruitment. Study participants were recruited with the aid of the grower and farmworker association. Convenience sampling was used to select participating crews and

assign them to either the treatment or comparison group. All participants gave their informed consent for inclusion before participating in the study. Two crews, comprised of 41 workers and two crew leaders, were assigned to the intervention. Another two crews, comprised of 50 workers and two crew leaders, were assigned to the comparison group. A total of 95 agricultural workers participated in the field research study.

Heat Safety Intervention. A heat safety training, developed by the Florida State University College of Human Sciences Pesticide and Heat Stress Education for Latino Farmworkers that is Culturally Appropriate (PISCA) Project, was delivered on May 9, 2021 to the two crews of farmworkers assigned to the study's treatment group. The hour-long training was delivered in Spanish by project personnel. A 15-item multiple-choice test, administered with the aid of audience-response technology prior to and following the training, was used to gauge knowledge gains. Results of the pre- and post-tests indicated that attendees improved their scores by 6%, on average. A dependent means t-test (t [$df = 50$] = -2.27) showed that the increase in knowledge test scores (pretest $M = 0.82$, $SE = 0.02$; posttest $M = 0.86$, $SE = 0.02$) was significant ($p = 0.01$).

In addition to the training, the treatment group also received visits from project personnel outside of work hours to reinforce hydration behaviors. OSHA heat safety posters, urine color charts, coolers, and water bottles were distributed during these visits to facilitate increased fluid intake. Based on their pre- and post-training scores, three agricultural workers in the treatment group were selected and guided to further promote heat safety practices among their peers.

Survey and Biological Research. On May 16, 2021, one week following the heat safety training, orientation sessions were held with farmworkers assigned to both the treatment and comparison groups to further familiarize them with the study and collect baseline data including weight and height measurements, a urine sample, and survey responses regarding demographics and HRI-prevention attitudes, knowledge, and behaviors. Results of the baseline survey showed that the majority of study participants were male from Mexico, aged 35 years or less. Almost half of participants assigned to the comparison group had worked in U.S. agriculture one to five years. In the treatment group, the majority reported less than a year of agricultural work in the U.S. (Figure 1). Thirty-eight percent of survey participants in the comparison group and 19% in the treatment group had completed four to six years of schooling, whereas 35% in the comparison group and 51% in the treatment group had completed seven to nine years of schooling (Figure 2).

Survey responses regarding safety attitudes, illustrated in Figure 3, revealed that a little over one third of individuals in the comparison group were "not at all concerned" about becoming ill from the heat while working. In the treatment group, which had received the intervention one week prior, only 7% were unconcerned. Nonetheless, 83% of survey participants in the comparison group and 95% in the treatment group had received some form of heat safety training, as shown in Figure 4. Responses to four heat safety knowledge test questions, also used during the 2019 fieldwork season, indicated participants in the treatment group were somewhat more familiar with HRI prevention measures. The difference in scores between the two groups, however, was not significant.

Survey responses regarding fluid intake routines indicated that most participants hydrated "whenever they were thirsty" and "at lunch" (Figure 5). Only 6% in the comparison group and 9% in the treatment group consumed beverages "every hour." The majority in both groups avoided any rest breaks aside from having lunch and going to the restroom. Approximately half of the comparison group and 81% of respondents in the treatment group had experienced at least one HRI symptom in the previous week (Figure 6). Most did not seek treatment for their symptom(s).

Following the orientation session, pre-, mid- and post-workday urine samples were collected from study participants in both groups over three days from May 17 – 19 to gauge the impacts of the training on hydration behaviors and status. Urine specific gravity (USG), a widely used index that measures the concentration of particles in urine and the density of urine compared with the density of water, was tested via urine refractometry to assess hydration status. Normal USG levels in adults generally range from 1.010 to 1.020 (Flasar, 2008). USG values above 1.020 indicate varying degrees of hypohydration (Armstrong et al., 1994) and above 1.030 indicate a clinically dehydrated state (Miller & Bates, 2007). Results of the refractometry indicated that study participants in both groups were hypo-hydrated, on average, by the end of each workday (Tables 1 – 2; Figure 7). Hypohydration levels among participants in the treatment group, however, were less severe than in the comparison group on Day 2 and most of Day 3.

Table 1. Comparison-group baseline, pre-, mid-, and post-workday mean urine specific gravity (±SD)

	Baseline	Range	Pre-workday	Range	Mid-workday	Range	Post-workday	Range
	1.020 (0.006)	1.003 - 1.032						
Day 1			1.020 (0.004)	1.012 - 1.028	1.024 (0.004)	1.013 – 1.033	1.028 (0.004)	1.010 - 1.035
Day 2			1.023 (0.005)	1.013 - 1.034	1.025 (0.005)	1.009 – 1.035	1.029 (0.004)	1.020 - 1.036
Day 3			1.025 (0.005)	1.011 - 1.034	1.026 (0.005)	1.014 – 1.037	1.031 (0.004)	1.018 - 1.036

Table 2. Treatment-group baseline, pre-, mid-, and post-workday mean urine specific gravity (±SD)

	Baseline	Range	Pre-workday	Range	Mid-workday	Range	Post-workday	Range
	1.022 (0.006)	1.009 - 1.033						
Day 1			1.019 (0.005)	1.012 - 1.031	1.024 (0.005)	1.015 – 1.038	1.029 (0.005)	1.018 - 1.041
Day 2			1.021 (0.005)	1.009 - 1.040	1.023 (0.005)	1.007 – 1.033	1.028 (0.004)	1.020 - 1.034
Day 3			1.023 (0.007)	1.007 - 1.037	1.028 (0.005)	1.012 – 1.040	1.030 (0.004)	1.023 - 1.040

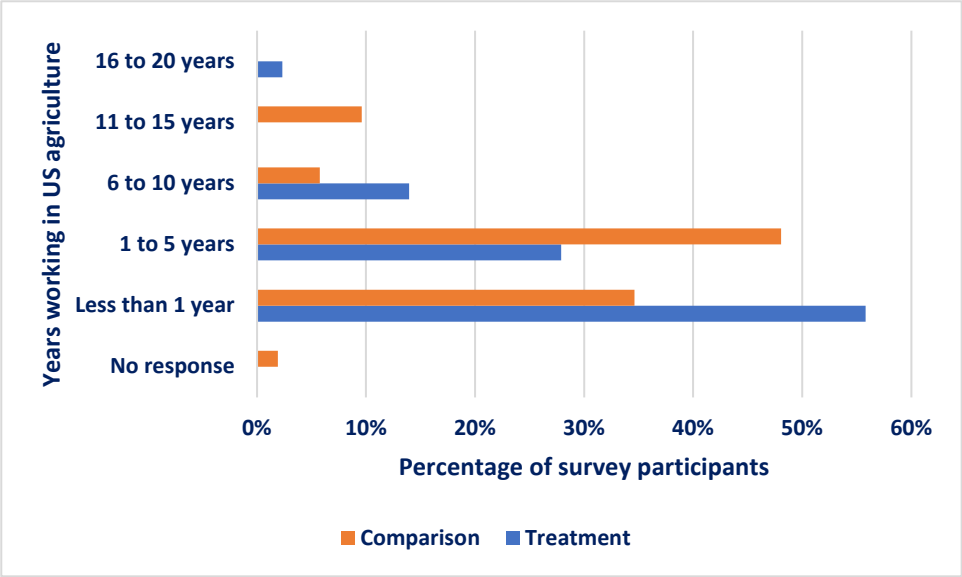


Figure 1. U.S. agricultural work experience (*n* = 95)

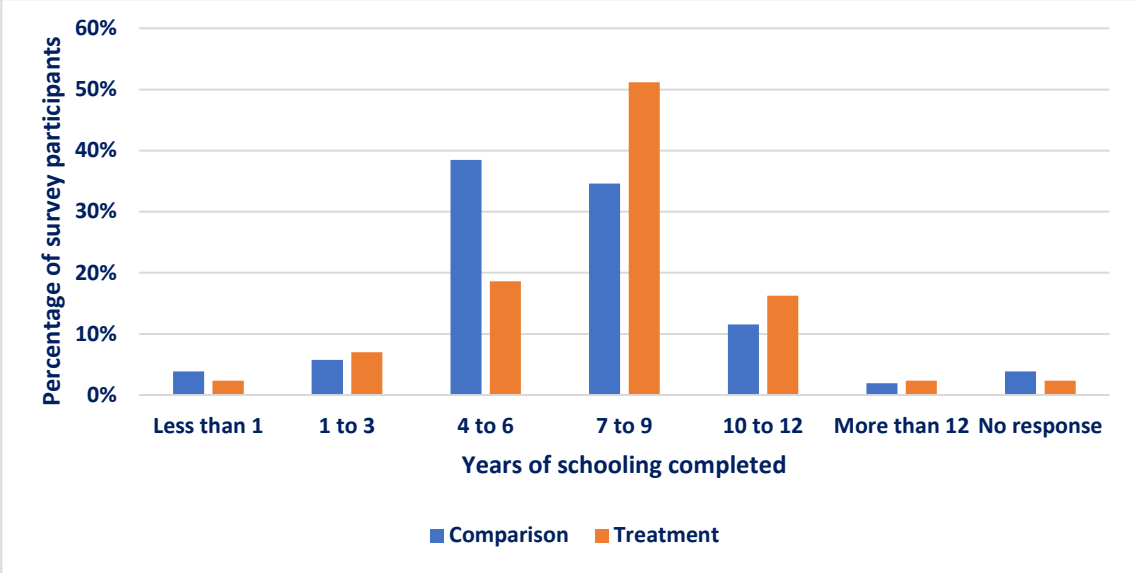


Figure 2. Education levels (*n* = 95)

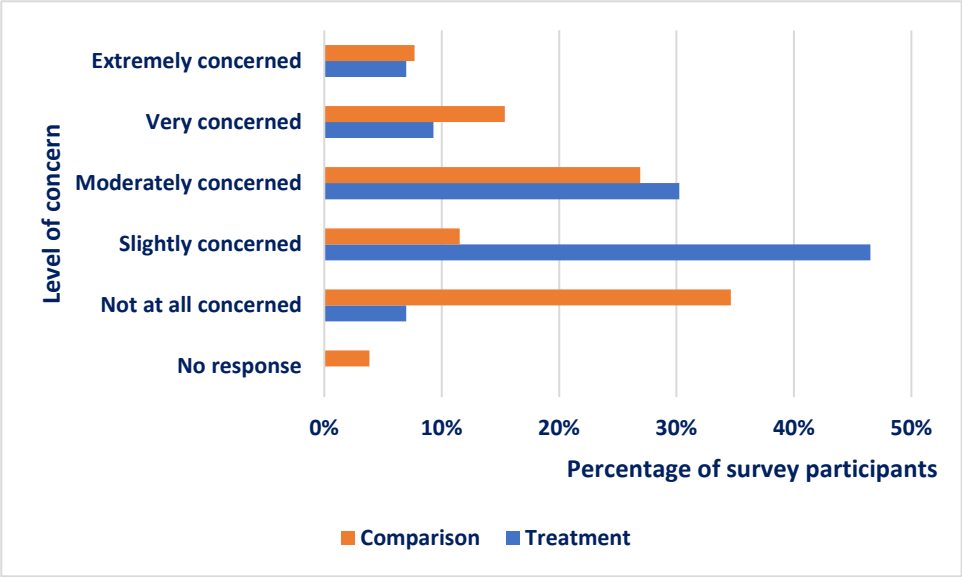


Figure 3. Post-intervention levels of concern about becoming ill from the heat while working (*n* = 95).

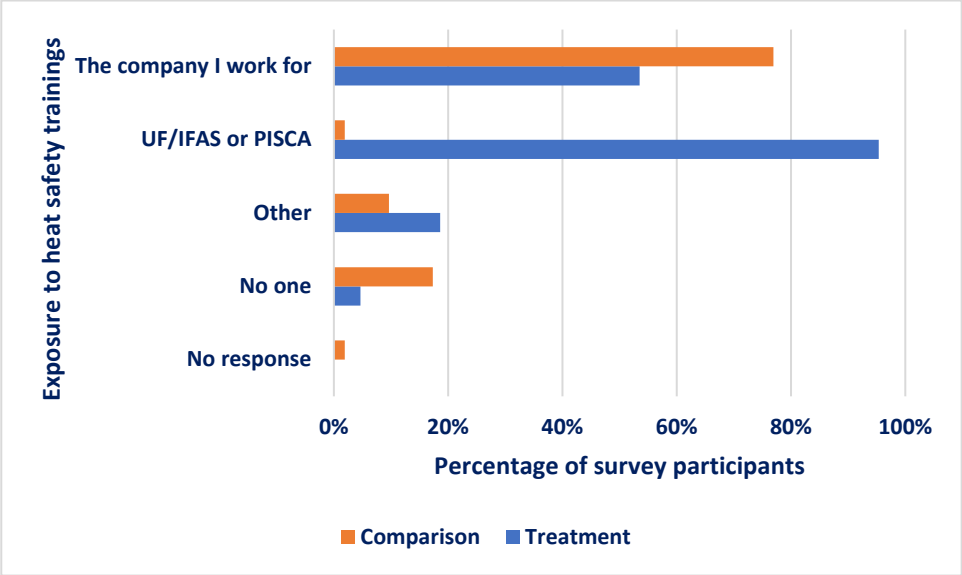


Figure 4. Post-intervention exposure to heat safety trainings (*n* = 95)

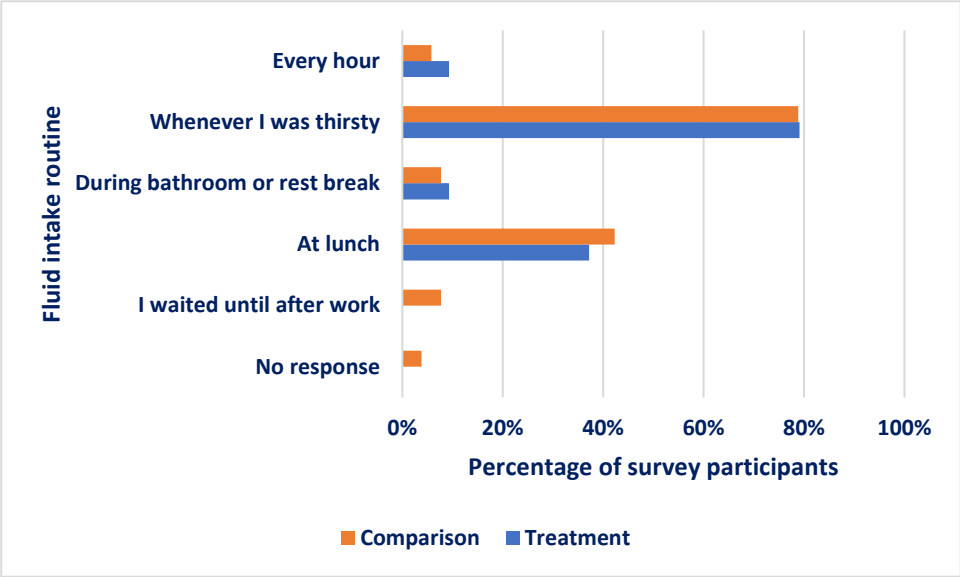


Figure 5. Fluid intake routines during the workweek preceding the study (*n* = 95).

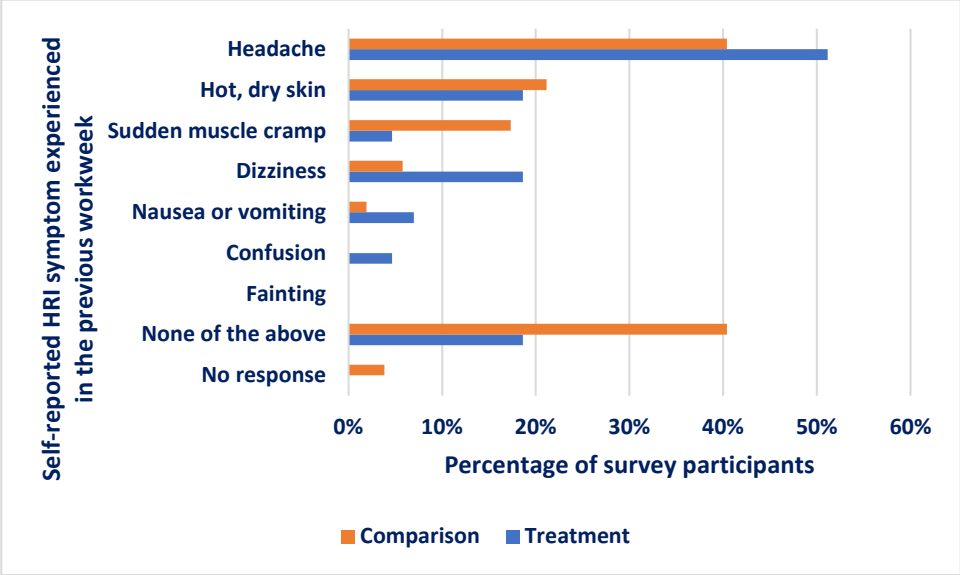


Figure 6. Self-reported symptoms of HRI experienced during the workweek preceding the study (*n* = 95).

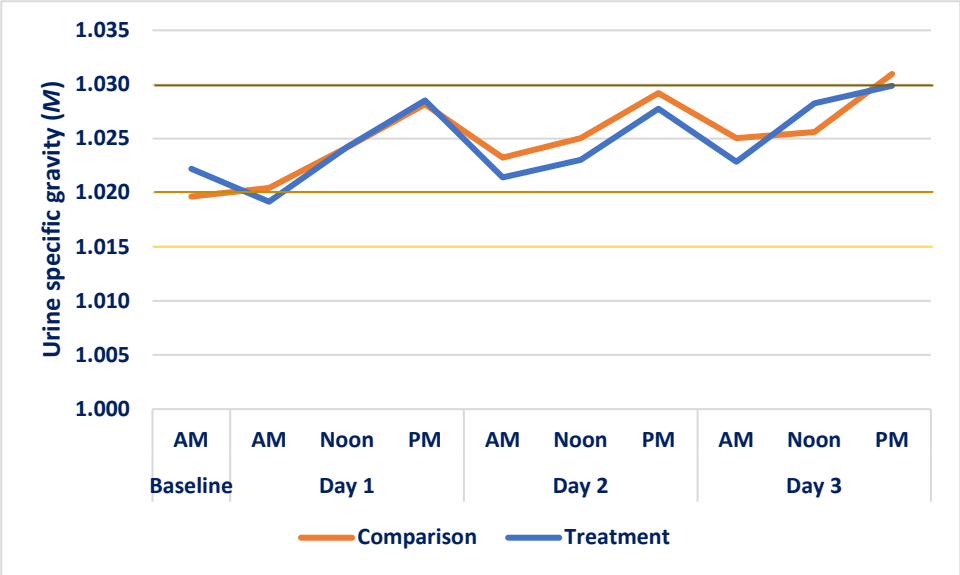


Figure 7. Mean urine specific gravity across the study period (*n* = 93)

Publications and Presentations

Results of research designed to evaluate impacts of COVID-19 on HRI prevention among Florida farmworkers were presented at the 2021 Meeting of the Society for Applied Anthropology. A manuscript reporting the results of survey and biological research conducted with tomato harvesters in southwest Florida was completed and is pending submission:

Morera, M.C., Tovar-Aguilar, J.A., González, R., Monaghan, P.F., & Roka, F.M. (forthcoming). Encouraging heat safety among Florida's tomato harvesters: Findings of formative research.

Morera, M.C., Tovar-Aguilar, J.A., Monaghan, P.F., Roka, F.M., & Perez-Orozco, J. (2021). Going the [social] distance: Safety and productivity in Florida agriculture during COVID-19. Presented at the 2021 Virtual Meeting of the Society for Applied Anthropology, March 26.

Occupational Health and Safety Surveillance of Gulf Seafood Workers

Project PI: Andy Kane, Principal Investigator, UF Environmental and Global Health
Melvin Myers, Consultant, Emory University
Robert Durborow, Consultant, Kentucky State University

Overview

Commercial fishing represents some of the most dangerous work sectors in the world. Occupational fatalities and injuries in the fishing sector occur at rates much higher than national averages for all occupational fatalities and injuries. In the southeastern US, Florida has the highest fatality rate for seafood workers, and this third nationally only to Alaska and Massachusetts. Non-fatal, work-related injuries and negative health outcomes are common in many of the highly productive fishery sectors in the Southeast, including traumatic injuries including amputations and fractures, trunk and lower back strains; sprains; skin cancers; infections due to cuts, bites, punctures, entanglement; thermal exposure; inflammatory and rheumatoid conditions associated with repetitive motion; and work-related stress outcomes including depression, anxiety, fatigue, and alcohol and drug abuse (which, in turn, serve as secondary risk factors).

The overarching goal of this community-based research project is to support the safety and well-being of our fishery workforce through collaborative engagement with coastal seafood workers in Florida, Alabama and Mississippi, using a translational research-to-practice approach. This Ag Center project has two specific aims focusing on surveillance and hazard intervention. Surveillance will be conducted using in-person survey interviews, and by making direct field observations to discern workplace hazards and risk factors associated with the dominant Gulf coast fishery subsectors: shrimping, fishing, crabbing, and oyster and clam harvesting. Surveillance data will be used to identify and support relevant points of intervention for hazards in the different fishery subsectors throughout the study region. Through our Ag Center Outreach Core, we will engage with regional extension agents and fishery associations to translate project-related support materials, and lessons learned and intervention tools (from this project and from other NIOSH centers), to extended networking capacity and provide sustainable support for fishery workers in the study region and nationally. Specific aims for the proposed efforts are described below and represent TO (surveillance) to T2 (intervention and evaluation) phase contributions in translational public health research.

Specific Aim 1: Conduct surveillance to discern occupational hazards and risk factors, history of injuries, and knowledge of co-worker deaths for workers engaged in multiple fishery subsectors along the Gulf coast of Florida and Alabama. Focus will be in Cedar Key, Steinhatchee, Apalachicola, Eastpoint, Carrabelle, Pensacola and Mobile, where we have established community partnerships and working relationships with seafood workers.

Aim 1a: Establish project-specific working relationships with community partners and seafood workers in the five port cities within the study area to facilitate participant recruitment, survey piloting and implementation, collection of workplace observational data, and engaging with the seafood worker community to provide project-related feedback and support.

Aim 1b: Develop, pilot, validate and implement a questionnaire instrument in Gulf coast fishery communities to relate occupational health and safety with environmental and personal risk factors.

Aim 1c: Conduct workplace observations with fishery workers on boats, in fish, crab, oyster and clam processing facilities, and at points of distribution, to supplement questionnaire-based health and safety data; and

Aim 1d: Analyze survey and observational data to examine industry-related injuries, illnesses and mortalities as related to risk factors, past experiences and perceptions, individual understanding of best practices and protective technologies, and demographic attributes.

Specific Aim 2: Assess the potential to apply functional intervention(s) to address risk factors associated with specific hazards and negative health outcomes in the different fishery subsectors in the study region.

Aim 2a: Guided by outcomes of Aim 1, collaboratively engineer behavioral and/or mechanical interventions with community partners and seafood workers, and conduct field piloting. Points of intervention for outcomes that have greatest adverse impacts (morbidity, death), and that are common and contribute to (a) lost productivity and/or (b) reduced quality of life, will serve as a focus;

Aim 2b: Implement a limited number of hazard interventions germane to the occupational health and safety of the eastern Gulf coast seafood worker community and provide metrics to discern acceptance tonality of the interventions.

Key Accomplishments in 2020-2021

This community-based surveillance project focuses on filling an important gap on non-fatal injuries health outcomes for Gulf coastal commercial fishers. Data from in-person interviews and workplace observations will provide feedback, empowerment, and some interventions to support a culture of safety and reduce the burden of injuries and medical care for this vulnerable and mostly self-insured population.

Specific Aim 1a. Establish project-specific working relationships with community partners and seafood workers in participating port cities within the study area. These partnerships are critical to gain trust in the community, facilitate participant enrollment, support the project team in piloting and implementing in-person interviews, conduct workplace observations, and engagement with the seafood worker community to develop community-specific project feedback and support.

Dr. Kane and project team members engaged with community partners in participating communities in Florida, Alabama and Mississippi, representing shrimping, fishing, oystering, crabbing, and coastal shellfish aquaculture. Project communications and updates have been shared with partners and stakeholders through with OysterSouth (national shellfish growers association with focus on Gulf and southeastern US), Cedar Key Aquaculture Association (clam farmers), Franklin County Seafood Workers Association and Water Street Seafood in Apalachicola (oyster harvesters, fishers, crabbers, shrimpers), Panacea Oyster Growers Association (oyster farmers), and Mississippi Commercial Fisheries United (shrimpers, oyster harvesters, fishers, crabbers, shellfish farmers).

Recent engagement with Mary Queen of Vietnam Development Corporation, representing shrimpers and oyster harvesters in Mississippi opened prospects to include and represent the Vietnamese fisherfolks in surveillance efforts. This partnership would support representation of Vietnamese fishers vital to the regional fisheries but who were not represented in previous survey efforts or engagements. Pandemic-related challenges prevented this effort at the end of the current project cycle, however a path forward to engage with these fishers in the future is bright and functional.

Specific Aim 1b. *Develop, pilot, validate and implement an in-person questionnaire in Gulf coast fishery communities to relate occupational health and safety with environmental and personal risk factors.*

The questionnaire was validated and piloted in YR01 and 02 of this project and survey implementation was conducted YR02-04. Expansion of participant numbers was limited in the second half of the project due to COVID-related travel restrictions and logistics. Excluding pilot studies, 73 participants representing 138 cross-sector commercial fishing jobs contributed data for 192 self-reported injuries. Participants represented multiple work sectors including commercial shrimping, oyster dredging, oyster tonging, crabbing, finfishing, clam farming, oyster farming and charter fishing. (Figure 1)

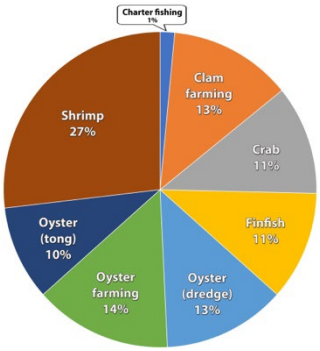


Figure 1. Representative Work Sectors

Participants across fishing sectors were predominantly white, male, with average age of 49 years. representing an aging workforce. Participants had an average of 22.1 years work experience, with shrimpers, oyster fishers and crabbers having the greatest number of work years (27-30 years), and oyster farmers, that represent a new Gulf commercial fishing industry, the least number of work years (3 years). 46% of participants had some form of health insurance.

Injury classifications and severity (Figure 2) were defined by BLS's Occupational Injury and Illness Classification System (OIICS). There were 192 injuries reported from 73 commercial fishers across all sectors, averaging 2.6 "significant injuries" per worker over their reported work history. 51% of all injuries reported were limiting injuries, i.e., injury outcome prevented workers from engaging with routine job tasks and/or involved missed workdays. The nature of injuries endured by fishers was broad. The most frequently reported injuries included punctures, soreness/pain (mostly lower back pain), soft tissue damage, skin infections, dislocations and fractures. All work sectors reported injuries of moderate or greater severity; shrimpers, oyster dredgers and oyster tongers reported injuries of serious severity.

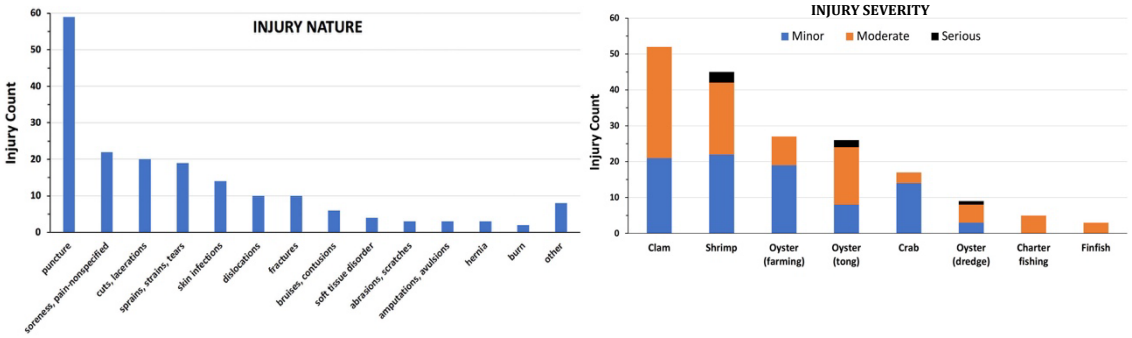


Figure 2. Injury Classifications and Severity

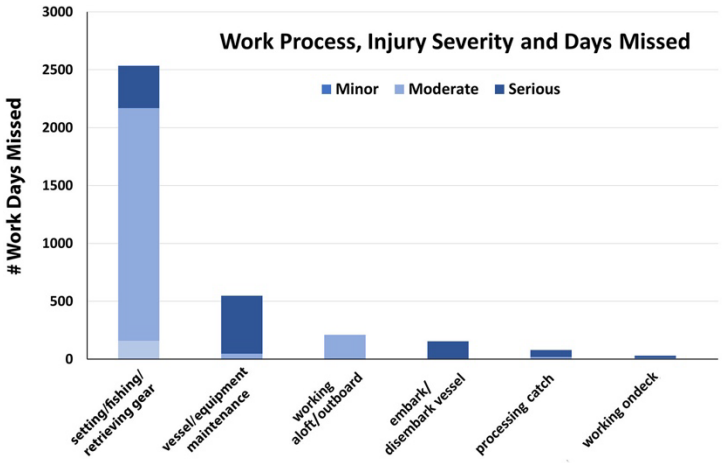


Figure 3. Work Process, Injury Severity and Days Missed

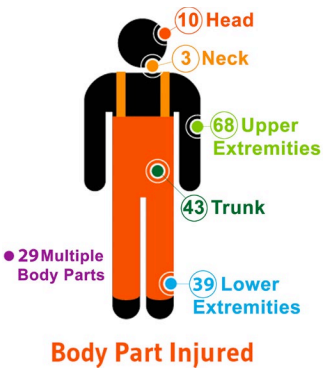


Figure 4. Most injuries involved upper and lower extremities, although injuries to the head, neck and trunk injuries were not uncommon.

Injury severity scores were not associated with job task limitations or missed work days. Lost work days across all sectors were often associated with injuries sustained while setting, fishing or retrieving gear, and while doing equipment or vessel maintenance. Cumulative injury rates per worker-year ranged from 0.02-0.18 across work sectors. With the exception of oyster farmers injury rates were not associated with worker age or number of years worked. Oyster farming is a new industry on the Gulf coast. At the time of our surveillance, most oyster farmers had less than 4 years related training or work experience. The injury rate per worker-year for oyster farmers was 0.46, higher than any other sector examined in the study. In other words, injuries reported by oyster farmers were far more frequent than injuries reported in other work sectors, although these injuries tended to be less severe than injuries reported in other sectors, and involved fewer missed work days associated with occupational injuries. Most oyster farmers reported lower back strain and pain, cuts and lacerations, and skin infections associated with job task ergonomics and lack of experience handing gear, respectively). Nevertheless, cumulative injury rates per worker-year across all work sectors were remarkably low and, based on insights from working with fishers, indicates notable under-reporting.

Specific Aim 1c. *Conduct workplace observations with fishery workers on boats, in processing facilities, and at points of distribution to supplement questionnaire-based health and safety. Workplace observations were recorded using photos and video, and when possible, engine room noise levels were measured.*

Workplace observations were not conducted in the final third of this project due to COVID-related travel restrictions and logistics. Onboard workplace observations from 15 participants representing shrimping, oyster dredging, oyster tonging, clam aquaculture and oyster aquaculture have provided observations to help interpret surveillance data and provide hazard imagery to assess and compare across vessels and fisheries. Photo- and videographic data from observations have been compiled and are under review to (1) visualize risk factors as described by surveyed participants (2) discern variability of vessel structure and operations within fishing sectors, and (3) examine opportunities for risk and hazard reduction that can be communicated in participating communities as part of project outreach and feedback.

Specific Aim 2. *Assess the potential to apply functional intervention(s) to address risk factors associated with specific hazards and negative health outcomes in the different fishery subsectors in the study region.*

Data from questionnaires, workplace observations, and stakeholder discussions were used to inform a list of intervention opportunities to reduce injury risk hazards. With input from community partners we observed severe or acutely debilitating injuries were more common on shrimp boats compared with vessels used in other fishing sectors and included winch-related injuries and being struck by gear. Less severe, but more common types of injuries include chronic lower back pain from heavy lifting and repetitive tasks, and hearing loss from working adjacent to engines, tumblers or sorters. Rushing, fatigue and working solo are risk factors across fishing sectors associated with a spectrum injury outcomes. Relevant intervention opportunities will be complied from surveillance data and shared with stakeholders as part of community outreach. Discussions for implementation options will provide pilot data to inform future adoption frameworks and the development of evidence-based intervention that provide efficacy and value across work sectors. Interventions opportunities discerned from current data include (1) dampening pads to reduce noise exposure associated with shellfish sorters, (2) hearing protection to reduce noise exposure associated with shellfish tumblers, (3) mechanical and behavioral adaptations to reduce risk of traumatic stingray puncture injuries, and (4) job task ergonomic considerations to reduce lower back strain and pain.

Workplace observations provided important perspectives for surveillance data analyses, discerning opportunities for hazard risk reduction and interventions that could have value and can be adopted by working fishers. **Top**, L to R: Discussions with the captain in the wheelhouse while underway on shrimp boat out of Biloxi, MS; Harvesting clam bags by hand in Cedar Key, FL; Harvesting clam bags using overhead winch. **Middle:** Setting skimmer frames (and nets) on shrimp boat using winch catheads; and Sorting clams - this process can take several hours each workday and involves noise levels that are associated with hearing loss. **Bottom:** Oyster tonging in Apalachicola Bay. Intervention opportunities pictured include: (1) use of overhead winch to reduce worker time in the water, risk of stingray puncture injury and lower back strain; (2) consistently using shuffle technique when doing in-water job tasks to avoid stingray encounters; (3) relocating access for power take-off controls and extending level-winders away from winch drums; (4) Acoustic dampening pads for sorting machine diverters to reduce chronic noise exposure; and (5) Hydration, closed-heeled shoes and swimming lessons for oyster tongers who reported dehydration, slips, trips and falls, and drownings because many are not good swimmers or cannot swim.

Dissemination

Project updates and summary results have been shared with participating communities during online or in-person stakeholder meetings throughout the project. These include the Cedar Key Aquaculture Association, Panacea Oyster Growers Association, Franklin County Seafood Workers Association, Mississippi Commercial Fisheries United and OysterSouth. Efforts in YR05 have included communications with community partners to optimize approaches, timing and venues for project (surveillance) outreach with stakeholders. Multi-sector community outreach from surveillance studies with shrimpers, oyster dredgers, and other fishers in Mississippi will be facilitated by Ryan Bradley, President, Mississippi Commercial Fisheries United. Outreach with oyster farmers, Gulf-wide, will be facilitated through OysterSouth (Beth Walton), Cedar Key Aquaculture Association (Rose Cantwell) and the Panacea Oyster Cooperative (Tim Jordan). Outreach with clam farmers will be facilitated by Rose Cantwell, Cedar Key Aquaculture Association, and Sue Colson, including an occupational health and safety outreach module for vocational training in shellfish production in the high school. Outreach with commercial oyster tongers, shrimpers and crabbers in Apalachicola and Eastpoint, Florida will be supported by Eric Lovestrand, Florida Sea Grant Extension.

Plans during the next reporting period include community-specific project outreach development and implementation, including intervention opportunities as informed by study, and manuscript preparation.

Conclusions

This community-based NIOSH research project developed new, and strengthened existing, academic-industry partnerships in commercial fishing communities along the northeastern Gulf coast. Research efforts provide non-fatal injury surveillance data for commercial Gulf fishers in Florida, Alabama and Mississippi. Project efforts have expanded stakeholder networks based on engagement with the project team. Working relationships with community partners within these industry sectors afford prospects for long-term working partnerships, opportunities for longitudinal surveillance, and development of numerous behavioral and mechanical interventions. Application of dissemination and implementation science approaches to discern intervention barriers and facilitators offers great opportunity to have "culture of safety" discussions, offer interventions based on community input and surveillance data, and develop evidence-based interventions that can be adapted for different stakeholder groups with similar hazard exposures.

Dissemination and translation of surveillance data, and application of implementation research in out-years will provide metrics to discern diffusion of knowledge shared with stakeholders, intervention adaptability for individuals and specific work sector environments, and facilitators and barriers to intervention adoption. Topical areas informed by our current studies might include: (a) "Winch Talk:" Community forum to discern self-reported winch injuries and close calls, risk factors, solutions, alternate configurations an procedures for operating specific gear; (b) being a professional; (c) keeping your deckhand; (d) hearing loss; (e) chronic lower back pain; and (f) use of PFDs (life jackets).

The COVID-19 pandemic substantially curtailed field travel to expand the number of participants, amidst a general downward trend over the past decade in the number of commercial fishing vessels leaving the docks to fish. Success to expand the project to include burgeoning coastal clam and oyster aquaculture sectors has been successful based on inclusion of clam farmers from Florida and oyster farmers from Florida, Alabama and Mississippi.

In the past year we have developed a pathway to include Vietnamese shrimp and oyster fishers in Mississippi based on the establishment of a new community partner, Mary Queen of

Vietnam Development Corporation (MQVN), MQVN has enthusiastically agreed to provide capacity for direct access to stakeholders and recruitment, language and cultural translation, and data analysis and outreach. Logistics to engage with MQVN and the Vietnamese American fishing community in Mississippi have been delayed due to the pandemic and are postponed for the immediate future. We jointly anticipate that this opportunity will avail itself in the renewal cycle to include representation from this vital component of the northern Gulf shrimping sector.

Pandemic-associated logistical challenges affected additional recruitment in the second half of the study; a re-focus was placed on translation of existing survey data into the CDC Occupational Injury and Illness Classification System (OIICS), developed by the Bureau of Labor Statistics. This effort supported the parsing important descriptive data into standardized categorical coding structures, consistent with other OHS reporting across industries. Four hierarchical coding structures within OIICS were used to capture (1) the nature of the injury or illness; (2) the part(s) of the body affected by the injury or illness; (3) the source and secondary nature the injury or illness; and (4) the event or exposure. Data from all participants in all fishing sectors was captured and analyzed using OIICS-formatted data sets. Workplace observations are being incorporated with survey data to discern upstream and downstream risk factors for injuries across sectors, and inform opportunities for interventions and professional development for stakeholders.

Publications and Presentations

Dunleavey K, Kane AS, Coffman AB, Reidy J and Bishop MD. 2021. Effectiveness of participatory ergonomic self- management strategies for chronic low back pain in seafood workers. Journal of Occupational Rehabilitation. DOI: 10.1080/10803548.2021.1935543.

Dunleavey K, Bishop MD, Coffman AB, Reidy J and Kane AS. 2021. Chronic lower back pain in aquaculture farmers: Adoption and feasibility of self-management strategies introduced using a rapid prototype participatory ergonomic approach. Journal of Agromedicine. *In review*.

Rash R and Kane AS. Environmental and Human Behavioral Risk Factors for Traumatic Stingray Puncture Injuries in Cedar Key Clam Harvesters. Presented at the 4th Southeast Regional Research Symposium (SERRS), February 17-18, 2021

Rash R and Kane AS. 2021. Preliminary reporting of injury observations, risk factors, and outreach staging with Cedar Key Aquaculture Association and Cedar Key City Council. May 10, 2021.

Rash R. 2021. Environmental and Human Behavioral Risk Factors for Traumatic Stingray Puncture Injuries in Cedar Key Clam Harvesters. Masters of Science Thesis, University of Florida.

Rash R, Brooks RM, Myers M, Durborrow R and Kane AS. 2021. Environmental and Human Behavioral Risk Factors for Traumatic Stingray Puncture Injuries in Cedar Key Clam Harvesters. Journal of Shellfish Research *In preparation*.

Kane, AS, Brooks RM, Rash R, Myers M, Durborrow R and Kane AS. 2021. Occupational health and safety of commercial clam farmers in Cedar Key, FL: Injury severity, job task limitations and intervention opportunities. Journal of Shellfish Research *In preparation*.

Coker E, Brooks RM, Myers M, Durborrow R and Kane AS. 2021. Surveillance of non-fatal injuries of commercial seafood harvesters in northeastern Gulf coast communities. Journal of Agromedicine *In preparation*.

Kane AS, Brooks RM, Rash R, Coker E, Durborrow R and Myers M. 2021. Workplace injuries and observations of commercial seafood harvesters in Florida, Alabama and Mississippi Gulf coast communities. Journal of Safety Research *In preparation*.

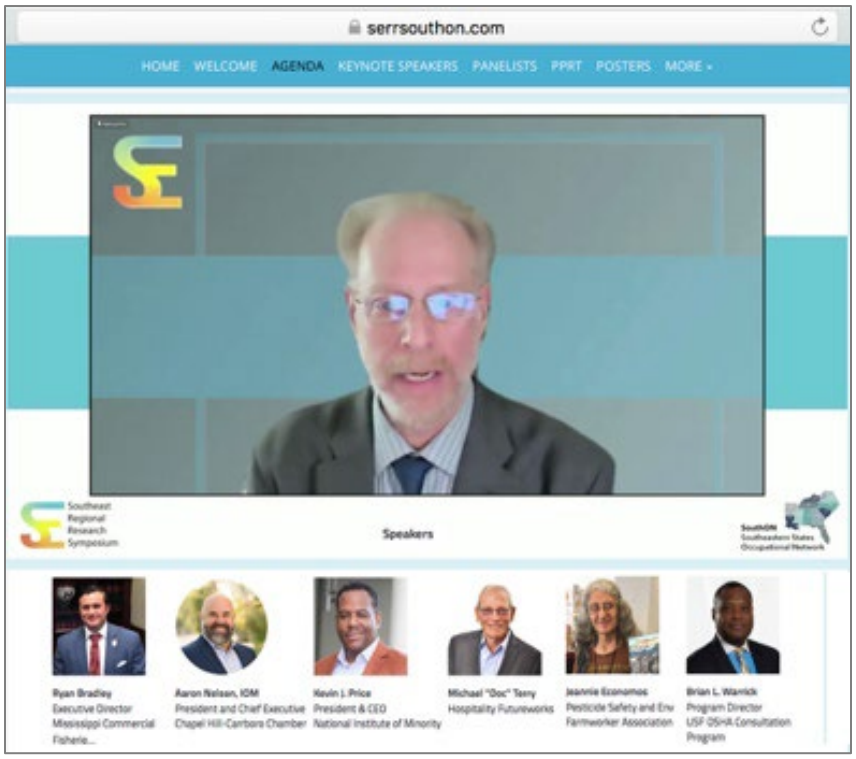
Dunleavey K, Kane AS, Coffman A, Reidy J and Bishop M. Effectiveness of participatory ergonomic self-management strategies for clam farmers with chronic low back pain. 4th Southeast Regional Research Symposium (SERRS), February 17-18, 2021

Kane AS. Co-host and Panel Lead: Industry Challenges Lunch-and-Learn with representatives from agriculture, fisheries, small and minority businesses and hospitality at 4th Southeast Regional Research Symposium (SERRS), February 17-18, 2021. This symposium serves five NIOSH centers in the SE region including faculty, professional students and trainees, departments of health and industry stakeholders within the region. Over 400 registrants and approximately 230 attendees with active engagement in sessions.

Website(s) and other Stakeholder outreach – include URL(s)

4th Southeast Regional Research Symposium (SERRS) website: https://www.serrsouthon.com

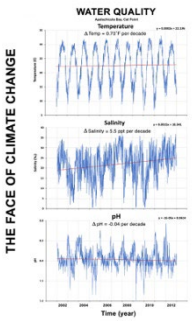
Kane, Co-host and co-organizer. This symposium serves five NIOSH centers in the SE region including faculty, professional students and trainees, departments of health and industry stakeholders within the region. Over 400 registrants and approximately 230 attendees with active engagement and live online attendance throughout the conference. (Left): Kane leads the Lunch & Learn Panel on COVID Industry Impacts during the 4th Southeast Regional Research Symposium (SERRS) https://www.serrsouthon.com/agenda/session/451167.



Gulf Coast Grown, Online Support for Beginning Oyster Farmers. Website: https://oyster-culture.teachable.com

In association with the Institute for Food and Agricultural Sciences (UF IFAS) and Florida Sea Grant this NIOSH project will support occupational health and safety needs of coastal oyster farmers with safety outreach informed by studies with clam and oyster farmers in Florida, Alabama and Mississippi. Contributions to these outreach programs provides an excellent research-to-practice conduit, and valued stakeholder support. https://oyster-culture.teachable.com/courses/1373938/lectures/34711172

Below the Waterline, an outreach exhibit focusing on a lost oyster fishery, disappearing oyster habitat, climate change, shell parasitism and oyster disease, species shifts. This art-and-science installation includes 23 framed photographs and mixed media and invites viewers to jump back in time through a portal, back before 2011, to when oysters grew at densities that supported a world-class fishery. The exhibit was designed to provoke discussion about the value of the habitat, the fishery, habitat management and restoration, and ecosystem services provided to the environment and to coastal communities. The exhibit was inspired and supported by oyster tongers from Apalachicola, Florida who we have worked closely with this project and have greatly supported this occupational health and safety surveillance study. The exhibit is scheduled to make its engagement in Apalachicola in November at the Apalachicola National Estuarine Research Reserve where the seafood harvesting and resource management communities, in addition to the general public, can visit and engage in an opening science cafe.



Heat and Pesticide Stress in the Kidney

PD/PI: Christopher Vulpe

Overview

Agricultural workers in hot and humid climates are subjected to a unique combination of occupational stressors that impact health. An epidemic of chronic renal disease of unknown etiology in primarily young agricultural workers of Central America and other countries has focused concern on potential occupational hazards affecting kidney function. Specifically, heat stress in agricultural workers may alter and interact with chemical exposure to impact kidney function. However, no study to date has examined whether heat stress increases the renal toxicity of agricultural chemicals to which farmworkers are exposed. Ultimately, it will be important to determine whether such an interaction occurs among workers under field conditions. A first step is demonstration under controlled conditions whether or not this interaction exists in a systematic animal study. The central hypothesis in this two-year exploratory study is that heat stress comparable to that experienced by farmworkers increases the renal injury from nephrotoxic insecticides and herbicides.

Aim 1: Characterize the nephrotoxicity of the most commonly used formulations of an insecticide, permethrin, and two herbicides, paraquat and glyphosate in the rat. These pesticides are chosen based upon existing evidence of nephrotoxicity in laboratory animals, evidence of an association between exposure and renal disease in farmworkers, and extensive agricultural use in the Southeastern U.S.

Hypothesis: Sub-chronic exposure to permethrin, paraquat, and glyphosate commercial formulations produces renal injury in the rat.
The study team will: a) establish dose-response relationships for nephrotoxicity of each pesticide formulation; b) develop a descriptive profile of the renal toxicity of each agent based upon histopathology and patterns of elevation of existing renal injury biomarkers; c) comprehensively assess the biological response of the exposed kidney through coordinated assessment of changes in gene expression and metabolism.

Aim 2: Develop a model of hyperthermia and mild dehydration in the rat resembling heat stress in Southeastern US agricultural workers.

Hypothesis: Hyperthermia and dehydration comparable to that observed in Southeastern U.S. farmworkers produces minimal evidence of renal injury using standard assessment methods.
The study team will: a) determine the influence of elevated ambient temperature on core body temperature and dehydration in rats; b) develop a set of exposure conditions producing core body temperature elevations and dehydration comparable to those observed in farmworkers in the ongoing NIOSH Girasoles study; and c) determine whether hyperthermia produced in the model is associated with renal injury, and if so, develop a descriptive and molecular profile of renal toxicity as in Aim 1.

Aim 3: Determine the combined effect of heat stress and pesticide exposure on renal injury in rats.

Hypothesis: Heat stress produces a significant increase in the renal injury produced by pesticides.
The study team will: a) assess the nephrotoxicity of permethrin, paraquat, and glyphosate in the presence and absence of heat stress using doses and conditions established in Aims 1 and 2; b) determine whether the effects of heat stress and pesticides on the kidney are interactive, i.e., greater than additive; c) evaluate the biological and pathological effects using both traditional and molecular endpoints. Together, this two-year study will provide a critically needed animal

study on the potential role of two commonly encountered conditions for Southeastern farmworkers, heat stress and pesticide exposure, on kidney function. This effort will inform the development of mitigation strategies, if necessary, to prevent or minimize risk to farmworkers. In addition, this work establishes a framework for the subsequent evaluation of additional pesticides of concern identified by ongoing work within the NIOSH Agricultural Health Center at the University of Florida.

Key Accomplishments in 2020-2021

Chronic Kidney Disease of Unknown Etiology is unexplained disease impacting farmworkers in regions with climates similar to Florida. Heat Stress and/or Pesticide Exposure may play a role in the development of kidney disease in Farm Workers. Farmworkers are subject to both heat and pesticides - both could independently affect Kidney Function. Combined exposure may lead to more adverse effects. The project goal is to assess the independent and combined effects of pesticide exposure and heat stress on kidney function in a controlled model system.

Aim 1.

- Identified acute and short-term exposure conditions with the three pesticides, permethrin, paraquat, and glyphosate, that result in limited but appreciable renal toxicity in a rat model.
- Identified early glomerular indicators of pesticide toxicity by systematic evaluation of multiple histopathological approaches for assessing acute renal toxicity.
- Evaluated existing urinary protein biomarkers of renal toxicity and identified dose dependent changes in urinary osteopontin (OPN) levels in rats exposed to glyphosate and permethrin, but not paraquat.
- Developed novel urinary biomarkers for assessing renal toxicity based on lipidomic analysis of urinary exosomes.

Aims 2 and 3.
The investigative team validated an approach for real time internal monitoring of heat stress of rats in environmental chambers to model heat stress in agricultural workers and identified environmental conditions to mimic the 1˚-1.5˚ C observed increase in body temperature in heat stressed agricultural workers in our controlled rodent model.

Results

The investigative team evaluated the nephrotoxicity of three commonly used pesticides, permethrin, paraquat and glyphosate in the rat to establish the baseline for interaction studies with co-exposure to heat stress. A series of dose/time exposure studies were carried out with each pesticide to identify the appropriate pesticide/dose/time for further analysis in the heat and pesticide exposure study. Systematic evaluation of multiple potential histopathologic endpoints of renal toxicity was completed. As chronic kidney disease of unknown etiology has been associated with both glomerular and tubulo-interstitial pathology, the team carefully evaluated both these regions. Increased podocyte immunoreactivity to desmin antibody with glyphosate and paraquat exposures indicative of glomerular filtration membrane insult was noted (See Figure 1).

Intriguingly, given the association of CKDu with tubulo-interstitial disease, the investigators also noted increased desmin immunoreactivity in the renal tubular interstitium in the paraquat exposure. Multiplex urinary protein biomarker analysis was completed in an effort to identify existing biomarkers correlated with early renal toxicity endpoints. A dose responsive change in urinary OPN with exposure to glyphosate and permethrin was observed, but none of the existing

biomarkers showed a clear correlation with renal histopathology suggesting that additional biomarkers of early renal toxicity are essential. In addition to the utilization of existing biomarkers, we also developed protocols for novel biomarker identification based on urinary exosomes including exosome characterization, miRNA isolation and lipidomics analysis which will be utilized in the continuing studies. The lipidomics analysis is particularly promising and multiple candidate biomarkers are being evaluated.

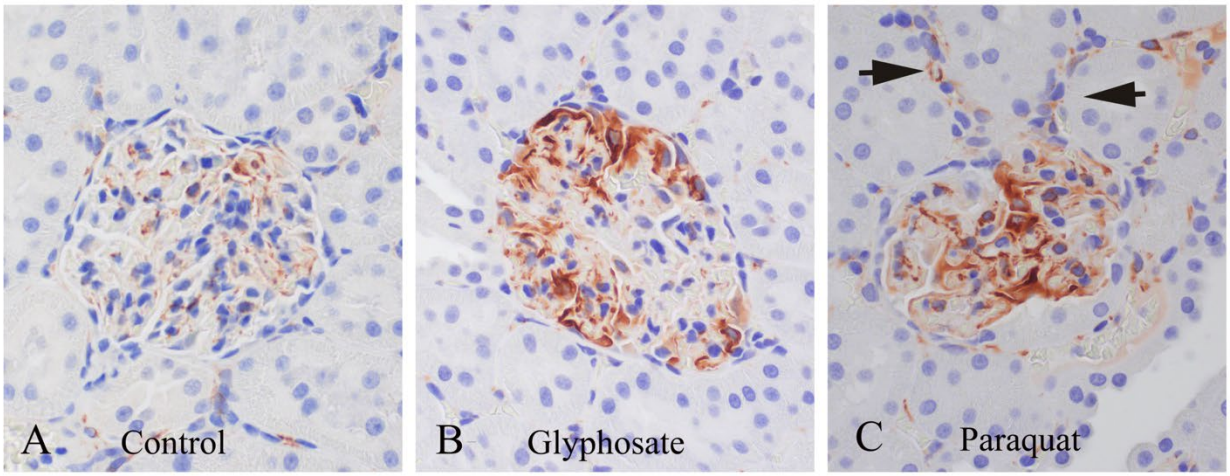


Figure 1. Increased desmin reactivity in podocytes after Glyphosate and Paraquat treatment. A. Sample control glomerulus. B. Glyphosate 50mg/kg administered 2 weeks. Cytoplasm of podocytes has increased immunoreactivity for desmin intermediate filaments. C. Paraquat 25mg/kg administered 3 weeks. Cytoplasm of podocytes has increased immunoreactivity for desmin. Interstitium between tubules also have increased immunoreactivity to desmin antibody, likely within perivascular fibroblast. Desmin antibody 600x magnification.

Additional Findings

1. Microvesicles purification and characterization

Microvesicles have been purified from 20 ml rat and human urine using methods developed in the Alli lab that involve filtration through a 0.2 mm filter followed by ultracentrifugation. In general, microvesicles have diameters ranging from 55 to 129 nm and concentrations ranging from 5E+9 to 6E+10 particles/ml. Fig. 1 illustrates NanoSight profiles for rat exosomes (Fig.1A), humans with reduced kidney function (RKF) (Fig. 1B) and humans with acute kidney injury (AKI) (Fig. 1C). Microvesicles will be further characterized by western blot.

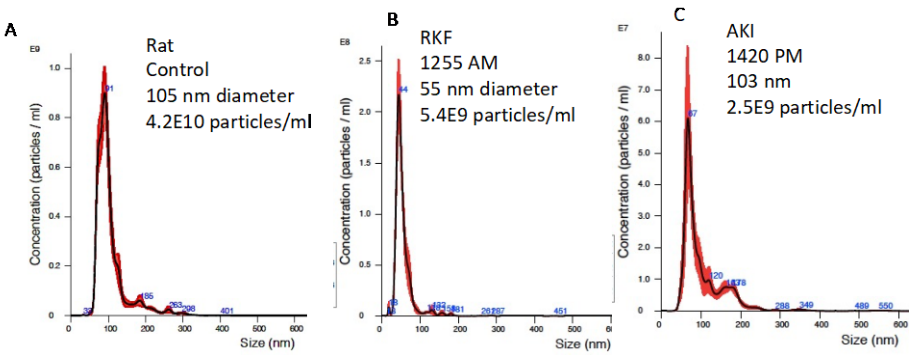


Figure 1. NanoSight characterization of size of microvesicles isolated from (A) control rat urine, (B) urine from workers with reduced kidney function (RKF) and (C) urine from workers with acute kidney injury (AKI).

We have performed pilot experiments with microvesicles isolated from control human urine to obtain miRNAs that look promising for sequencing (Fig. 2). The kit we use focuses the isolation of small RNAs < 300 nts, which includes miRNAs.

We have also successfully performed lipidomics on microvesicles isolated from human urine that shows promising differential lipid expression depending on whether the urine was obtained from individuals with no kidney disease, individuals with reduced kidney function (RKF) or acute kidney injury (AKI) (data included in the main body of the proposal). A larger group of agricultural workers are needed to help validate the utility of the biomarkers.

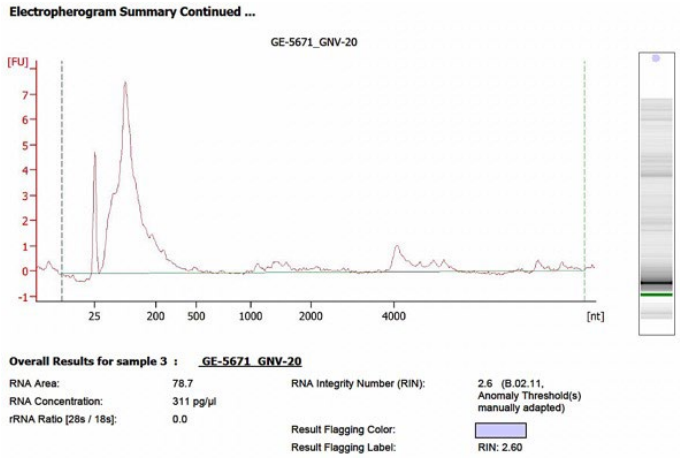


Figure 2. Small RNA isolation from control human urine and analyzed on the PicoChip with the Agilent bioanalyzer. A yield of 311 pg/ul indicates that we will have sufficient RNA for library construction and sequencing by Illumina.

2. Traditional biomarkers for kidney disease. We have piloted Luminex panels for rat and human kidney disease some of which correlate well with the assignment of reduced kidney function or acute kidney injury in humans (data included in the main body of the proposal). Similar biomarkers for rats seem to correlate with histologic determination of early kidney disease. We also measure creatinine, osmolality and refractive index in order to be able to normalize the data to a similar endpoint.

3. Rat renal histology. We carried out a systematic effort to identify renal pathologic changes associated with pesticide exposure in the rat. As noted in the proposal, analysis is conducted primarily by Dr. John Roberts, in a blinded fashion. He is focusing on renal regions previously identified as altered in CKDu. Sampling areas for transverse section of rat kidney that we routinely analyze are shown in Fig. 3. Both routine and special stains were used to examine the rat tissues from rats exposed to paraquat, glyphosate and permethrin (Fig. 4). We used immunohistochemistry to evaluate intermediate filaments and inflammatory components in various cell types (Fig 5). As described in the proposal, we noted preliminary evidence of altered desmin staining of podocytes in glyphosate exposures (Fig. 6) which will be further evaluated in the proposed work. In addition, we also carried out quantitative measurements of specific areas of the renal architecture and found reduced glomerular size in (Fig 7) in glomerular size in glyphosate and paraquat exposures but not permethrin.

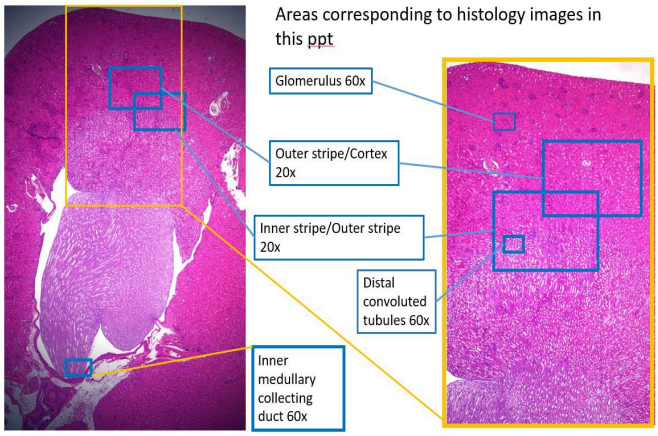


Fig. 3. Multiple regions of the rat kidney were analyzed by histology with a focus on glomerulus and interstitial regions.

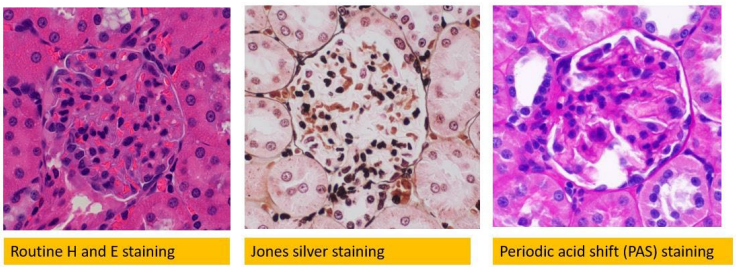


Fig. 4 Several routine and special stains were used to analyze histologic samples for pathologic changes.

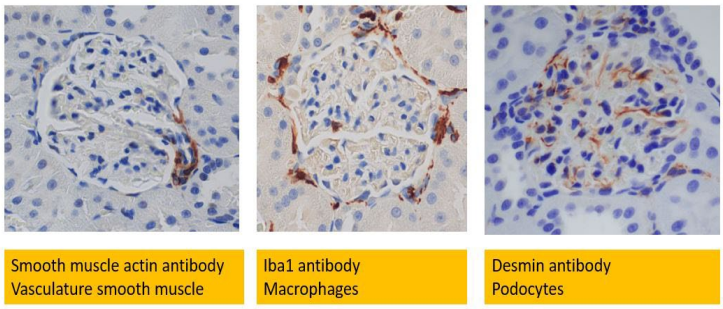


Figure 5. Use of immunohistochemistry to evaluate inflammatory markers in renal tissue.

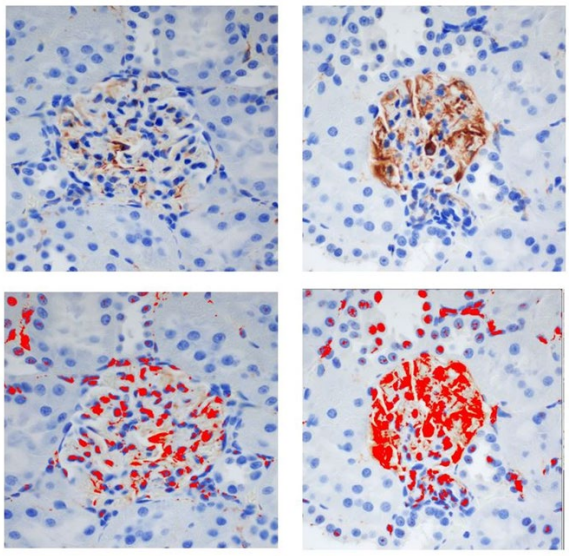
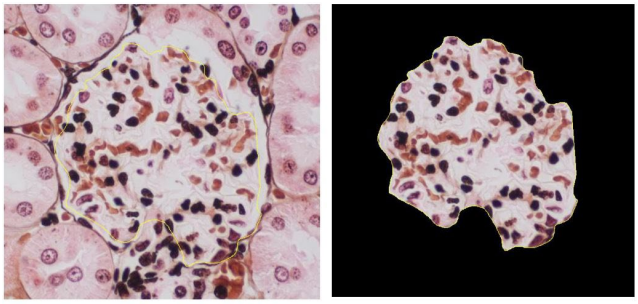
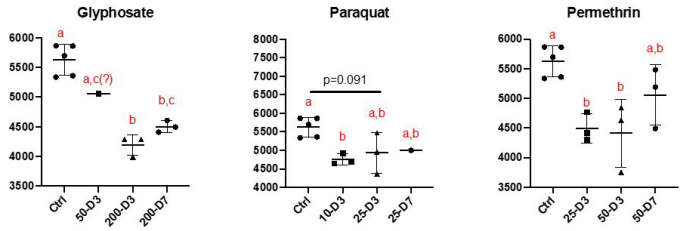


Figure 6. Altered desmin staining of podocytes in glyphosate exposure. Top panels are desmin staining and highlighted intensity of staining shown below



Jones stain - Glomerular basement membrane is isolated using lasso tool in ImageJ and can be cut out of digital images for specific analysis of morphometrics, nuclear staining or immunoreactivity specific to the glomerular area.



- All results showed as Mean ± SD.
- D3 stands for 3 days treatment, D7 stands for 7 days treatment.
- Each dot represents mean value of each individual rat.
- Analyzed by one-way ANOVA and Tukey's multiple comparisons test. Bars with different letters atop indicate significant differences from one other ($p<0.05$).

Figure 7. Paraquat and Glyphosate multiple doses at three days result in decreased glomerular size.

Outreach

The investigative team solicited input from Florida farmworker advocacy groups about our work subsequent to the 2020 annual meeting. This feedback has been important in our proposed studies going forward in year six. We also initiated a collaboration with another research group at the University of Colorado working on CKDu in Guatemala which will form the basis of continuing work in year six.

Conclusions

Acute pesticide exposure can result in observable renal histopathological changes. Each of the chemicals resulted in observable but subtle phenotypic differences at the dose and time points utilized. Glomerular changes, particularly increased podocyte cytoplasm, appear to represent reasonable histologic indicators of renal toxicity associated with pesticide exposure. Preliminary evidence of tubulointerstitial disease was noted with paraquat exposure although additional evaluation is required. Sub-acute paraquat exposure at doses which do not result in acute pulmonary toxicity but do result with evidence of renal toxicity was selected for further studies combining heat and pesticide exposure. Existing urinary protein biomarkers may be insufficiently sensitive to detect early signs of renal toxicity associated with pesticide exposure in the rat, although additional analysis will be carried out in co-exposure studies. Analysis of urinary exosomes, particularly through the use of lipidomics, were promising and candidate multi-lipid species biomarkers identified in Aim 1 will be further evaluated in subsequent work.

Pilot/Feasibility Program

J. Glenn Morris, Jr.
Farah A. Arosemena

Overview

The Pilot/Feasibility Program is a key component of the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS). This program provides seed funds to stimulate original projects relevant to health and safety in the agricultural, forestry, and fishery (AFF) industries. The Pilot Program awards high quality research that promotes collaboration between the Center and the Southeast partner communities, as well as builds a nexus for mentorship and development of new/early-stage investigators as they aspire to establish independent research. Projects may include basic/etiologic research, translational research, intervention studies, and/or surveillance.

The goal is to provide seed support to projects that ask innovative and important questions, and which lay the groundwork for subsequent research grant submissions or interventions. Successful implementation of the Pilot/Feasibility Program will ultimately expand research in health surveillance, air quality, respiratory health, pesticide exposure, mental health and health disparities of migrant and seasonal farmworkers and/or fishers. Some of the projects selected will be "high risk, high reward" novel ideas and approaches, with limited preliminary data, but with the potential for having a major impact. Cumulatively, across years 1 through 3, the *Southeastern Coastal Center for Agricultural Health and Safety* awarded 9 pilot research projects to improve the safety and health of agricultural workers.

Pilot Grant Awards

Cumulatively, the Southeastern Coastal Center for Agricultural Health and Safety has awarded a total of 11 pilot awards across the University of Florida, Florida State University, Florida A&M University, University of Maryland, Georgia Southern University and Migrant Clinicians Network.

Lynn Grattan, MD – Professor, Neuropsychology, University of Maryland
Pilot study of the acute psychological and health impacts of hurricane Irma in UFAS extension workers
Dr. Grattan examined 36 IFAS Extension Agents to explore Hurricane Irma's impact on health-related quality of life 6 to 8 weeks and at 1-year post disaster. Findings demonstrate that hurricane impact (exposure high versus low) predicted depression and PTSD. All participants obtained scores within the high average to very superior range on the Symbol Digits Modalities Test. Greater Hurricane Impact (home+work) was associated with elevated Depression, PTSD sx, Medical Symptoms 6- 10 weeks post hurricane (controlling for age and prior hurricane exposure).

	Beck Depression Inventory total score		Post Traumatic Checklist-5 Total Score		Total Number of Medical Symptoms	
	Coefficient (SE)	P value	Coefficient (SE)	P value	Coefficient (SE)	P value
Model 1:						
Exposure High vs. low	5.111111	0.036	11.22222	.01	5.111111	.002
Model 2:						
Exposure High vs. low	5.228696	.04	10.97848	.06	4.906668	.005
Past exposure	5.228696	.27	-.0248143	.97	.0126636	.57
Age	-.051819	.25	-.1153924	.47	.0126636	.83

TABLE 1. Depression, PTSD, No. of Medical Symptoms and Exposure (n=36).

John Luque, PhD – Associate Professor, Behavioral Sciences/Health Education, Florida A&M University

Aplicación Movil para Prevenir Agotamiento por Calor (AMPAC)

Pilot study of mobile app monitoring to prevent heat-related symptoms among Hispanic Farmworkers Farmworkers and supervisors or crew leaders showed enthusiasm for using the Heat Safety Tool. Since most farmworkers have smartphones, downloading the free app is feasible for them to download in most instances. 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 nonspecific 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 heat safety training for both crew leaders and farmworkers to reduce the risk of HRI, especially among less experienced farmworkers.

Gülcan Önel, PhD – Assistant Professor, Food and Resource Economics, University of Florida

Uncovering patterns of mental, physical and occupational health issues among migrant farmworkers with different sociocultural networks: A pilot study among Haitian and Mexican farmworkers in Immokalee, FL

Dr. Önel will establish her team in the data collection phase during Year 3 Quarter 4 to explore theextent to which migrant farmworkers with different ethnic backgrounds and social networks face higher risks of mental, physical and occupational health issues. The following marked key progress – 1) The study team completed interviews with 80 Hispanic workers, 2) Culturally-appropriate Haitian Creole translations of questionnaires, including mental health measures PHQ-9, GAD-7, and PROMIS-Social Isolation, and 3) CBPR: Better understanding of underlying socio-economic and cultural differences between Hispanic and Haitian farmworkers as they relate to mental and occupational health.

Kimberly Dunleavy, PhD – Associate Clinical Professor, Physical Therapy, University of Florida

Chronic low back pain in seafood workers: a pilot intervention study to identify modifiable work and movement solutions

Dr. Dunleavy has enrolled 28 subjects to conduct research on chronic low back pain in seafood workers. She will research clam workers in Cedar Key, Florida, to identify work-related movements and positions that aggravate or contribute to low back pain. Data analysis is in progress.

Antonio Tovar, PhD – Director, Farmworker Association of Florida

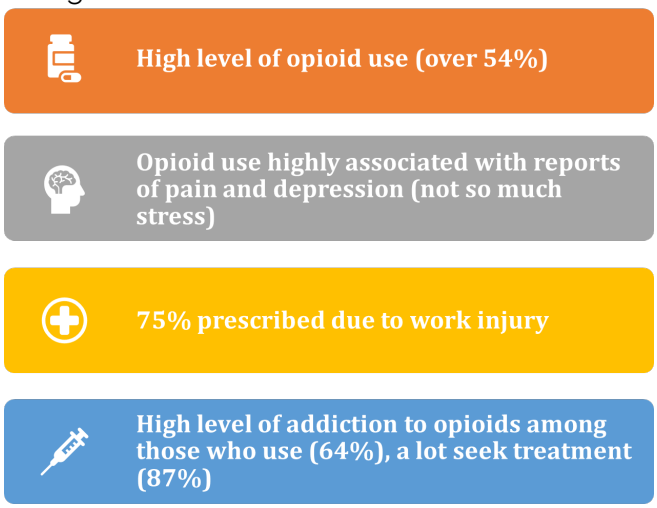
Agroecological practice in the face of climate change: Resilience, sustainability, and preparedness in Puerto Rico

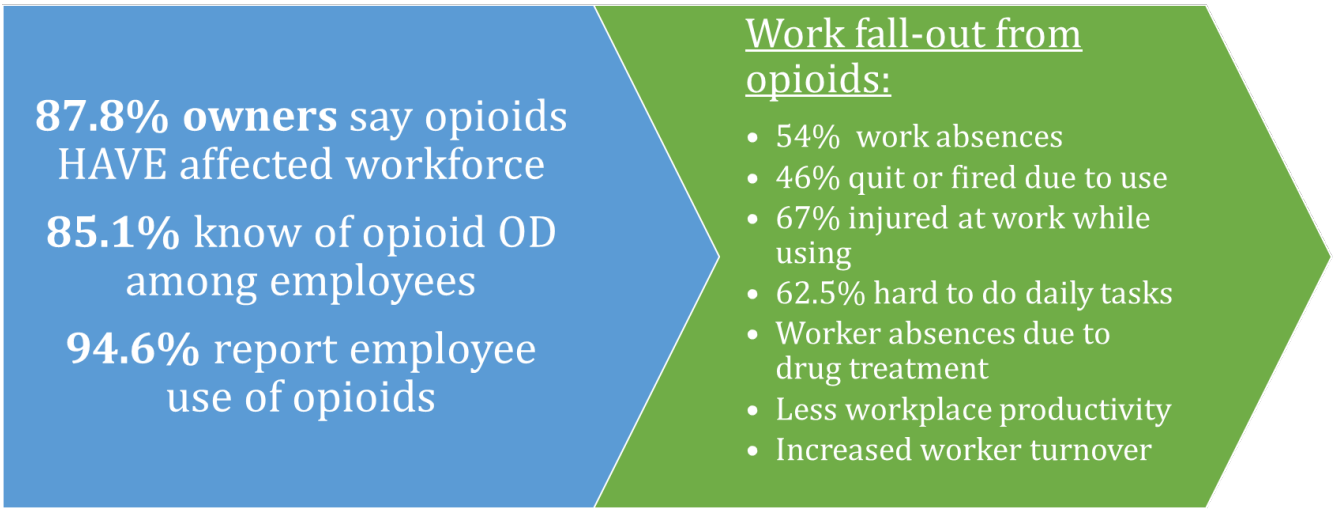
Dr. Tovar has completed training of study field assistants and data collection. The team surveyed the 5 geographical regions of Puerto Rico and compiled a list of 29 agroecology farmers, 15 conventional small-scale farmers, and additional 17 potential partners (i.e. extension officers, agricultural officials, and farmers associations). 50 surveys were completed by small farmers (<10 acreage): agroecology farmers, conventional farmers, and farmers using mix practices were interviewed. Data analysis is in progress.

Heidi Radunovich, PhD – Associate Professor, Family, Youth and Community Sciences, University of Florida

Understanding the scope of the opioid epidemic for agricultural industries

Data collection is in process and the total subjects to date are 132. Preliminary findings show that opioid use is strongly associated with pain among agricultural workers – of the people reporting opioid use, nearly 93% are reporting pain. However, pain is common for this population, with 86% of the total population reporting pain. Many who are experiencing pain do not take opioids (68%), so this begs the question: how are they managing their pain instead? The study team continues to observe a difference among the industries, with those in the nursery/landscape industry reporting much higher use of opiates (54%) than those in the livestock (7%) or crops (nearly 12%).





Gregg Stanwood, PhD – Associate Professor, Biomedical Sciences & Neuroscience

A novel approach to monitoring pesticide exposure in farmworkers

The goal of this study is to determine the feasibility of using sweat patches for biomonitoring pesticide exposure among immigrant Latino farmworkers. Laboratory experiments are underway to develop and assess the accuracy and precision of analytical techniques for assessing pesticide metabolites from sweat patches. Sweat and urine were monitored over a 1-week period (Sweat was sampled every 2 days and first void urines were collected every day. Only 1 sample each is being analyzed initially, but the PI will retain the ability to expand the analysis if warranted.

Atin Adhikari, PhD – Assistant Professor, Environmental Health Sciences, Georgia Southern University

Field evaluation of N95 filtering facepiece respirators against airborne dust and microorganisms during cotton harvesting

Dr. Adhikari has collected control air samples from three cotton farm locations and analyzed them for PM and culturable microorganisms. Respiratory deposition modeling data for particulate matter (PM) was presented in the inhaled aerosol dosimetry conference in Irvine, CA. Air sampling other field experiments at cotton farms continue during harvesting (by combine harvesters). Year 4 highlights include,

- The collection of air samples at three cotton farms have been completed. In addition to measuring the levels of PM_{10}, $PM_{2.5}$, PM_1, respirable, and total particle levels, the study team has measured total culturable bacteria, fungi, and abundance of airborne antibiotic resistance genes at all three farm locations.

- The respiratory deposition doses of PM_{10}, $PM_{2.5}$, PM_1 have been estimated by using the ICRP LUDEP computer-based respiratory deposition model. The study team has also used the Multiple Path Particle Dosimetry (MPPD) model. The new MPPD data is currently under analysis.

- The respiratory protection factors against airborne particles and total microorganisms during cotton harvesting have been determined by using a manikin fitted with N95 filtering facepiece respirators. We have also completed measuring the ATP levels (as a measure of total microbial activity) inside and outside of respirator surfaces.

Overall, all project tasks are now completed except for the additional analysis of respiratory deposition doses by using the MPPD model. This analysis part of the project is delayed because the student assistant was unavailable due to COVID-19 related university closure.

Results (March 2020 – September 2020)

Dr. Adihikari completed the analysis of airborne bacterial antibiotic resistance genes (ARGs) in air samples collected from cotton farms during this reporting period (March – September, 2020). Bacterial colonies were harvested from the agar plates, and the total genomic DNA (gDNA) was extracted using the PowerSoil® DNA Isolation Kit (QIAGEN-MO BIO) as described previously by our group (Adhikari et al., 2017). DNA was employed to perform real-time PCR to quantify targeted major bacterial ARGs. The ARG's include β-lactams resistance genes (bla_{tem-1} and bla_{pse-1}) (Chen et al., 2004), an aminoglycosides resistance gene (*aac*(3)-*Iva*) (Chen et al., 2004), a tetracycline resistance gene (*tet*A) (Chen et al., 2004), a trimethoprim resistance gene (*dhfrI*) (Chen et al., 2004), a sulfomamide resistance gene *(sulI*) (Chen et al., 2004), a chloramphenicol resistance gene (*flo*) (Chen et al., 2004), a phenicol resistance gene (*catIII*) (Maynard et al., 2003), a glycopeptide resistance gene (*van*C) (Clark et al., 1993), and a macrolide resistance gene (*erm*B) (Gevers et al., 2003). The positive control for detection used for ARG PCR was *Salmonella typhimurium*. A series of comparative critical threshold ($\Delta\Delta C_T$) real-time PCR was used to quantify targeted major ARGs with reference to bacterial 16S rRNA gene as described previously (Zhu et al., 2013).

The figure below is showing a heatmap displaying the relative abundance of selected antibiotic resistance genes (ARGs) in different air samples collected from cotton farms during harvesting related work activities.

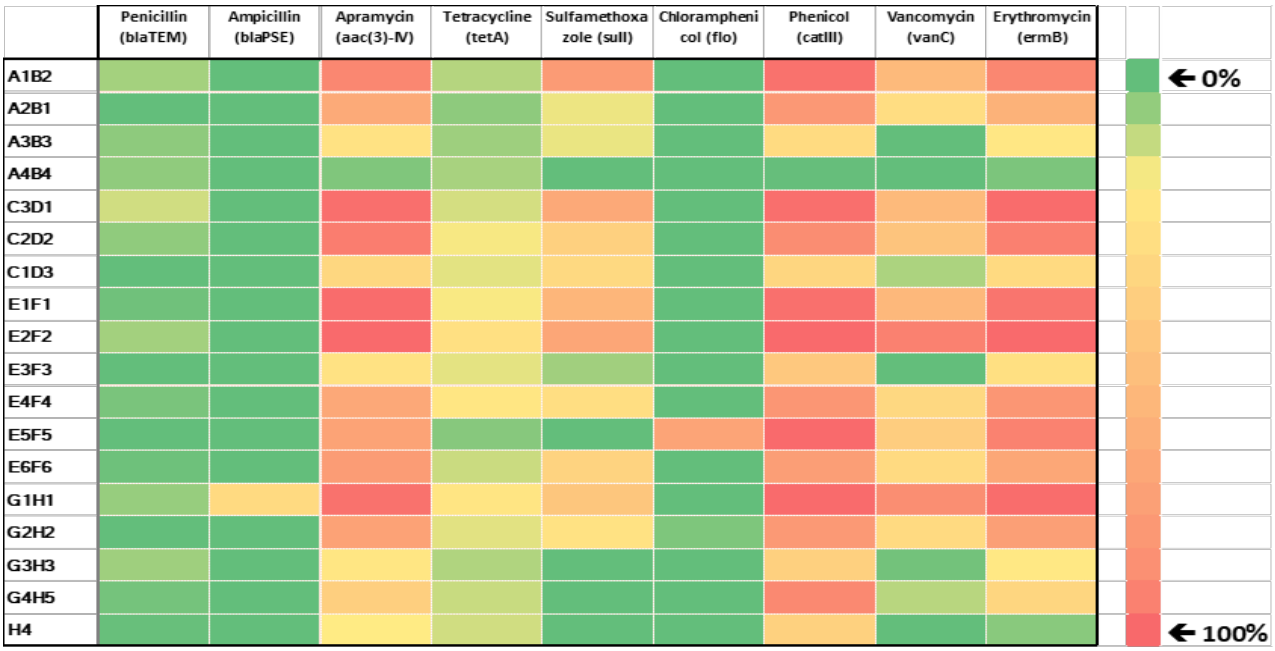


FIGURE 1. Heatmap: Relative abundance of selected ARGs across air samples from cotton farms during harvesting related work.

Conclusions

The abundance of antibiotic resistance genes (expressed in % with respect to 16S gene copies per unit sample volume) for phenicol, apramycin, and erythromycin were relatively higher (96.60±35.68%), (92.49±33.63%), and (85.98±26.49%) than other ARGs in the air during cotton harvesting works.

Outreach & Dissemination (conference presentations)

- Sherpa SD, Adeoye C, Thornton T, Adhikari A. Overall microbial activity on N95 respirator surfaces when used in an agricultural farm. "ICEM 2020: International Conference on Environmental Microbiology" April, 2020 in New York City, NY (virtual).
- Thornton T, Higgins D, Banerjee P, Adeoye C, Sherpa SD, Adhikari A. Exposure levels of bioaerosols and airborne antibiotic resistance genes in cotton farms during cotton harvesting. APHA 2020 Virtual Annual Meeting and Expo (Accepted).
- Thornton T, Adeoye C, Sherpa SD, Adhikari A. Airborne concentrations of $PM_{2.5}$ and PM_{10} at cotton farms during harvesting. Georgia Southern University Research Symposium, 2020, Statesboro, Georgia (accepted for presentation; the conference was canceled due to COVID-19).
- Adeoye C, Thornton T, Sherpa SD, Adhikari A. Respiratory protection against particles of 0.3 – 10 µm in cotton farms during harvesting. Georgia Southern University Research Symposium, 2020, Statesboro, Georgia (accepted for presentation; the conference was canceled due to COVID-19).

Eric Coker, Assistant Professor, University of Florida, Environmental and Global Health
A Pilot Study to Assess Personal PM2.5 Exposure and Respiratory Virus Infections among Farmworkers in the Southeast
The pilot is generating new PM2.5 exposure assessment data among farmworkers within the southeastern U.S., including exposure data among those working on different types of crops. The investigative team is using a real-time exposure monitoring device (MicroPEM). Real-time exposure monitoring data will enable us to not only determine the distribution of farmworker exposures and differences in exposure between the types of crops worked on, but also to assess within-day variability of personal PM2.5 exposures. Capturing within-day variability could be important in terms of pinpointing high-exposure episodes that could eventually lead to more targeted investigations aimed at identifying exposure-mitigation strategies.

The collection/analysis of farmworker nasal swab samples for the detection of viral carriage is another innovative approach characterizing viral carriage for multiple respiratory pathogens provides important baseline data. This is the first study that will characterize upper airway viral infection and co-infections among agricultural farmworkers using a highly sensitive, specific and state-of-the-art molecular detection technique to explore the feasibility of accessing and utilizing electronic medical records from MHCs for the purposes of active surveillance of ARIs.

Burden: Respiratory infections and dust exposure
- NIOSH data suggests elevated respiratory infection mortality rates among crop farmworkers
- Emerging evidence suggests respiratory risks associated with exposure to respirable agricultural dusts

Need: Fill knowledge gaps by generating preliminary data
- Occupational exposure to respirable particulate matter (PM2.5) is poorly understood among crop farmworkers in the southeast
- Little is known regarding types of respiratory infections as well as respiratory infection burden among crop farmworkers

Impact: Lead to follow up research to build on findings – CDC/NIOSH R01 November, 2020 submission (PAR-18-812), *Assess Personal Air Particulate Exposure and Respiratory Virus Infections among Farmworkers in the Southeast*

Preliminary Results. A standardized questionnaire that addresses farmworker sociodemographic characteristics, types of work-related agricultural crop/s and tasks, pesticide application, self-report of frequency and severity of ARI symptoms and related risk factors (e.g., smoking and family size), and self-report of medical diagnosis for chronic respiratory conditions was administered and personal PM2.5 air monitoring was implemented among Florida farmworker populations. Between January 10th through February 15th 2020, the study team recruited nine farmworkers who worked on fern harvesting in Pierson, Florida. Most participants were female (77%) and had a household income below $30,000 (55%). All participants self-identified as Mexican or Chicano and spoke Spanish fluently with only two who reported speaking English "well". More than half (55%) of participants reported having at least one ARI symptom in the past year and one participant reported wheezing in the past year. Less than half (n=4) reported having received an influenza vaccination in the past year. Preliminary data from eight participants resulted in an average work-shift PM2.5 concentration of 23.8 µg/m3 (sd=17.6; range=7.4, 56.3).

Publication. Coker, E. S., Cavalli, L., Fabrizi, E., Guastella, G., Lippo, E., Parisi, M. L., Pontarollo, N., Rizzati, M., Varacca, A., & Vergalli, S. (2020). The Effects of Air Pollution on COVID-19 Related Mortality in Northern Italy. Environmental & resource economics, 1–24. doi: 10.1007/s10640-020-00486-1. PMID: 32836855; PMCID: PMC7399615.

Marysel Pagán-Santana – Program Manager, Migrant Clinicians Network
Exploring mental health and natural disasters in agricultural communities in Puerto Rico
The overarching goal of this project is to adapt and pilot an assessment tool to explore mental health status using previously developed resources. The investigative team expects that the implementation and use of the developed tools will provide a pathway to effectively assess the mental health and resilience of agricultural workers in Puerto Rico as it relates to climate change and disasters (e.g. earthquakes). During Year 4, Dr. Pagán-Santana continued to identify culturally appropriate research methods and tools to better understand agricultural workers' mental health as it relates to natural disasters and climate change. The team analyzed/classified validated instruments related to agricultural workers health, climate perception, mental and behavioral health, and resilience using the following variables:

- Purpose description: Source, purpose, type of document (report, journal), topic
- Population description: literacy level, intended population, locations where it has been used
- Survey description: language, length (amount of questions), metrics

Next steps are to finish the analysis and classification and begin identification of key questions and indicators in the available tools by creating a questions bank for appropriate terminology and concepts for tool adaptation regarding culture and language. The study team will incorporate indicators to explore the effects of stressors (e.g. evacuation, displacement, housing damage, injuries and death, job insecurity, water, and crop loss) caused by disasters related to the climate crisis. In addition, they will look to incorporate indicators to explore the effects of stressors (e.g. evacuation, displacement, housing damage, injuries and death, job insecurity, water, and crop loss) caused by disasters related to the climate crisis.

Maria Morera – Assistant Research Scientist, University of Florida, Agricultural Education and Communication
Developing an Integrated Decision Support Tool and Network for WPS Respirator Compliance in Florida Agricultural Industries

Overview
Over the past five years, up to 27% of annual deaths from exposure to harmful substances or environments in the agriculture, forestry, fishing and hunting sector involved respiratory exposures (U.S. Bureau of Labor Statistics, 2019). Recent research reveals substantial knowledge gaps among US farmers regarding the proper selection and fitting of personal protective equipment (PPE) against respiratory hazards (Cramer et al., 2017). Findings indicate that farmers rely on local sources of information, such as farm implement dealers and retailers, yet there is evidence that these resources, including public health nurses and primary care providers, also lack appropriate technical knowledge. To improve respiratory PPE effectiveness, it is thus vital to increase knowledge among four interconnected audiences: farmers, pesticide handlers, agrochemical and PPE dealers, and healthcare providers. A key problem is a lack of respiratory safety research translation and user-friendly materials for farmers and industry intermediaries. The objective of this project is to develop customized decision support tools that address the complexities of new regulations on respirator selection, medical evaluation, and fit testing. The project is guided by the following four aims:

1. Evaluate needs for translational materials in respiratory protection through a survey of key stakeholders
2. Pilot-test the use of socially marketed audience-tailored decision support tools to clarify hazard communication labels, respirator selection, medical evaluation procedures, and fit testing

3. Perform an outcome evaluation to asses usage of translational materials per audience
4. Apply for funding to transition the support tool to a web-based format, scale up the intervention, and evaluate its impact on respiratory safety in Florida's agricultural workforce.

Key Accomplishments in 2021

Survey Research

Development and implementation of healthcare provider needs-assessment survey

A mixed-mode survey questionnaire, designed to investigate the availability of respirator medical evaluations among local healthcare providers in Miami-Dade County, their familiarity with Occupational Safety and Health Administration (OSHA) guidelines, experience with agricultural workers, and provision of assessments and forms in multiple languages, was constructed during the spring of 2021 and approved by UFIRB-02 in May. The survey was developed as part of the project's aims to evaluate the outreach needs of audiences that support the respiratory safety of farmers and pesticide handlers. Using a local directory, a list of health facilities in Homestead, Florida City, and Miami potentially providing services to agricultural workers employed in the Homestead area was subsequently compiled. Local practices and facilities specializing in occupational medicine were also included in the list. Healthcare administrators at these facilities were invited to participate in the survey and share it with their associates.

The 23-question needs-assessment survey was distributed via telephone and electronically using an anonymous link generated through Qualtrics survey software (Version 2020; Provo, UT). Survey questions, presented in multiple-choice, open-ended, and Likert-type formats, addressed the structure, frequency, and language of respirator medical evaluations, other services provided to agricultural workers, knowledge of OSHA's respiratory protection standard, and the need for resources including standardized document templates.

Results of healthcare provider needs-assessment survey

Healthcare administrators at ten of the facilities and practices contacted agreed to participate in the survey. The majority of these health facilities, however, did not offer respirator medical evaluation services or were not frequented by agricultural workers. Only those specializing in occupational medicine offered the service and just one received repeat referrals for that purpose from agricultural employers (Figures 1 -2). This facility also provided respirator fit-tests. Survey responses indicated the facilities specializing in occupational medicine more frequently based their determination of an agricultural worker's ability to use a respirator on a medical examination covering all areas included in OSHA's Respirator Medical Evaluation Questionnaire than on written responses to the questionnaire delivered in person or by mail (Figure 3). One facility relied on internal versions of the questionnaire that had been translated to Spanish and Creole. That was the only facility that reported agricultural workers frequently discussed the questionnaire or examination results with medical staff. The language most frequently spoken during these discussions was Spanish. Nonetheless, only one facility regularly used a translator to discuss examination results with patients as most had bilingual staff. All survey participants spoke Spanish at least slightly well and the majority spoke it very, or extremely, well.

Half of survey participants reported the facilities they are affiliated with rely solely on internal resources to respond to the needs of their patients. In response to an open-ended question regarding the need for additional information or resources to help agricultural employers and workers comply with respiratory protection requirements, a third expressed interest in fact sheets that could be distributed to patients. One respondent noted it would be helpful if agricultural workers were aware of factors affecting their use of respirators and better prepared for their examinations and fit-tests. Only the facilities specializing in occupational medicine had access to standardized document templates for respirator medical evaluation questionnaires and respirator medical clearance forms based on OSHA's requirements.

As expected, administrators at the facilities specializing in occupational medicine were more familiar with OSHA's respiratory protection requirements. Although all respondents answered at least three of five knowledge test questions correctly regarding these requirements, just two administrators were able to correctly answer all of them and only one reported being extremely familiar with the requirements. Respondents were most familiar with the requirement that agricultural employers provide a medical evaluation at no cost to employees who are required to use a respirator in the workplace. They were least familiar with instances in which a follow-up medical examination is necessary based on responses to OSHA's Respirator Medical Evaluation Questionnaire (Table 1).

Based on the needs articulated through the survey, compliance and outreach materials, including fact sheets and certified translations of key documents and forms, will be added to the project's repository of respiratory safety resources for growers, pesticide applicators, retailers, and healthcare professionals.

Table 1. Percentage of correct survey responses per knowledge test question.

Question topic	*Percent correct*
Medical evaluation requirements for agricultural employees who must use a respirator in the workplace.	100
Relevance of expected physical work effort and types of additional protective equipment worn to medical determination of the ability to use a respirator.	83
Healthcare professionals who can perform medical evaluation procedures to determine an agricultural employee's ability to use a respirator.	67
Application of medical evaluation requirements to required respirators regardless of the type, level of protection, or whether it is tight-fitting or loose-fitting.	67
The need for follow-up medical examinations based on responses to OSHA's Respirator Medical Evaluation Questionnaire.	50

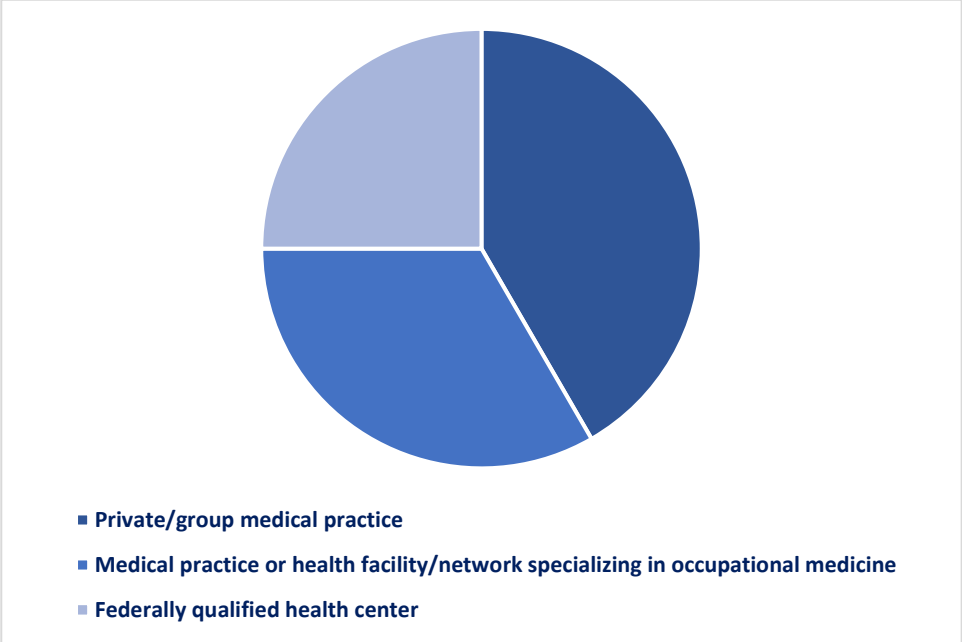


Figure 1. Types of healthcare providers survey participants are affiliated with.

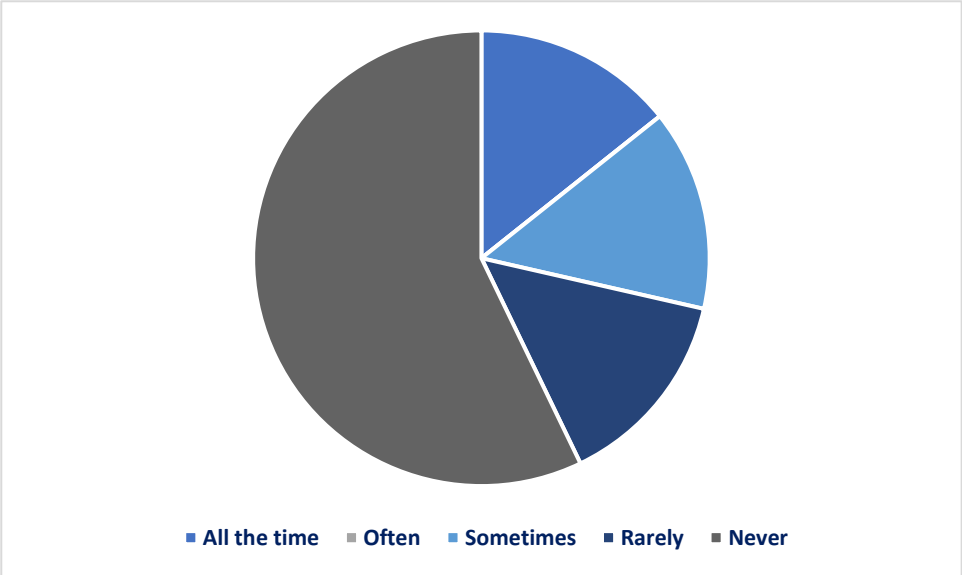


Figure 2. Frequency with which surveyed healthcare practices and facilities receive requests for respirator medical evaluation services from agricultural employers and workers.

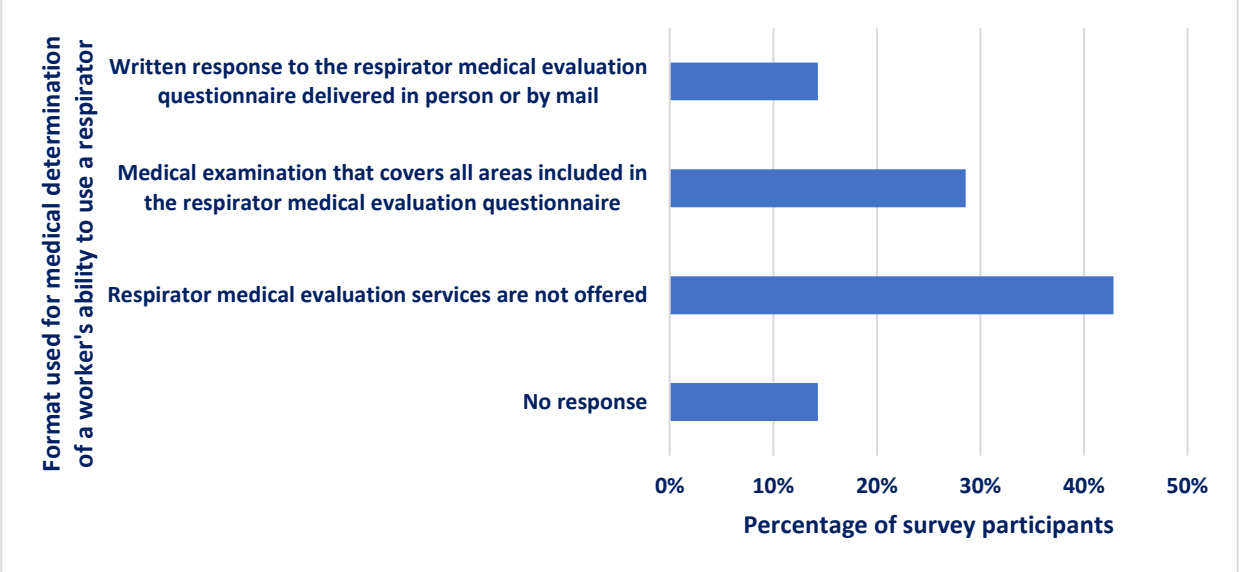


Figure 3. Format most frequently used by surveyed healthcare providers for medical determination of a worker's ability to use a respirator.

Outreach and Dissemination

Results of the previous needs-assessment survey, designed to identify barriers farmers and pesticide handlers face when adopting best practices for respirator use and complying with regulations, were presented at the Agricultural Safety and Health Council of America 2021 North American Agricultural Safely Summit. The presentation abstract is currently in press and will be published in a future issue of the *Journal of Agromedicine*.

Morera, M.C. & Campoverde, E.V. (in press). Developing a customized decision-support tool for respiratory protection in Florida agriculture: Preliminary findings of a pilot project. Presented at the Agricultural Safety and Health Council of America 2021 North American Agricultural Safely Summit. *Journal of Agromedicine*.

Highlights

Publications and Presentations

Onel, G., Simnitt, S., Stacciarini, JM and **Tovar-Aguilar, A.** (2020). Covid-19 Risk Factors Vary by Legal Status among Florida Crop Workers. *Agricultural & Applied Economics Association.* 25 (3), 1-10

Coker, E. S., Cavalli, L., Fabrizi, E., Guastella, G., Lippo, E., Parisi, M. L., Pontarollo, N., Rizzati, M., Varacca, A., & Vergalli, S. (2020). The Effects of Air Pollution on COVID-19 Related Mortality in Northern Italy. Environmental & resource economics, 1–24. doi: 10.1007/s10640-020-00486-1. Epub ahead of print. PMID: 32836855; PMCID: PMC7399615.

Campoverde, E.V. and Morera, M. (2020). Personal protective equipment: Respirators. Continuing education workshops to delivered online in English and Spanish at the UF/IFAS Extension Miami-Dade County office, October 22 and November 5, Homestead, Florida.

Adhikari, A. Contributions of pets to indoor environment exposome: hypothetical links with cancers and respiratory disorders. 2020 Mount Sinai Exposome Symposium (March 2020), New York, NY.

Tovar, A. Society for Applied Anthropology Annual Meeting. Agricultural Practices and Climate Change in Puerto Rico: Lessons from Maria. (March 2020) Albuquerque, NW.

Citrus Industry News: Florida Crop Workers at Risk. (2020, October 1). *Citrus Industry Magazine is a publication of AgNet Media, Inc.* Interview with **Dr. Gülcan Önel** retrieved from https://citrusindustry.net/2020/10/01/florida-crop-workers-at-risk/.

Luque, J, Becker, A, Bossak, B, Grzywacz, J, Tovar-Aguilar, A: Guo, Y. (2019) Knowledge and Practices to Avoid Heat-Related Illness among Hispanic Farmworkers along the Florida-Georgia Line. *Journal of Agromedicine*. DOI: 10.1080/1059924X.2019.1670312 PMID: 31544652

Luque, J, Becker, A, Bossak, B, Grzywacz, J, Tovar, A, Guo, Y. "Knowledge and Practices for Adapting to Working in the Heat among Latino Farmworkers in the Florida-Georgia Border Region," roundtable paper presented at the APHA Conference (November 2019), Philadelphia, PA. https://apha.confex.com/apha/2019/meetingapp.cgi/Paper/431357

Adhikari, A, Dotherow, JE. Respiratory deposition modeling for PM10, PM2.5, and PM1 exposure in cotton farms for standard and heavy workers. Third Aerosol Dosimetry Conference, Inhaled Aerosol Dosimetry: Models, Applications and Impact (October 2019), Irvine, CA.

Stacciarini, J.M., **Önel, Gülcan**, & **Tovar, A.** A Rural State of Mind: Addressing Mental, Physical, and Economic Health of Farm Communities in Florida. *East Coast Migrant Stream Forum.* (October 2019), San Juan, Puerto Rico.

Honors/Awards

Gregg Stanwood. CDC/NIOSH R21 OH012124-01A1 NIH/NIOSH Noninvasive Pesticide Biomonitoring Using Sweat Patches (09/01/21 – 08/31/23).

Maria Morera. Promotion to Assistant Research Scientist. (2020). Agricultural Education and Communication at the University of Florida, Institute of Food and Agricultural Sciences.

Heidi Radunovich. Co-Investigator. (2019). Agrisafe Network, Inc. (PI: Natalie Roy) *Southern region farm and ranch stress assistance network.* Develop a clearinghouse of farmer assistance programs in the region inclusive of programs providing professional agricultural behavioral health counseling and referral.

Heidi Radunovich. (2018). Research Enhancement Award. Florida Nursery, Growers and Landscape Association (FNGLA). Endowed Research Fund.

Gülcan Önel and **Antonio Tovar**. (2018). Robert Wood Johnson Foundation. Interdisciplinary Research Leaders Award. The broad goal of the Interdisciplinary Research Leaders (IRL) program is to produce diverse interdisciplinary leaders who conduct and apply high-quality, community-engaged, action-oriented, equity-focused health research in order to drive improvements in the health of communities.

Section III – Outreach Core

Project PI: Tracy Irani
Ricky Telg; Ashley McLeod-Morin; Lisa K. Lundy; Angela B. Lindsey; Heidi Radunovich; Martie Gillen

Overview

The Outreach Team leads a comprehensive Core, providing knowledge transfer support for the Research Core and Pilot/Feasibility Program, integration with all proposed educational and extension activities, and effective and culturally competent communication, and information dissemination to stakeholders across the six-state region. The Outreach Core activities consist of disseminating relevant risk reduction interventions and research findings and promoting adoption of best practices in the agricultural and fishery workplaces.

Community Stakeholder Advisory Board

The Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) is committed to stakeholder involvement. The Outreach Core prioritizes community-based participatory research, and has included representatives from Extension, industry, public agencies, regulatory agencies, academia, advocacy organizations, and medicine on our Center's Community Stakeholder Advisory Board. A high-functioning CSAB allows our Center to better engage stakeholders in receiving input on research findings, educational and communications materials and message testing to make our work accessible to the community at large.

Communications

The Outreach Core prioritizes a connection with center leadership to develop messages for farm families, laborers, supervisors, and company owners (all the stakeholders) to communicate important points about workplace safety. These messages are developed with different frames to ascertain which frame will be most effective. SCCAHS seminars/webinars in agricultural safety and health/occupational health have proven reach to all stakeholders and academic partners. The seminar/webinar series adds to the library of outreach materials and is intended to draw on SCCAHS investigators as well as external speakers. Seminars are webcast and archived on the SCCAHS website to facilitate inclusion of investigators at collaborating institutions.

State of the Science Meeting

Hosted by the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) headquartered at the University of Florida in Gainesville, FL, the annual State of the Science Meetings combine esteemed speakers to present research relevant to occupational safety and health needs of people working in agriculture, fishing, and forestry in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Puerto Rico, and the U.S. Virgin Islands. State of the Science 2021 featured researchers and scientists from various fields from across the United States, who presented their findings related to occupational, environmental and physical barriers in the agriculture, forestry and fishery industries.

Key Accomplishments 2020-2021

Community Stakeholder Advisory Board

The Community Stakeholder Advisory Board met virtually on March 11, 2021. During the meeting, board members were provided a review of the accomplishments made by the center in the last five years and research project updates. Members broke out into small groups to work through a brief SWOT analysis and renewal discussion.

Communications

The SCCAHS Outreach Core annually develops and updates multilevel outreach and educational resources that in Year 5 included:

- Up-to-date webinar schedule and archived webinar repository
- Social media messages
- Met weekly with the UF community engagement and vaccine access steering committee to work with minority and rural community leaders to address challenges related to vaccine hesitancy and access
- Met biweekly with leaders in state agencies (Florida Department of Health, Florida Department of Agriculture and Consumer Services), UF representatives (SCCAHS, Florida Extension, UF Health), and major agricultural organizations to discuss and act on ways to help Florida's agricultural workforce during the pandemic.
- Worked with Emerging Issues Programs to address community outreach needs related to vaccines and COVID-19
- Conducted qualitative focus groups and interviews with Extension professionals in rural communities to learn about challenges associated with vaccine confidence, access, and communication in rural communities
- 2020 State of the Science White Paper
- Outreach specific to COVID-19 and vaccines, including a COVID-19 vaccine communication toolkit
- Multiple outreach awards from the Association for Communication Excellence in Agriculture, Natural Resources, and Life and Human Sciences (ACE), including:
    - Silver in the Crisis Communication category for the COVID-19 toolkit for Extension and agricultural workers
    - Bronze in the Technical Publications category for the 2019 State of the Science White Paper
    - Bronze in the Educational Video category for the video with Dr. Glenn Morris on COVID-19 testing and screening for agricultural workers.

Eight webinars were released October 2020 through September 2021. The below list of webinars and speakers highlights the multidisciplinary specialty areas that address health and safety issues in agricultural and fishing industries.

June 16, 2021: Protecting Agricultural Communities During the COVID-19 Pandemic: Respiratory Fit Testing and Personal Protective Equipment

May 19, 2021: Communicating Vaccine Adoption Based on U.S. Perceptions of COVID-19

April 14, 2021: Facilitating Pandemic Preparedness in Agricultural Industry via COVID-19 Hazard Assessment and Mitigation Plan (CHAMP) e-tool

March 31, 2021: Fighting Coronavirus with Corona Discharge (No recording for this webinar)

February 17, 2021: Impacts of COVID-19 on Florida Agriculture and Marine Industries

January 26, 2021: COVID-19 Vaccine Town Hall

December 15, 2020: Development and Deployment of a Farmworker Housing Simulator for COVID-19 Risk Mitigation

November 19, 2020: Adapting Agriculture in Florida during the COVID-19 Pandemic: COVID-19 testing for migrant workers in Florida and the Farm to You webpage

Communication media strategies maintained an objective to develop fewer posts on social media that had more substance to promote the SCCAHS and affiliate research, provide resources on agricultural health and safety topics, and strengthen the public health response to COVID-19 and COVID-19 vaccines. Reducing vaccine hesitancy and expanding vaccine access among agricultural and fishery workers through public awareness was a Year 5 priority and this resulted in the *COVID-19 Vaccine Communication Toolkit*.
As COVID-19 vaccines were granted authorization for emergency use, it was an Outreach priority to share consistent, accurate, culturally appropriate, multilingual information. The team mobilized to review resources from the Centers for Disease Control and Prevention and Departments of Health. These resources included social media messaging, images, videos, and infographics. The *COVID-19 Vaccine Communication Toolkit* included frequently asked question one-pagers, social media assets, news column template, and best communication practices for agricultural audiences.

State of the Science Meeting

There has been an increased focus on moving beyond generating evidence to translating evidence into practice and policy actions to ensure that scientific discoveries actually reach the populations for whom they are intended and are implemented with fidelity. The State of the Science meetings were developed in response to this increased focus, and the dissemination approach is accomplishing its work by deepening multidisciplinary relationships, building capacity for public health professionals to collaborate effectively with other–related disciplines, and developing a research agenda on farmworker/fisher/forestry health translation, dissemination, and implementation through interdisciplinary collaboration. Although effort was dedicated to the planning/implementation of an in-person meeting, the event was moved to a virtual format. The State of the Science meetings have become a special, more regionally coveted space for the dissemination of new scientific knowledge across disciplines, as well as for the establishment and development of social networks among scientists across U.S. academic institutions and community partners. However, the virtual dimension of conferences, was a challenge in ensuring effectiveness and relied on a different framing of events, the teams' comfort navigating the multiple facets of technology and the chosen platform. To deliver content in a more interactive online space, the Outreach Core chose to deliver the 2021 SOS Meeting using Whova, an interactive virtual meeting platform.

The 2021 State of the Science Meeting focused on Pathways to Health Equity in Agriculture, Fishery and Forestry was delivered via Whova on September 9, 2021. The annual meeting featured researchers and scientists from various fields from across the United States, who presented their findings related to occupational, environmental and physical barriers in the agriculture, forestry and fishery industries.

Pathways to Health Equity in Agriculture, Fishery and Forestry
September 9,2021
Keynote Speakers
Pathways to Health Equity in Agriculture, Fishery and Forestry presented by Glenn Morris and Linda Cottler

Equity as a Framework for Health presented by Michael Gutter, Roger Rennekamp, and Latoya O'Neal

Communicating with Vulnerable Populations about Pandemic-Related Health Risks presented by Ashley McLeod-Morin, Samantha Grenrock, Megan Macpherson, and Matt Surrency

Understanding Injury and Illness Disparities to Achieve Health Equity presented by Erika Scott, Risto Rautianen, and Marcy Harrington

Poster Presentations
Prevalence of Anaplasmosis in White-tailed Deer and Inherent Risks to Hunters

Social determinants of occupational health and safety among agricultural workers in the U.S. southeastern coastal states

Prevalence of Ehrlichiosis ewingii in White-tailed Deer and Possible Transmission to Humans
Agricultural Mental Health Literacy Programs

Dangers of Gossypol to Cotton Farmers and Gin Operators

Anaplasmosis and the Dangers of Tick-Borne Diseases to Handlers of White-tailed Deer Carcasses

Publications and Presentations

Mitchell, R. C., Kandzer, M., Irani, T., Lindsey, A. B., Lundy, L. K., Telg, R., McLeod-Morin, A., Stokes, P., Chasek, C., Scheyett, A., Leeman, R. F., Stacciarini, J., Wennerstrom, A., Smithwick, J. G., Grattan, L. M., Dunleavy, K., Radunovich, H. L., Kane, A., Arosemena, F., & Honeycutt, S. (2020). State of the Science: Mental Health Issues in Agricultural, Vulnerable and Rural Communities. SCCAHS2020/21-02. Gainesville, FL.: University of Florida/ Southeastern Coastal Center for Agricultural Health and Safety. http://www.sccahs.org/wp-content/uploads/2020/09/whitepaper2020_final1.pdf

McLeod-Morin, A., Kandzer, M., Telg, R., & Stokes, P. (2020). COVID-19 Training Toolkit for Extension. Retrieved at http://www.sccahs.org/index.php/covid-19/#covid-19-training-toolkit.

Mitchell, R.C., Irani, T, Arosemena, F. A., Pierre, B., Bernard, T.E., Grzywacz, J.G., McCauley, L.A., Vi Thien Mac, V., Lopez, R.M., Ashley, C.D., Sawka, M.N., Misra, V., Pierre, B., & Morris, J.G. (2019). SCCAHS2019-02. Gainesville, FL: University of Florida/Southeastern Coastal Center for Agricultural Health and Safety.

Lundy, L. K., Rogers-Randolph, T. M., Lindsey, A. B., Hurdle, C., Ryan, H., Telg, R. W., & Irani, T. (2018). Analyzing Media Coverage of Agricultural Health and Safety Issues. Journal of Applied Communications, 102(4), 5.

Rogers, T., Lundy, L.K., Lindsey, A.B., Irani, T., Telg, R.W., McLeod, A., Stokes, P., Mitchell, R.C. Identifying Influencers in Agricultural Health and Safety Twitter Conversations. Southern Association of Agricultural Scientists Conference.

Tovar J.A., (September 10-12, 2018). Processes of Development and Implementation of Training Conducted by Community Health Workers. *Midwest Migrant Stream Forum.* New Orleans, LA.

Mitchell, R.C. (August 15-16, 2018). Southeastern Coastal Center for Agricultural Health and Safety. *Citrus Expo.* Ft. Meyers, FL. Available at: https://public.3.basecamp.com/p/5M5WdbGzHTWYoA3TTPw5zzsb

Section IV – Cumulative Years 1 - 5 Publications/Presentations

Planning and Evaluation Core 2016 – 2021

1. Lauzardo M, Kovacevich N, Dennis A, Myers P, Flocks J, Morris JG Jr. An Outbreak of COVID-19 Among H-2A Temporary Agricultural Workers. Am J Public Health. 2021 Apr;111(4):571-573. doi: 10.2105/AJPH.2020.306082. PMID: 33689435; PMCID: PMC7958039.

2. Israel, G. D., Diehl, D. C., Galindo, S., Ward, C., Ramos, A. K., Harrington, M., & Kasner, E. J. (2021). Extension Professionals' Information Use, Protective Behaviors, and Work-Life Stress During the COVID-19 Pandemic. *The Journal of Extension, 58*(6), Article 5. https://tigerprints.clemson.edu/joe/vol58/iss6/5

3. Israel, G. D., James, H. E., & Gariton, C. E. Anxiety disorders among Extension Professionals' during the COVID-19 Pandemic. Paper presented at the virtual annual meeting of the Southern Rural Sociological Association, February 2021.

4. Flocks J. The Potential Impact of COVID-19 on H-2A Agricultural Workers. J Agromedicine. 2020 Oct;25(4):367-369. doi: 10.1080/1059924X.2020.1814922. Epub 2020 Aug 28. PMID: 32856557.

5. Israel, G. D., James, H. E., & Gariton, C. E. Anxiety disorders among Extension Professionals' during the COVID-19 Pandemic. Paper presented at the virtual annual meeting of the Southern Rural Sociological Association, February 2021.

6. Mitchell, C., Israel, G. D., Galindo, S. & Diehl, D. C. (February, 2020). From Plan to Action: Adapting Evaluation to Serve the Developmental Needs of a Newly-Funded Multidisciplinary Research Center. Evaluation and Program Planning. 78. ISSN 0149-7189

7. Mitchell RC, Israel GD, Diehl DC, Galindo-Gonzalez S. From plan to action: Adapting evaluation to serve the developmental needs of a newly-funded multidisciplinary research center. Eval Program Plan. 2020 Feb;78:101729. doi: 10.1016/j.evalprogplan.2019.101729. Epub 2019 Oct 18. PMID: 31698318.

8. Flocks J, Tovar JA, Economos E, Thien Mac VV, Mutic A, Peterman K, McCauley L. Lessons Learned from Data Collection as Health Screening in Underserved Farmworker Communities. Prog Community Health Partnersh. 2018;12(1S):93-100. doi: 10.1353/cpr.2018.0024. PMID: 29755052.

Presentations

9. Gators Going Green, Gainesville, FL, October 8, 2020. Presentation on farmworker health at University of California Davis law school panel, February 25, 2021.

10. Flocks J. "The Potential Impact of COVID-19 on H-2A Agricultural Workers." Journal of Agromedicine 25(4): 367-369, 2020. "Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS)" (invited presentation)

11. Environmental Protection Agency's Virtual Farmworker Community Visit, October 28, 2020. Occupational Pesticide Exposure and Pregnancy Health in Vulnerable Workers" (invited speaker).

12. Florida Local Section of the American Industrial Hygiene Association, October 16, 2020. "Environmental Justice Panel" (panel) with C Zimring, T Thomas-Burton, and H Young.

13. Halverson, C. & S. Galindo. (2019, April). Creating an Organizational Culture Responsive to Emerging Public Health Threats. Presented at the 2019 National Conference of the American Association of Occupational Health Nurses (AAOHN), Jacksonville, Florida.

14. Galindo, S., Mitchell, C., Saqib, H., Israel, G. D., & Diehl, D. C. (2019). Assessing SCCAHS' economic impact: Return on investment thematic approach for heat-related illness. Poster presented at the annual conference of the International Society for Agricultural Safety and Health, Des Moines, Iowa, June, 2019.

15. Nelson, J. D., Galindo, S., Israel, G. D., & Diehl, D. C. (2019). Developing a Common Evaluation Framework for the Centers for Agricultural Safety and Health. Oral presentation at the annual conference of the International Society for Agricultural Safety and Health, Des Moines, Iowa, June, 2019.

16. Galindo-Gonzalez, S., Mitchell, R. C., Diehl, D., Israel, G. D., Williams, D. Saqib H, Galindo S, & Irani T. Surfacing Strategies: Organizational Learning for the Strategic Development of an Agriculture, Forestry, and Fishing Occupational Health and Safety Research and Outreach Center. Poster presented at: International Conference on Sustainable Development; September 23-24, 2019; Columbia University, New York.

17. Galindo, S., Mitchell, C., Saqib, H., Israel, G. D., & Diehl, D. C. (2019). Assessing SCCAHS' economic impact: Return on investment thematic approach for heat-related illness. Poster presented at SCCAHS State of the Science Meeting, Saint Petersburg, Florida, September, 2019.

18. Flocks J, Monaghan P, and Tovar-Aguilar A. "Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS): Current Projects at the Newest NIOSH Center for Agricultural Disease and Injury Research, Education, and Prevention." 2018 North American Agricultural Safety Summit, Scottsdale, AZ, February 21-23, 2018.

19. Flocks J. "The Environmental and Social Injustice of Farmworker Pesticide Exposure," (online guest lecture) for Vanessa Casanova's Environmental Justice class at the University of Texas Health Science Center at Tyler, July 11, 2018.

20. Bronstein J, Economos E, Flocks J, and Grzywacz J."Pesticides and Health: What We Need to Know" (panel) 19th National Our Community, Our Health Town Hall, University of Florida Health Street, Gainesville, FL, August 29, 2018. https://mediasite.video.ufl.edu/Mediasite/Play/e7e8e15cc65c462b93bfb0c1d22da2371d

21. Galindo-Gonzalez, S., Mitchell, R. C., Diehl, D., Israel, G. D., Williams, D. F., Avalos, N., & McLoed, A. The agricultural safety and health innovation, information and knowledge system: Considerations for its evaluation. Poster presented at the annual conference of the International Society for Agricultural Safety and Health, Halifax, Nova Scotia, Canada, June, 2018.

22. Flocks J. "Immigration Policy and Agricultural Labor in Florida" University of Florida, Department of Agricultural Education and Communications Seminar Series, Gainesville, FL, October 27, 2017.

23. Mutic A, Mix J, Elon L, Tovar J, Flocks J, Economos E, and McCauley L. "Classification of Heat Related Illness Symptoms among Florida Farmworkers." American Public Health Association Annual Meeting, Atlanta, GA, November 7, 2017.
24. Flocks J. "Immigration, Farm Labor, and Food Justice" University of Florida, Center for the Study of Race and Race Relations, Race Matters in the News Seminar Series, Gainesville, FL, November 9, 2017.
25. Flocks J. "Immigration, Farm Labor, and Food Justice" University of Florida, Center for the Study of Race and Race Relations, Race Matters in the News Seminar Series, Gainesville, FL, November 9, 2017.
26. Tovar J, Economos E, and Flocks J. "Community Based Research on Heat-Related Illness in Florida Farmworkers." American Public Health Association Annual Meeting, Atlanta, GA, November 7, 2017.
27. Flocks J. "Immigration Policy and Agricultural Labor in Florida" University of Florida, Department of Agricultural Education and Communications Seminar Series, Gainesville, FL, October 27, 2017.

Outreach Core 2018 – 2021

28. Santa Maria, N., Irani, T., Telg, R., Lundy, L.K., Lindsey, A.B., McLeod-Morin, A., Stokes, P., Kandzer, M., Castano, V., Morris, G., McCue, L., Millerick-May, M., Zhong, Y., Halverson, C., Baker, L.M., Andrews, D., Abler, D., Court, C., Galindo, S., Ramos, A.K., & Sampson, S.; Rampold, S., Kelly-Begazo, C., Pierre, B.F. (2021). State of the Science: Global Pandemics and the Agricultural Workforce: Research and Policy Implications. SCCAHS2020/21-03. Gainesville, FL.: University of Florida/ Southeastern Coastal Center for Agricultural Health and Safety. Whitepaper-2020-FINAL.pdf (sccahs.org)
29. McLeod-Morin, A., Baker, L. M., Lindsey, A. B., Lundy, L. K., & Telg, R. (2021, February). A tale of two agencies: Comparing Americans' attitudes and behaviors toward the CDC and Local Health Departments During COVID-19. Emerging Pathogens Institute Research Day, Gainesville, FL.
30. McLeod-Morin, A., Baker, L. M., Lindsey, A. B., Lundy, L. K., & Telg, R. (2021, February). The dimensions of the organization-public relationship of the Centers for Disease Control and Prevention during the COVID-19 pandemic. National Agricultural Communications Symposium, virtual.
31. Baker, L. M., Rampold S. D., McLeod-Morin, A., Lindsey, A. B., Telg, R. W., & Oglesby, M. (2021, February). Spreading information instead of COVID-19: Examining public communication networks in the early stages of a zoonotic disease pandemic. Paper presented at the 2021 National Agricultural Communications Symposium, virtual.
32. Schaper, TA. (2021). Characterizing major crop change trends in Florida from multiple sources: a comparison of USDA Cropland Data Layer and statewide Random Forest Classifications of the top five crops. M.S. thesis University of Florida.

33. Sampson, S., Mazur, J., Israel, G., Galindo, S., & Ward, C. (2020). Competing Roles and Expectations: Preliminary Data from an Agricultural Extension Survey on COVID-19 Impacts. Journal of agromedicine, 25(4), 396–401. https://doi.org/10.1080/1059924X.2020.1815619. PMID: 32945240.

34. Baker, L., Kandzer, M. S., Rampold, S. D., Chiarelli, C., Peterson, H. H., McLeod-Morin, A. (2020). Agriculture and natural resources business owners economic and communication concerns early in the COVID-19 pandemic. Advancements in Agricultural Development, 1(3), 95-110. https://doi.org/10.37433/aad.v1i3.83

35. Mitchell, R. C., Kandzer, M. S., Irani, T., Lindsey, A. B., Lundy, L. K., Telg, R. W., McLeod-Morin, A., Stokes, P., Chasek, C., Scheyett, A., Leeman, R., Stacciarini, J. M., Wennerstrom, A., Smithwick, J., Grattan, L., Dunleavy, K., Radunovich, H. L., Kane, A., Arosemena, F., & Honeycutt, S. (2020). State of the Science: Mental Health Issues in Agricultural, Vulnerable and Rural Communities. SCCAHS2020/21-02. Gainesville, FL.: University of Florida/ Southeastern Coastal Center for Agricultural Health and Safety. whitepaper2020_final1.pdf (sccahs.org)

36. Mitchell, R.C., Irani, T, Arosemena, F. A., Pierre, B., Bernard, T.E., Grzywacz, J.G., McCauley, L.A., Vi Thien Mac, V., Lopez, R.M., Ashley, C.D., Sawka, M.N., Misra, V., Pierre, B., & Morris, J.G. SCCAHS2019-02. Gainesville, FL: University of Florida/Southeastern Coastal Center for Agricultural Health and Safety. SOS_WhitePaper.pdf (sccahs.org)

37. Lundy, L. K., Rogers-Randolph, T. M., Lindsey, A. B., Hurdle, C., Ryan, H., Telg, R. W., & Irani, T. (2018). Analyzing Media Coverage of Agricultural Health and Safety Issues. Journal of Applied Communications, 102(4), 5.

38. Rogers, T., Lundy, L.K., Lindsey, A.B., Irani, T., Telg, R.W., McLeod, A., Stokes, P., Mitchell, R.C. Identifying Influencers in Agricultural Health and Safety Twitter Conversations. Southern Association of Agricultural Scientists Conference. Tovar J.A., (September 10-12, 2018). Processes of Development and Implementation of Training Conducted by Community Health Workers. Midwest Migrant Stream Forum. New Orleans, LA.

39. Mitchell, R.C. (August 15-16, 2018). Southeastern Coastal Center for Agricultural Health and Safety. Citrus Expo. Ft. Meyers, FL. Available at: https://public.3.basecamp.com/p/5M5WdbGzHTWYoA3TTPw5zzsb

40. Monaghan, P., (July 10-13, 2018). The Role of Labor Supervisors in Florida Citrus and Vegetable Production and How that Shapes Safety Behaviors. University of Nebraska Medical Center Agricultural Health and Safety Course. Omaha, NE. Monaghan, P., (April 3-7, 2018). Preliminary findings. Society for Applied Anthropology Annual Meeting. Philadelphia, PA.

State of the Science Meetings

The SCCAHS Outreach Core has hosted annual State of the Science Meetings since Year 3 (2018). The meetings are convened to educate the Southeast regional academic community and frontline professionals on clinical and public health science driving new thinking in areas of heat related illness and stress and resilience among agricultural, fishery, and forestry workers. Given our southern location, the work of SCCAHS has included a major focus on heat-related illness. Additionally, addressing mental health remains a public health concern. Those who work in agriculture face many stressors, including financial uncertainty, family and relationships issues,

social isolation, disaster, accidental injury, and acute and chronic diseases, that can affect their mental health. While some mental health issues, such as the high rate of farmer suicides, have been discussed widely, other mental health stressors that affect agriculture workers in vulnerable rural communities have not been discussed as broadly. Multidisciplinary research, strategies, and policies are needed 1) to identify the mental health issues that farmworkers, farm operators, farm owners and others in these communities face; 2) address the social, environmental and built-environment associations with mental health in rural communities; and 3) understand the inequities in farmworker/fishery/ forestry community mental health (depressive or substance use disorder rates) and how we might close these gaps to encourage individual, family, and community-level resilience. A recap of the Southeastern Coastal Center for Agricultural Health and Safety 2018 and 2019 State of the Science Meetings can be found at the below websites:

41. September 9, 2021, Pathways to Health Equity in Agriculture, Fishery and Forestry
42. September 11/18, 2020, Global Pandemics and the Agricultural Workforce: Research and Policy Implications
43. September 26/27, 2019, Stress and Resilience Among Agricultural Workers in Vulnerable Rural Communities
44. October 25/26, 2018, Heat-related Illness State of the Science Meeting

Websites and Other Internet Sources

45. SCCAHS Website: http://www.sccahs.org/
46. COVID-19 resources webpage http://www.sccahs.org/index.php/covid-19/
    - Screening and testing video: https://www.youtube.com/watch?v=oAByapLmi0I&feature=youtu.be
    - Adapted CDC guidance video: https://www.youtube.com/watch?v=dZ-jn3V1C4U&feature=youtu.be
    - Narrated PPT video for CDC guidance: https://youtu.be/9FWHMFi9NQE
    - Narrated PPT video for CDC guidance (Spanish): https://www.youtube.com/watch?v=8z11u6fsyzE
    - Face coverings (English): https://www.youtube.com/watch?v=6QZQvUDYvus
    - Face coverings (Spanish): https://www.youtube.com/watch?v=VJEfF5SnScE
    - Social distancing (English): https://www.youtube.com/watch?v=o0dWBoXCOZg
    - Social distancing (Spanish): https://www.youtube.com/watch?v=kQAFBtTV-_c

47. COVID-19 training toolkit: http://www.sccahs.org/wp-content/uploads/2020/08/COVID-19_ExtentionToolkit.pdf
48. COVID-19 training toolkit for Florida Extension: https://extadmin.ifas.ufl.edu/resources/grower-and-worker-education/
49. COVID-19 vaccine webpage: http://www.sccahs.org/index.php/covid-19-vaccine/
50. SCCAHS webinars (archived): http://www.sccahs.org/index.php/media/webinars/

- **Dawn Burton** February 23, 2022 Practical Steps to Advancing Equity
- **LaToya O'Neal** January 20, 2022 Advancing Health Equity as a Core System Value
- **Serap Gorucu** November 17, 2021 Available Data Sources for Agricultural Injury Surveillance
- **Cindy Prins** October 28, 2021 What's Next? Understanding the current status of COVID-19 and future projections
- **David Abler** July 22, 2021 COVID-19 and Resilience in Food Supply
- **Charlotte Halverson** June 16, 2021 Protecting Agricultural Communities During the COVID-19 Pandemic: Respiratory Fit Testing and Personal Protective Equipment
- **Lauri Baker** May 19, 2021: Communicating Vaccine Adoption Based on U.S. Perceptions of COVID-19
- **Melissa Millerick-May** April 14, 2021: Facilitating Pandemic Preparedness in Agricultural Industry via COVID-19 Hazard Assessment and Mitigation Plan (CHAMP) e-tool
- **Sarah (Ying) Zhong** March 31, 2021 Fighting Coronavirus with Corona Discharge
- **Christa Court**, February 17, 2021: Assessing the Impact of COVID-19 on Florida's Agricultural and Marine Industries
- **Glenn Morris and Ira Longini** January 26, 2021 COVID-19 Vaccine Town Hall
- **Leigh McCue** December 15, 2020 Development and Deployment of a Farmworker Housing Simulator for COVID-19 Risk Mitigation
- **LeiAnna Tucker and Danielle Andrews** November 19, 2020 Adapting Agriculture in Florida during the COVID-19 Pandemic: COVID-19 testing for migrant workers in Florida and the Farm to You
- **Sebastian Galindo** August 20, 2020 Impacts of COVID-19 on Extension
- **Ricky Telg, Saqib Mukhtar, Cindy Prins** August 7, 2020 COVID-19 Training Toolkit for Extension in Agriculture
- **Jeffrey Lindsey** August 6, 2020 Preparing for the 2020 Hurricane Season in the Midst of a Pandemic
- **Jeanne-Marie Stacciarini** June 18, 2020 Rurality, Social Networks and Mental Well-being in Rural Latinos (no recording)

- **Robert Leeman** May 14, 2020 Stressors, Resilience Factors and Applicability of New Interventions for Substance Misuse
- **Gülcan Önel** March 10, 2020 Uncovering Patterns of Mental, Physical, and Occupational Health Issues Among Migrant Farmworkers with Different Socio-Cultural Networks (no recording)
- **Anna M. Scheyett** February 14, 2020 Death on the Farm: Characteristics and Contextual Factors in Farmer and Agricultural Worker Suicide in Georgia from 2008-2015
- **Christine Chasek** January 8, 2020 Investigating Opioid and Alcohol Risk and Misuse Among Agricultural Workers
- **Vasubandhu Misra** October 10, 2019 Heat-related Illness in a Changing Climate and Demography of Florida
- **Kim Dunleavy** September 13, 2019 Chronic Low Back Pain in Seafood Workers: A Pilot Intervention Study to Identify Modifiable Work and Movement Solutions
- **Heidi Radunovich** June 4, 2019 Understanding the Scope of the Opioid Epidemic for Agricultural Industries
- **Angela Lindsey** May 14, 2019 Preparing for the 2019 Hurricane Season: Applying Lessons from Hurricanes Irma and Michael
- **Paul Monaghan** April 17, 2019 Using Social Marketing to Prevent Heat-related Illness and Improve Productivity Among Farmworkers
- **Linda McCauley** February 12, 2019 Heat Stress and Biomarkers of Renal Disease
- **Joseph Grzywacz** January 22, 2019 Pesticide & Heat Stress Education for Latino Farmworkers that is Culturally Appropriate
- **Jose A. Perez** November 6, 2018 The Need for a Safety Focus in Agriculture
- **Andrew Kane** October 24, 2018 Occupational Health and Safety Surveillance of Gulf Seafood Workers.
- **Martie Gillen** September 18, 2018 Assessing Agriculture Liability

51. The training toolkit webinar: https://vimeo.com/447806944
52. 2020 SOS meeting website: http://www.sccahs.org/index.php/state-of-science/2020-global-pandemics-and-the-agricultural-workforce-research-and-policy-implications/
53. Podcast: https://piecenter.com/media/podcast/

Research Core 2016 – 2021

2021

54. Glass, G. E., Ganser, C., & Kessler, W. H. (2021). Validating Species Distribution Models With Standardized Surveys for Ixodid Ticks in Mainland Florida. *Journal of medical entomology*, *58*(3), 1345–1351. https://doi.org/10.1093/jme/tjaa282 PMID: 33386731; PMCID: PMC8122235.

55. Dunleavy K, Bishop M, Coffman A, Reidy J, Kane A. Chronic lower back pain in aquaculture clam farmers: adoption and feasibility of self-management strategies introduced using a rapid prototype participatory ergonomic approach. Int J Occup Saf Ergon. 2021 Jul 7:1-11. doi: 10.1080/10803548.2021.1935543. Epub ahead of print. PMID: 34121632.

56. Dunleavy K, Kane A, Coffman A, Reidy J, Bishop MD. Outcomes of Participatory Ergonomics and Self-management in Commercial Clam Farmers with Chronic Low Back Pain: A Feasibility Study. J Agromedicine. 2021 Nov 23:1-15. doi: 10.1080/1059924X.2021.2004961. Epub ahead of print. PMID: 34772318.

57. Grzywacz JG, Gonzales-Backen M, Liebman A, Trejo M, Gudino CO, Trejo M, Economos J, Xiuhtecutli N, Tovar-Aguilar JA. Comparative Effectiveness of Training Alternatives for the EPA's Worker Protection Standard Regulation Among Immigrant Latino Farmworkers. J Occup Environ Med. 2021 Aug 27. doi: 10.1097/JOM.0000000000002368. Epub ahead of print. PMID: 34456324.

58. Mac V, Elon L, Mix J, Tovar-Aguilar A, Flocks J, Economos E, Hertzberg V, McCauley L. Risk Factors for Reaching Core Body Temperature Thresholds in Florida Agricultural Workers. J Occup Environ Med. 2021 May 1;63(5):395-402. doi: 10.1097/JOM.0000000000002150. PMID: 33560064.

59. Houser MC, Mac V, Smith DJ, Chicas RC, Xiuhtecutli N, Flocks JD, Elon L, Tansey MG, Sands JM, McCauley L, Hertzberg VS. Inflammation-Related Factors Identified as Biomarkers of Dehydration and Subsequent Acute Kidney Injury in Agricultural Workers. Biol Res Nurs. 2021 Oct;23(4):676-688. doi: 10.1177/10998004211016070. Epub 2021 May 21. PMID: 34018403.

60. Chicas R, Xiuhtecutli N, Elon L, Scammell MK, Steenland K, Hertzberg V, McCauley L. Cooling Interventions Among Agricultural Workers: A Pilot Study. Workplace Health Saf. 2021 Jul;69(7):315-322. doi: 10.1177/2165079920976524. Epub 2020 Dec 24. PMID: 33357122.

61. Chicas R, Xiuhtecutli N, Dickman NE, Flocks J, Scammell MK, Steenland K, Hertzberg V, McCauley L. Cooling Interventions Among Agricultural Workers: Qualitative Field-Based Study. Hisp Health Care Int. 2021 Sep;19(3):174-181. doi: 10.1177/1540415321993429. Epub 2021 Feb 19. PMID: 33601922; PMCID: PMC8363586.

62. Mac VV, Elon L, Smith DJ, Tovar-Aguilar A, Economos E, Flocks J, Hertzberg V, McCauley L. A modified physiological strain index for workplace-based assessment of heat strain experienced by agricultural workers. Am J Ind Med. 2021 Apr;64(4):258-265. doi: 10.1002/ajim.23230. Epub 2021 Feb 4. PMID: 33543496.

63. Matthew OO, Monaghan PF, Luque JS. The Novel Coronavirus and Undocumented Farmworkers in the United States. New Solut. 2021 May;31(1):9-15. doi: 10.1177/1048291121989000. Epub 2021 Jan 31. PMID: 33517834; PMCID: PMC8193739.

Presentations

64. Morera, M.C., Tovar-Aguilar, J.A., Monaghan, P.F., Roka, F.M., & Perez-Orozco, J. (2021). Going the [social] distance: Safety and productivity in Florida agriculture during COVID-19. Presentation at the 2021 Virtual Meeting of the Society for Applied Anthropology, March 26, 2021.

65. Morera, M.C. & Campoverde, E.V. (2021). Developing a customized decision-support tool for respiratory protection in Florida agriculture: Preliminary findings of a pilot project [Poster session]. Agricultural Safety and Health Council of America 2021 North American Agricultural Safely Summit, March 22-24.

66. Rash, R. and Kane, A.S. (2021). Environmental and Human Behavioral Risk Factors for Traumatic Stingray Puncture Injuries in Cedar Key Clam Harvesters. Presented at the 4th Southeast Regional Research Symposium (SERRS), February 17-18, 2021.

2020

67. Grattan LM, Lindsay A, Liang Y, Kilmon KA, Cohen S, Irani T, Morris JG. The Short- and Long-Term Impacts of Hurricane Irma on Florida Agricultural Leaders as Early Emergency Responders: The Importance of Workplace Stability. Int J Environ Res Public Health. 2020 Feb 7;17(3):1050. doi: 10.3390/ijerph17031050. PMID: 32046012; PMCID: PMC7038044.

68. Monaghan P, Raskin K, Morera M, Tovar Aguilar JA, Mac V, Flocks J. "What the Agricultural Sector in Florida Needs to Know about Heat-Related Illness (HRI)." EDIS (5). https://doi.org/10.32473/edis-wc359-2020.

2019

69. Mix JM, Elon L, Thein Mac VV, Flocks J, Economos J, Tovar-Aguilar AJ, Hertzberg VS, McCauley LA. Physical activity and work activities in Florida agricultural workers. Am J Ind Med. 2019 Dec;62(12):1058-1067. doi: 10.1002/ajim.23035. Epub 2019 Aug 16. PMID: 31418883.

70. Luque JS, Becker A, Bossak BH, Grzywacz JG, Tovar-Aguilar JA, Guo Y. Knowledge and Practices to Avoid Heat-Related Illness among Hispanic Farmworkers along the Florida-Georgia Line. J Agromedicine. 2020 Apr;25(2):190-200. doi: 10.1080/1059924X.2019.1670312. Epub 2019 Sep 23. PMID: 31544652; PMCID: PMC7075471.

71. Chicas R, Mix J, Mac V, Flocks J, Dickman NE, Hertzberg V, McCauley L. Chronic Kidney Disease Among Workers: A Review of the Literature. Workplace Health Saf. 2019 Sep;67(9):481-490. doi: 10.1177/2165079919843308. Epub 2019 Jun 10. PMID: 31179873.

72. Grzywacz JG, Gonzales-Backen M, Liebman A, Marín AJ, Trejo M, Gudino CO, Economos J, Tovar-Aguilar JA. Attending to Pesticide Exposure and Heat Illness Among Farmworkers: Results From an Attention Placebo-Controlled Evaluation Design. J Occup Environ Med. 2019 Sep;61(9):735-742. doi: 10.1097/JOM.0000000000001650. PMID: 31205205.

73. Mac VVT, Hertzberg V, McCauley LA. Examining Agricultural Workplace Micro and Macroclimate Data Using Decision Tree Analysis to Determine Heat Illness Risk. J Occup Environ Med. 2019 Feb;61(2):107-114. doi: 10.1097/JOM.0000000000001484. PMID: 30335678; PMCID: PMC6367045.

Presentations

74. Luque, J, Becker, A, Bossak, B, Grzywacz, J, Tovar, A, Guo, Y. "Knowledge and Practices for Adapting to Working in the Heat among Latino Farmworkers in the Florida-Georgia Border Region," roundtable paper presented at the APHA Conference (November 2019), Philadelphia, PA.

75. Adhikari, A, Dotherow, JE. Respiratory deposition modeling for PM10, PM2.5, and PM1 exposure in cotton farms for standard and heavy workers. Third Aerosol Dosimetry Conference, Inhaled Aerosol Dosimetry: Models, Applications and Impact (October 2019), Irvine, CA.

76. Stacciarini, J.M., Onel, Gulcan, & Tovar, A. A Rural State of Mind: Addressing Mental, Physical, and Economic Health of Farm Communities in Florida. East Coast Migrant Stream Forum. (October 2019), San Juan, Puerto Rico.

77. Flocks, J. "Prevention of Heat Stress among Farmworkers" (roundtable discussion moderator) Western Agriculture Safety & Health Conference, Seattle, WA, August 7-9, 2019.

78. Flocks, J., Saville, A., & Economos, J. "Differing Reponses and Perspective to Environmental Justice, Lessons from Lake Apopka, FL" (panel) with A Saville and J Economos. Association for Environmental Studies and Sciences Annual Conference, Orlando, FL, June 27, 2019.

2018

79. Mix J, Elon L, Vi Thien Mac V, Flocks J, Economos E, Tovar-Aguilar AJ, Stover Hertzberg V, McCauley LA. Hydration Status, Kidney Function, and Kidney Injury in Florida Agricultural Workers. J Occup Environ Med. 2018 May;60(5):e253-e260. doi: 10.1097/JOM.0000000000001261. PMID: 29271837.

80. Alterman T, Grzywacz JJ, Muntaner C, Shen R, Gabbard S, Georges A, Nakamoto J, Carroll DJ. Elevated Depressive Symptoms Among Hired Crop Workers in the United States: Variation by Sociodemographic and Employment Characteristics. Rural Ment Health. 2018 Apr;42(2):67-68. doi: 10.1037/rmh0000090. PMID: 31777642; PMCID: PMC6880944.

81. Myers ML, Kane AS and Durborow RM. 2018. Gulf of Mexico Seafood Harvesters: Part 1. Occupational Injury and Fatigue Risk Factors. Safety doi:10.3390/safety4030031.

82. Myers ML, Durborow RM, Kane AS. 2018. Gulf of Mexico Seafood Harvesters, Part 2: Occupational Health-Related Risk Factors. Safety doi: 10.3390/safety4030027.

83. Myers ML, Durborow RM and Kane AS. 2018. Gulf of Mexico Seafood Harvesters: Part 3. Potential Occupational Risk Reduction Measures. Safety doi:10.3390/safety4030033.

Presentations

84. Tovar-Aguilar A and Flocks J. "A Web of Immigration and Labor Regulation and How it Binds Farmworkers." American Association of Geographers Annual Meeting, New Orleans, LA, April 10-14, 2018.

85. Flocks J, Grzywacz J, Tovar-Aguilar A, McCauley L, Mac V, Chicas R, Vulpe C, Roberts S, and Denslow N. "Current Occupational Heat and Pesticide Research in Southeastern Coastal States," (poster) NIDDK-NIEHS Workshop on Chronic Kidney Diseases in Agricultural Communities, Bethesda, MD, June 25-26, 2018. http://www.sccahs.org/index.php/2018/07/11/joan-flocks-presents-on-behalf-of-sccahs-at-national-conference/

2017

86. Mutic AD, Mix JM, Elon L, Mutic NJ, Economos J, Flocks J, Tovar-Aguilar AJ, McCauley LA. Classification of Heat-Related Illness Symptoms Among Florida Farmworkers. J Nurs Scholarsh. 2018 Jan;50(1):74-82. doi: 10.1111/jnu.12355. Epub 2017 Oct 12. PMID: 29024370.

87. Mathews AE, Al-Rajhi A, Kane AS. Validation of a photographic seafood portion guide to assess fish and shrimp intakes. Public Health Nutr. 2018 Apr;21(5):896-901. doi: 10.1017/S1368980017000945. Epub 2017 Dec 29. PMID: 29284548; PMCID: PMC5848755.

Presentations

88. Flocks J. "Immigration Policy and Agricultural Labor in Florida" University of Florida, Department of Agricultural Education and Communications Seminar Series, Gainesville, FL, October 27, 2017.

89. Mutic A, Mix J, Elon L, Tovar J, Flocks J, Economos E, and McCauley L. "Classification of Heat Related Illness Symptoms among Florida Farmworkers." American Public Health Association Annual Meeting, Atlanta, GA, November 7, 2017.

90. Tovar J, Economos E, and Flocks J. "Community Based Research on Heat-Related Illness in Florida Farmworkers." American Public Health Association Annual Meeting, Atlanta, GA, November 7, 2017.

91. Flocks J. "Immigration, Farm Labor, and Food Justice" University of Florida, Center for the Study of Race and Race Relations, Race Matters in the News Seminar Series, Gainesville, FL, November 9, 2017.

92. Flocks J. "Immigration, Farm Labor, and Food Justice" University of Florida, Center for the Study of Race and Race Relations, Race Matters in the News Seminar Series, Gainesville, FL, November 9, 2017.

93. Mutic A, Mix J, Elon L, Tovar J, Flocks J, Economos E, and McCauley L. "Classification of Heat Related Illness Symptoms among Florida Farmworkers." American Public Health Association Annual Meeting, Atlanta, GA, November 7, 2017.

94. Tovar J, Economos E, and Flocks J. "Community Based Research on Heat-Related Illness in Florida Farmworkers." American Public Health Association Annual Meeting, Atlanta, GA, November 7, 2017.

95. Flocks J. "Immigration Policy and Agricultural Labor in Florida" University of Florida, Department of Agricultural Education and Communications Seminar Series, Gainesville, FL, October 27, 2017.

2016

96. Runkle J, Flocks J, Economos J, Dunlop AL. A systematic review of Mancozeb as a reproductive and developmental hazard. Environ Int. 2017 Feb;99:29-42. doi: 10.1016/j.envint.2016.11.006. Epub 2016 Nov 23. PMID: 27887783.

97. Mac VV, Tovar-Aguilar JA, Flocks J, Economos E, Hertzberg VS, McCauley LA. Heat Exposure in Central Florida Fernery Workers: Results of a Feasibility Study. J Agromedicine. 2017;22(2):89-99. doi: 10.1080/1059924X.2017.1282906. PMID: 28118110; PMCID: PMC5682629.

98. Hertzberg V, Mac V, Elon L, Mutic N, Mutic A, Peterman K, Tovar-Aguilar JA, Economos E, Flocks J, McCauley L. Novel Analytic Methods Needed for Real-Time Continuous Core Body Temperature Data. West J Nurs Res. 2017 Jan;39(1):95-111. doi: 10.1177/0193945916673058. Epub 2016 Oct 22. PMID: 27756853; PMCID: PMC5797491.

Awards 2016 – 2021

Outreach Core
Association for Communication Excellence in Agriculture, Natural Resources, and Life and Human Sciences

Crisis and Issues Management
Silver Award Winner: COVID-19 Crisis Communication for Extension and Agricultural Workers, COVID-19 Toolkit for Extension and agricultural workers

Diversity
Bronze Award Winner: State of the Science: Mental Health Issues in Agricultural, Vulnerable and Rural Communities White Paper, 2019 State of the Science White Paper

Publishing
Bronze Award Winner: Screening and Testing of Agriculture Farm Workers and Employers for COVID-19,
Electronic Media and Audio for Targeted Audiences, video with Dr. Glenn Morris on COVID-19 testing and screening for agricultural workers

Heidi Radunovich. Co-Investigator. (2019). Agrisafe Network, Inc. (PI: Natalie Roy) Southern region farm and ranch stress assistance network. Develop a clearinghouse of farmer assistance programs in the region inclusive of programs providing professional agricultural behavioral health counseling and referral.

Heidi Radunovich. (2018). Florida Nursery, Growers and Landscape Association (FNGLA). Endowed Research Fund. Research Enhancement Award. During August 2017, FNGLA leadership identified opioid misuse as a problem within their industries and contacted the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) to gain assistance with addressing the issue of opioid misuse. SCCAHS created a resource section dedicated to opioids in order to help support FNGLA. However, it is unclear the extent to which opioids are a problem for FNGLA, what the economic impact might be, how individuals and families are affected, and what resources or programs might be useful for these industries. This project seeks to document the impact that opioid abuse has had on Florida's nursery, grower and landscaper industries, as well as their families, and determine how best to help them. In order to do this, information will be obtained from relevant stakeholders, and stakeholders will be informed of findings. This project will involve both assessment and information dissemination, which will be outlined below.

Gülcan Önel and Antonio Tovar. (2018). Robert Wood Johnson Foundation. Interdisciplinary Research Leaders Award. The broad goal of the Interdisciplinary Research Leaders (IRL) program is to produce diverse interdisciplinary leaders who conduct and apply high-quality, community-engaged, action-oriented, equity-focused health research in order to drive improvements in the health of communities.