Quarter 1 Report

Year 3

Southeastern Coastal Center for Agricultural Health and Safety

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February 1, 2019

For More Information

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

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Background

The occupational risks for farmworkers, fishers and forestry workers in the coastal southeast are numerous. Farmworkers who harvest fruit, vegetables, and ornamental plants by hand frequently bend, crouch, and lift to carry crops and tools weighing as much as 90 pounds. They can be exposed to pesticides sprayed on crops and are at risk for injuries caused by farm machinery. Fishers also labor under hazardous conditions, and transportation to medical facilities can be difficult if they are injured while on the water. Most fatalities for fishing industry workers are from drowning, but injuries can also be caused by malfunctioning fishing gear, entanglement in fishing gear, slippery decks, strong currents, tidal surges and waves washing over the deck, and collisions. Forestry workers face risks using heavy logging equipment, as well as risk of injury from the massive weights of falling, rolling and sliding trees and logs. Transporting logs from harvesting sites to processing sites can also lead to injuries in forestry workers. Farmworkers, fishers and forestry workers generally work outdoors in all kinds of weather, leading to major concerns in Florida, other southern states and the Caribbean about the impact of heat stress on workers, particularly in the setting of recent increases in number of days with temperatures above 90 degrees F.

In response to these issues, the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) was established in 2016 as part of a Centers for Disease Control and Prevention (CDC) / National Institute for Occupational Safety and Health (NIOSH) Agricultural Health and Safety Initiative. 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. SCCAHS focuses specifically on the unique environments and occupational communities of this region (e.g., hot, humid climate and coastal/coastal plains with farming and fishing and timber). SCCAHS is a multidisciplinary partnership of academic institutions, community organizations, and industry representatives that brings together individuals and organizations that are already pursuing academic and applied basic research, intervention, translational, and outreach solutions for occupational illness and injuries. SCCAHS provides centralized regional infrastructure where these individuals, organizations and companies can engage in mutual learning, leverage resources, build on previous efforts of colleagues, and promote new research.

The SCCAHS Evaluation Program is tasked with collecting relevant monitoring and evaluation (M&E) data from the Center's projects and Cores to document program progress and assess the extent to which the SCCAHS meets its intended goals. The Evaluation Program analyzes and interprets data to establish the quality, effectiveness, and impact of the Center and its disparate parts, and reports and shares evaluation findings and recommendations with key stakeholders.

Research Projects

Research Project 1- Occupational Health and Safety Surveillance of Gulf Seafood Workers

Project PI: Andrew Kane, PhD

Project Description

This 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 fisheries subsectors. Surveillance data will be used to identify and support relevant points of intervention for hazards in the difference fishery subsectors throughout the study region.

No updates for this project in Y3Q1.

Research Project 2- Extent of Agricultural Pesticide Applications in Florida Using Best Practices

Project PI: Gregory Glass, PhD

Project Description

This two-year surveillance project uses an integrated remote sensing (RS) system (time series of high and moderate resolution) to create an analytic framework to establish the levels of various, selected herbicides/pesticides (H/P) on specific, commercially grown crops within the state of Florida. The extent of health risks for agricultural workers depends, as an initial step, on the amounts of H/P that they contact during their work activities. Although acute unintentional exposures are serious risks for individuals, the more extensive, lower dosage exposures of the workers may be a more serious issue. Unfortunately, estimates of amounts of H/P used in the industry were last gathered between 2007-2009. This report aggregated H/P usage by target pests and crops but was insufficiently detailed to establish potential worker exposure from the environment. Given the continued absence of exposure data, the proposed work is essential for subsequent research projects seeking to correlate health impact with H/P exposure.

During this quarter the team evaluated a final approach for crop identification using remotely sensed imagery. This approach used time series of images with an artificial intelligence algorithm (Random Forest). This approach provided a nominally better classification compared to current approaches.

This project's funding has ended. The PI and outreach core will meet to identify key findings and develop a dissemination plan.

Research Project 3- PISCA: Pesticide & Heat Stress Education for Latino Farmworkers that is Culturally Appropriate

Project PI: Joseph Grzywacz, PhD

Project Description

The overall goal of this project is to reduce poor health outcomes among Latino farmworkers resulting from exposure to pesticides and extreme heat and humidity. To achieve this goal the proposed project will build a community-advocate-university partnership to accomplish three primary aims.

Specific Aim 1

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

Completed.

Specific Aim 2

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

Product Indicator: Phase 1 Results Publication

Phase 1 data analysis was completed in Y2Q2. A manuscript based on these results has been submitted for publication.

Activity Indicator: Phase 2 Safety Training Sessions

Description of Progress

In Y3Q1, our team has facilitated three trainings. The first was an EPA WPS training that took place in Lake Park, GA on October 1, 2018. Participants included 25 H2A workers, 7 women and 18 men. The follow-up survey took place three months later, and 18 surveys were completed. The second training was an HRI training that took place in Lake Park, GA on October 23, 2018. Participants included 19 H2A workers, 3 women and 16 men.

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 will begin in Year 4.

Other Activities and Products

Community Outreach Events

- Fiesta Latina planning meeting- October 2, Valdosta, GA.
- Fiesta Latina- October 13, Lake Park, GA. The team promoted PISCA at this community event.
- Migrant Clinic Advisory Board Meeting- October 16, Lake Park, GA.
- Georgia Home Visiting meeting- October 24, Valdosta, GA. Beginning collaboration with Georgia Home Visiting Program in conjunction with PISCA recruiting.
- Colquitt County Schools- November 12, Moultrie, GA. Outreach for Familia Adelante.

- Migrant Clinic Advisory Board Conference Call- December, 19, Lake Park, GA.

Conferences

Outreach

Trejo, M. & Ordaz Gudiño, C. (October 4-6, 2018). Tabling for SCCAHS and PISCA. *East Coast Migrant Stream Forum.* Portland, ME.

Presented

Grzywacz, J.G., (October 2018). Attending to Heat Illness & Pesticide Exposure among Farmworkers: Results from an Attention Placebo-Controlled Design. *SCCAHS Heat-Related Illness State of the Science Meeting.* St. Petersburg, FL.

Grzywacz, J.G., Gabbard, S., Fung, W., Salvatore, A.L., Georges, A., & Carroll, D., (November 2018). Social Determinants of Health Among Farmworkers: Evidence from the NAWS. *American Public Health Association Conference.* San Diego, CA.

Products

Manuscript submitted

Grzywacz, J.G., Gonzales-Backen, M., Marin, T., & Trejo, M. Attending to Pesticide Exposure & Heat Illness among Farmworkers: Results from an Attention Placebo-Controlled Evaluation Design. *Journal of Occupational & Environmental Medicine.*

Book chapter submitted

Grzywacz, J.G., Luque, J., & Becker. Pesticide Exposure and the Health Effects among Latino and other Farmworkers. Edited volume, "Increasing Occupational Health and Safety in Workplaces: Research and practice" Edited by Ronald Burke & Astrid Richardson.

Poster

Gou, Y., McQuerry, Chavez, Brownstein, Brumbach, B., & Grzywacz, J.G., (October, 2018). Prevention of Heat Related Illness Among Immigrant Latino farmworkers: Statistical Considerations. *SCCAHS Heat-Related Illness State of the Science Meeting.* St. Petersburg, FL.

Tovar, A., Flocks, J., Monaghan, P., Grzywacz, J.G., Kane, A., Glass, G., McCauley, L.A. & Morris, G., (November, 2018). Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS): Current Projects at the Newest NIOSH Ag Center. *American Public Health Association conference*. San Diego, CA.

Gonzales-Backen, M., Tovar, M., Trejo, M., Gudino, Rendon, & Liebman., A., (November, 2018). Improving Pesticide & Heat Stress Knowledge among Latino Farmworkers: Phase I of PISCA. *American Public Health Association conference*. San Diego, CA.

Curriculum

Marie Denis-Luque and Stefka Mentor have been working to translate the PISCA curriculum into Haitian Creole. The curriculum is still in progress.

Outreach materials

Amy Liebman from the Migrant Clinicians Network has collaborated with the PISCA team to create a comic book based on the PISCA pesticide safety curriculum. The publication is still in progress.

Research Project 4- Heat Stress and Biomarkers of Renal Disease

Project PI: Linda McCauley, PhD

Project Description

We **hypothesize** that biomarkers of renal damage previously identified in the Mesoamerican population will also exist among Latino farmworkers who have immigrated to the U.S. to work in agriculture. We will recruit 70 agricultural workers in Florida who are between 18 and 54 years of age, oversampling workers who report they have migrated from Central America or Southwest Mexico, and 30 controls of similar heritage who do not work in heat intensive agricultural environments such as mushroom facilities, restaurants and hotels. In this work, we will accomplish the following specific aims:

1. characterize the occupational environment of these workers including work practices, workplace heat exposure and work intensity;
2. characterize the physiologic profile of these workers including body anthropometrics, dehydration, and self-reported heat–related illness symptoms;
3. determine if biomarkers indicating kidney injury are present (kidney injury molecule – 1 (KIM-1), Beta-2 microglobulin (B2M), neutrophil gelatinase-associated lipocalin (NGAL), elevated blood urea nitrogen (BUN), creatinine, uric acid, uromodulin, and decreased glomerular filtration rate (GFR)) and if the presence and levels of these biomarkers in agricultural workers differ from controls who are not employed in agriculture; and
4. use non-targeted metabolomics analysis of blood plasma to explore the molecular mechanisms of renal dysfunction associated with occupational heat exposure.

Activity Indicator: Kidney Biomarker Labwork

During Y3Q1 we ordered kidney biomarker lab analysis kits, organized kidney biomsamples for analysis, prepared sample manifests and oversaw analysis of laboratory testing and processing of kidney biomarker tests in the Emory Multiplex Immunoassay Core (EMIC). This activity occurred during October and November 2018: Key personnel on this activity include Valerie Mac.

Activity Indicator: Data Cleaning and Assembly of Study Dataset

This quarter we worked on data cleaning of biomonitoring data to ascertain any missing data. We also integrated the Florida Automated Weather Network (FAWN) environmental data with survey data, physiologic biomonitoring data (i.e. Heart rate, activity, urinalysis, basic metabolic panel), and kidney biomarker data. This activity began in December 2018, and is ongoing. Key personnel on this activity include Valerie Mack and Lisa Elon.

Activity Indicator: Metabolomics Data Analytics Pipeline Design and Formulation

We worked on the assembly and testing of an analytical pipeline to analyze the pending metabolomics data in RStuduio with the xmsPANDA package. Raw metabolomics data is expected to have been generated by the Emory Metabolomics Core from the analysis of plasma samples by the end of January. This activity occurred from October to December 2018. Key personnel on this activity include Vicki Hertzberg, Valerie Mac, and Linda McCauley.

Conference

Presented

McCauley, L., (October 2018). The Girasoles (Sunflower) Study: Exploring the Physiologic Heat Stress Response. *SCCAHS Heat-Related Illness State of the Science Meeting.* St. Petersburg, FL.

Products

Poster presentation

Vi Thien Mac, V., (November 2018). Risk Factors Associated with Reaching Recommended Physiological Limits for Core Body Temperature in Agricultural Workers*. American Public Health Association*, San Diego, CA.

> This poster displayed results from the Girasoles Study and discussed the level of heat illness risked faced by ag workers in Florida. This poster also discussed potential interventions for HI in Florida Ag workers and described the biomonitoring protocol that is also being employed in the current Renal Biomarkers or Heat Stress study.

Poster presentation

Hertzberg, V.S., (November 2018). Regional Variation in End-Stage Renal Disease: Could Heat Exposure be a Risk Factor among Young Hispanic Males? *American Public Health Association*, San Diego, CA.

> This poster describes an analysis of publicly available data from the CDC Wonder database. This study aimed to examine end stage renal disease (ESRD) mortality in young white males in the US, to determine time trends over 1999-2016, to compare mortality rates by ethnicity, and to examine if rates are elevated in southern states more likely to experience longer periods of hot temperatures.

Research Project 5- Using Social Marketing to Prevent HRI and Improve Productivity Among Farmworkers

Project PI: Paul Monaghan, PhD

Project Description

As climate change leads to warmer temperatures and higher humidity in the southeastern United States, the risk of heat related illness (HRI) and associated injuries for farmworkers is growing. Currently, only California, Washington, and Minnesota have agricultural worker regulations regarding HRI. Even in these states, agricultural piece rate payment dis-incentivizes workers from

adopting many safety practices. Improved training content and methods for farmworkers will continue to have limited success because they do not address other modifiable workplace factors. Research is needed to show the costs and potential productivity benefits of HRI prevention to workers, supervisors and employers. To increase organizational support for farmworker safety we need to quantify the educational, economic and health outcomes of training. Three key problems 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 objective of this proposal is to measure the impacts of different models of HRI safety promotion on hydration and productivity among farmworkers employed in Florida agricultural production. We hypothesize that

a) farmworker training alone does not significantly increase prevention behaviors; trained farm labor supervision and personalized incentives are also necessary to overcome structural barriers and
b) changes in behavior are associated with productivity levels measured at the company level.

Specific Aim 1

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

Activity: Connect and confirm with growers to recruit workers to collect urine data

Dr. Fritz Roka met with a high-ranking production manager as well as the head of the HR/Safety department at one of the largest vegetable operations in the country. He discussed the logistics and timeline of the project, and both were very keen on the project and see big advantages to participating in the study. Meeting attendees estimated that at least 50% of workers on the operation's farms south of Naples and in Estero/Fort Myers would be available for December 2019 and April 2020 trials. A follow-up meeting in Immokalee at the end of January 2019 with the grower's Chief Financial Officer to confirm recruitment and data collection logistics is currently being scheduled and will include all key project personnel (Monaghan, Morera, Roka, Tovar-Aguilar).

Activity: Modify IRB approval

Our team added a pilot urine data collection component to our project to prepare for urine sample collection during the main study. Research instruments (registration questionnaires, focus group guides, pre-intervention survey, and post-workday survey) for both the pilot study and main study were edited and will be resubmitted to UFIRB for approval on January 14, 2019.

Activity: Recruit 60 total farm labor supervisors and agricultural workers for focus groups

This activity will begin in Y3Q1. Recruitment flyers will be posted at the Immokalee office of the Farmworker Association of Florida. Farmworkers interested in participating in the first focus group scheduled for January 27, 2019 will call Dr. Jose Antonio Tovar-Aguilar. The phone call will be used to screen for inclusion criteria (18 years of age or older, self-identification as Latino, and

employed in tomato production for at least three months within the last year), introduce the farmworker to the project, and obtain verbal consent. Recruitment will begin January 15, 2019 to ensure minimal lag time between recruitment efforts and focus group discussions.

Product: Focus group instruments

Two initial focus group guides—one for farmworkers and another for crew leaders—were developed to explore the following:

- Farmworker fluid intake practices
    - How, when, and where beverages are consumed
    - Beverage preferences
    - Hydration routines at work
- Farmworker cooling practices
- Structure and nature of farmworker rest breaks
- Contextual behaviors linked to hydration
    - Pre- and post-work activities and consumption habits
- Farmworker risk perceptions
- Perceived and structural fluid intake barriers and facilitators
- Farmworker receptivity to eight social marketing strategies
- Crew leader baseline beliefs regarding worker heat safety
- Crew leader implementation of heat safety policies and provision of supplies and equipment
- Crew leader risk perceptions
- Crew leader perceived benefits of hydrated workers
- Crew leader receptivity to managing fluid intake behaviors
- Crew leader receptivity to eight social marketing strategies

Once feedback on heat safety context and social marketing strategies is obtained, two more focus group guides—one for farmworkers and one for crew leaders—will be developed to test preferences for communications messaging and delivery for the promotional campaign.

Specific Aim 2

Determine the comparative effectiveness of the social marketing approach to the existing HRI educational programming currently used in Extension and employer-based models of safety promotion. We will document changes in knowledge of HRI symptoms, attitudes towards hydration, self-reported behavior and biophysical measures to compare the success of the different approaches have with worker hydration.

This will take place further along in the project.

Specific Aim 3

Establish the relationship between hydration interventions, changes in safety culture and productivity levels by measuring output per worker using piece rate pay slips. Translating our research on behavior change is a crucial part of the diffusion model. Companies, supervisors and workers will learn the efficacy of better hydration and productivity levels in order to incentivize investment in farmworker safety.

This will take place further along in the project.

Outreach activities

Morera, M., (November, 2018). UF/IFAS Fall 2018 Farm Labor Supervisor Training. Immokalee, FL.

Description: attended training, performed participant observation

Target audience: 50+ Farm labor supervisors, including: crew leaders, licensed labor contractors, field foremen, farm managers, and farm owners

Tovar-Aguilar, T., (November, 2018). Heat Stress Prevention. *UF/IFAS Fall 2018 Farm Labor Supervisor Training*. Immokalee, FL.

Description: Taught HRI module of farm labor supervisor training

Target audience: 50+ Farm labor supervisors, including: crew leaders, licensed labor contractors, field foremen, farm managers, and farm owners

Conferences

Attended

Monaghan, P., Tovar-Aguilar, T., Morera, M., (October, 2018). *The Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) Heat Related Illness State of the Science Meeting*. October, 2018, St. Petersburg, FL.

Products

Poster

Monaghan, P., Tovar-Aguilar, T., (November, 2018). Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS): Current Projects at the Newest NIOSH Center for Agricultural Safety and Health. *American Public Health Association meeting*. San Diego, CA.

Poster

Tovar-Aguilar, T., (November, 2018). Translating Scientific Research on Heat Related Illness into Preventing Education Training for Farmworkers. *American Public Health Association meeting*. San Diego, CA.

Pilot Projects Program

Task 1

Advertisement and assistance for pilot project applications

Activity Indicator: Pilot project advertisement

The Year 3 RFA was released in July and the letter of intent and proposal submission dates were extended. The RFA is available in Appendix I. Five proposals were received, which were reviewed by the SCCAHS peer review board.

Activity Indicator: Pilot project mentoring

Key Personnel/Mentors

J. Glenn Morris (Principal Investigator)

Farah A. Arosemena (Program Manager)

As the overarching PI, Dr. Morris, along with Farah Arosemena will convene Pilot PI Quarterly meetings in July 2018, October 2018, January 2019 and April 2019 with each of the seven awarded pilot projects from Years 1 & 2).

Task 2

Selection of Pilot Projects

Activity Indicator: Pilot project review

Peer reviewers with relevant expertise and no reported conflict of interest were selected to receive 1-2 proposals each to review and score. They were selected between September 27 and October 5, 2018, and included:

Joe Grzywacz – FSU
Valerie Mac – UF
Christopher Vulpe – UF
Ann Zaia – UF
Divya Patel – UF
Janice Krieger – UF
Diana Gomez – UF

The full application packages (N=4) and a score sheet were provided. The score sheet is available in Appendix II. Scores ranged from 55-82. Final score sheets and summary statements with proposals were sent to Council to recommend funding. Based on the initial proposal submission, 3 members of the recommended Council member list were selected. Dr. Sabo-Attwood joined SCCAHS as a Senior Advisor on the Planning and Evaluation Core for PHHP/EGH and was an addition to the Pilot/Feasibility Program Review Council member list. The Council was selected between December 3-7, and included:

Tara Sabo-Attwood – UF
Andy Kane – UF
Alan Becker – FAMU
Marie Bourgeois – USF

Activity Indicator: Pilot project selection

The Year 3 award will go to Atin Adhikari, Assistant Professor at Georgia Southern University in Environmental Health Sciences. The title of the proposal is *Field evaluation of N95 filtering facepiece respirators against airborne dust and microorganisms during cotton harvesting.* The pilot project proposal is available in Appendix III.

Task 3

Monitoring of projects, and converting pilot projects to federally funded grants.

Activity Indicator: Monitoring of pilot projects

Pilot project PIs met with the administration program to discuss project progress, budgets, obstacles, and future funding. Pilot project updates are provided in the following section.

Task 4

"Development of metrics for evaluating the Pilot Project Program"

Activity Indicator: Evaluate pilot projects based on number of presentations/ publications, further funding

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

PI- Juan Luque

Accrual data- In Phase 1, 5 focus groups were held in South Carolina. In Phase 2, six crew leaders (3 male, 3 female) and 101 farmworkers (61 male, 40 female) completed surveys. All participants self-reported they were Hispanic and all provided informed consent. There were no refusals to participate in either the focus group or survey phases. Preliminary findings are available in Appendix IV.

Impacts on study participants- After completing either the focus groups or surveys, all research participants received a 4-page OSHA educational handout on heat safety in Spanish and were offered the opportunity to download the OSHA Heat Safety Tool App if they had a smartphone https://www.osha.gov/SLTC/heatillness/3423_ factsheet_sp.pdf). The six crew leaders received the 4-page handout, participated in a two-hour OSHA Heat Illness Prevention Training, and received training on the Heat Safety Tool app (https://www.osha.gov/SLTC/heatillness/osha_ heattraining_guide_0411.pdf). They also completed a validated Agriculture safety app rubric later to evaluate features of the app. Many participants were appreciative of the opportunity to receive training since most had never received any type of heat safety training, only pesticide training.

Obstacles to implementation- There were no obstacles to implementing Phase 1, the focus group study. After Phase 1 was completed, the PI changed institutions from Medical University of South Carolina to Florida A&M University, and there was some delay in transitioning to Phase 2 to transfer the grant, receive IRB approval for the new study site, recruit survey interviewers, and implement Phase 2 of the study. The study site in South Georgia is two hours from Tallahassee, so making the time to be able to travel to the study site for the PI was sometimes challenging because of competing work responsibilities and the availability of research participants and survey interviewers. Because survey administration mostly occurred between mid-September and mid-October, the research activity to test the iButton temperature and humidity readings with the OSHA Heat Safety Tool has been postponed until summer 2019. The equipment has been ordered and the researchers will consult with Dr. Antonio Tovar on using the technology so they can complete this final part of the research project in the field in 2019. The researchers also plan to follow up with the same crew leaders in April or May to see if they plan to use the OSHA Heat Safety Tool in their work to obtain temperature and heat advisories.

Project sustainability- Based on this research project, both 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. The Heat Safety Tool app training could be added to other crew leader training on heat safety. However, since the PISCA project is implementing heat safety training in their research project, there would likely be confounding to test such an intervention in the same study area. New study areas such as Gadsden County, Florida or other counties in South Georgia could be approached to gauge interest in receiving the training and testing the educational intervention on knowledge and practices using a pretest/posttest design. The original concept was to develop another heat safety tool app that would improve on the current app by providing more accurate local temperature and humidity data through a peripheral device that could be connected to a smartphone. The long-term goal of this research is to develop and test this technology.

Products-

Manuscript

Luque, J; Bossak, B; Davila, C; Tovar-Aguilar, JA. (2018) "I think the temperature was 100 degrees!": Work Safety Discussions among Farmworkers. *Journal of Agromedicine*, Epub ahead of print.

Poster presentation

Luque, J; Bossak, B; Tovar-Aguilar, A; Davila, C. (November, 2018). Heat Stress Prevention Strategies among Farmworkers in South Carolina. *American Public Health Association*, San Diego, CA.

Paper presentation accepted

Luque, J., (March, 2019). Heat Stress Prevention Strategies among Farmworkers in Georgia. *Society for Applied Anthropology*, Portland, OR.

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

PI- Lynn Grattan

Accrual data- Examined of 43 participants: Demographics, medical symptoms, Hurricane Impact (HI), information processing speed, everyday memory, self-reported resilience, coping strategies, symptoms of PTSD, Depression. Update on follow-up studies discussed in March 2018 not provided – request have made to the PI several times throughout Year 2 of the project.

Impacts on stakeholder community- No update provided.

Impacts on study participants- No update provided.

Obstacles to implementation- None stated.

Project sustainability- Follow up studies of all participants will occur over the next two months. Will incorporate potential effectiveness of brief Resilience training in data analysis. NIH R21 submitted, currently under review for extended follow-up studies.

Products- No manuscripts published to date

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

PI- Kim Dunleavy

Accrual data- Phase I - 12 prospective subjects contacted, 9 consented, 6 completed, 3 lost to follow-up (employment change). Phase 2 - 12 additional prospective subjects contacted 12 consented, 12 ongoing. No adverse events were reported and additional recruitment is planned for early January 2019.

Impacts on stakeholder community- Project has increased the awareness of possible options to manage low back pain including workplace modifications, movement adjustment and breaking up sustained positions.

Impacts on study participants- The self-management and participatory methods have potential to increase coping and confidence to manage pain; the final results are still to be determined. Some participants have reported improvements in pain and ability to perform tasks. There is an additional spin-off community engagement project planned for January. UF Physical Therapy

students will be assisting with teaching lifting techniques and weight lifting for strengthening to a high school group at risk of dropping out with potential to enter the seafood industry in the future.

Obstacles to implementation- The reinforcement and reminders to implement chosen solutions has been difficult to schedule with variable schedules related to tides, timing of different tasks impacted by orders for clams and a one-hour drive time with limited ability to plan visits ahead of time. We are working around the workers' schedules, as this is the number one priority for participant recruitment. We have switched to using Redcap to allow for piping of choices into future surveys and revised the survey, requiring IRB revision. The new survey is likely to assist with more consistent data collection for more participants at any one point. We are also using two research assistants to provide reminders and track participant completion of surveys.

Project sustainability- The methods show promise for scaling to other groups but may require some minor adjustments for different types of seafood workers. There is also a need to determine the optimal method for support and reminder systems using text as most workers do not access email. The availability of educational methods online is also unlikely to be useful for an audience that has limited electronic access. Dissemination of the methods is therefore likely to be dependent on local seafood association and center outreach initiatives and may require training of other local personnel for wider reach. However, targeting a different target group - the owners of the seafood companies - might be a valuable initiative. The findings of this study are likely to highlight the needs of this unique group of workers with extreme physical requirements who also show high coping and resilience characteristics. The majority of work-related low back pain research has focused on individuals with low coping skills and emphasized the importance of developing coping skills to return to work. The research in this area may have implications for other groups with similar responses to the workload such as agricultural workers.

Products- Coffman A, Dunleavy K., (March 2019). Self-efficacy and Pain Coping in Seafood Workers with Chronic Low Back Pain. Accepted for: *Primary Care Progress* meeting, Gainesville Florida.

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

PI- Gulcan Onel

Accrual data- The storms significantly shortened the 2017-2018 harvest season and created a delay for the study team. The project was granted an extension and interviews were postponed until the 2018-2019 harvest season. Data collection has not yet started. 30 Haitian farmworkers and 30 Mexican farmworkers will be interviewed in 2019 growing season in Immokalee, FL. To date, all instruments have been finalized and Haitian Creole translations are complete and IRB approved.

Impacts on stakeholder community- Enhanced capacity building of the community partner, FWAF, by training their community health workers on mental well-being of farmworkers (expected results).

Impacts on study participants- Increased awareness among farmworkers to understand, identify and seek help for mental health problems (expected results).

Obstacles to implementation- IRB approval was delayed due to concerns about current immigration environment and back translations of Haitian Creole instruments. It has been a

challenge to identify Haitian-Creole interviewers who are from within the community and trained in research data collection.

Project sustainability- Dr. Onel has leveraged her pilot to attain additional funding to sustain her research, expanding her aims.

1. 2018 Research Opportunity Seed Fund Award, UF Office of Research, Implications of Shifting Migration Trends: Comparative Assessment of Social Networks, Health Status, and Productivity of Hispanic and Non-Hispanic Migrant Farm Workers, 2018-2021, PI: Gulcan Onel.
2. Robert Wood Johnson Foundation, Interdisciplinary Research Leaders Program, A Rural State of Mind: Addressing Mental, Physical and Economic Health of Farm Communities in Florida, 2019-2021, PIs: Gulcan Onel, Jeanne-Marie Stacciarini, Jose Antonio Tovar-Aguilar

Products- none

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

PI- Antonio Tovar-Aguilar

No update this quarter.

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

PI- Greg Stanwood

Accrual data- As of January 2019, we have made progress on the in vitro studies of Aim 1. IRB approval has been obtained and we have just begun recruiting participants for Aim 2, leveraging the staff and recruitment efforts of the separately funded Familia Sana study (as described in the full proposal). Laboratory experiments are underway to develop and assess the accuracy and precision of analytical techniques for assessing pesticide metabolites from sweat patches. We are verifying that the sweat patches (PharmChek®) absorb pesticides and metabolites of interest and defining our detection limits following chemical extraction of the patches. These results will guide the deployment of sweat patches in our upcoming human subject study. Mass spectrometry and high performance liquid chromatography analyses are being conducted at the Florida State University College of Medicine Translational Science Laboratory with support from their Director, Dr. Roger Mercer. To date, we have established assays for the following pesticides of interest, using a combination of chemical and isotopic standards: beta-cyfluthrin, imidacloprid, and trans-permethric acid.

Impacts on stakeholder community- none stated

Impacts on study participants- none stated

Obstacles to implementation- none stated

Project sustainability- It is too early to tell, but the collaborating teams (led by Stanwood and Gryzwacz) are working well together and we are confident that we will scale this up – we are planning an NIH proposal for submission in late 2019.

Products- none

Understanding the scope of the opioid epidemic for agricultural industries

PI- Heidi Radunovich

Accrual data- Data collection has not begun

Impacts on stakeholder community- none to date

Impacts on study participants- none to date

Obstacles to implementation- During the Fall 2018 PI-to-PI Quarterly meeting questions about sample size/power led to delay in work in order to obtain consultation with project biostatistician Babette Brumback, as well as considering whether paying participants $5 more would a barrier to enrollment. IRB approval anticipated for the quantitative survey by end of January, and data collection to begin February.

Project sustainability- Additional funds were received from Florida Nursery, Growers and landscape Association (FNGLA) for this work; anticipate a resubmission of a grant proposal to United States Department of Agriculture (USDA), National Institute of Food and Agriculture (NIFA) in May 2019 (previous submission was not funded).

Products- Anticipate submission to the National Association of Rural Mental Health conference in February 2019.

Product Indicator: Metrics for evaluating the impact of pilot program research, including ROI score

The following metrics will be used to evaluate pilot projects:

Project Logic Model Key Components to Measure Impact

- Outputs
- Outcomes – Achievement of outcome indicators

Research data impact

- Publications
- Citation of literature

Sustainability

- Number of grant applications submitted
- Impact scores of grant proposals
- Number of funded proposals
- Award types (foundation, state, federal)

Community Engagement (if applicable)

- Partner network strength
- Contribution to Outreach Core

Outreach Core

Project Description

The Outreach Core is comprehensive in nature, providing knowledge transfer support for the proposed research projects, integration with all proposed educational and extension activities, and effective and culturally competent communication and information dissemination to stakeholders across the six state region. Outreach Core activities align with the National Occupational Research

Agenda (NORA AgFF) plan. Our outreach plan follows NORA AgFF's Strategic Goal 3 – Outreach, Communications and Partnerships, which indicates the intention to "move proven health and safety strategies into agricultural, forestry and fishing workplaces through the development of partnerships and collaborative efforts" (CDC, 2013). As in the NORA AgFF plan, our outreach consists of disseminating relevant risk reduction interventions and research findings and promoting adoption of best practices in the agricultural and fishery workplaces.

Specific Aim 1

"Develop a robust, comprehensive plan to disseminate research to practice findings and promote adoption of health and safety strategies in agricultural workplaces among the center's target populations, including underrepresented, vulnerable and culturally diverse subpopulations."

Communication with Internal and External Stakeholders

Activities Indicator: Heat Related Illness State of the Science Meeting

On October 25-25, 2018, the Southeastern Coastal Center for Agricultural Health and Safety brought together scientists from the disciplines of sports medicine, military, and farmworker safety and health for a Heat Related Illness State of the Science meeting. Seven presenters discussed their work and participated in a panel discussion to determine the direction and potential collaborations in HRI research. Attendees represented four universities, federal agencies, medical institutions, and consulting organizations. In addition, a poster session was held the night before the meeting, in which PIs and students shared and discussed HRI research.

The following speakers presented at the meeting:

- **Thomas Bernard**: Professor, Environmental and Occupational Health, Sunshine Education and Research Center
- **Candi Ashley:** Professor, Exercise Science, University of South Florida
- **Rebecca Lopez**: Program Director, Athletic Training Professional Program, University of South Florida
- **Joe Grzywacz**: Chair, College of Human Sciences, Florida State University
- **Linda McCauley**: Dean, Nell Hodgson Woodruff School of Nursing, Emory University
- **Eric Coris**: Director, Primary Care Sports Medicine, University of South Florida
- **Vasubandhu Misra:** Professor, Earth, Ocean and Atmospheric Sciences, Florida State University
- **Mike Sawka**: Professor, Biological Sciences, Georgia Tech

There were several key findings from the meeting. First, the scope of HRI in the Southeast is pervasive, affecting outdoor workers, military personnel, and athletes. There is a need for collaborative, multi-disciplinary research to protect worker health and mitigate productivity losses in outdoor industries. Second, organizational factors influence HRI. These factors include allowing workers to acclimatize to hot working conditions; providing water and breaks for rehydration; and recognition, treatment and management of HRI symptoms. This last factor includes having an emergency plan for HRI, and managing the worker's re-entry into work activity. There are also individual factors that influence HRI, which include the worker's physical fitness, illnesses, medications, sleep deprivation, and co-morbidities. Finally, there are conflicting recommendations

for treatment of severe HRI. Clear guidelines for first response for farmworkers and farm labor supervisors are needed.

Activities Indicator: Communication with Community Stakeholder Advisory Board (CSAB) Members

Grant Proposal Text

"The CSAB will meet formally as a group with project staff twice a year. In addition, public education and outreach team members will personally meet with each of the board members during the summer months."

Description of Progress

Following the HRI State of the Science meeting, Dr. Thomas Bernard and Dr. Tracy Irani released a webinar for CSAB members describing the outcomes of the meeting. More details about the webinar are discussed further on in this section. The outreach core has been developing a white paper about the meeting entitled *State of the Science White Paper: Interdisciplinary Perspectives on Heat Related Illness*. A corresponding article is also in the works for submission to the Journal of Health Care for the Poor and Underserved, written in conjunction with the administration program.

The outreach core has also begun work to plan the upcoming CSAB meeting in March 2019, which will focus on key findings from the HRI White Paper. Presenters from the State of the Science meeting have been invited for a panel discussion. Furthermore, we have created a survey to solicit feedback from CSAB member about the structure of the board and how they would like to organize themselves. Survey analysis will be completed in preparation for the CSAB meeting.

Communication with Stakeholders in SCCAHS Region

As part of our directive to reach out to stakeholders in the six-state SCCAHS region, we have continued contacting AgFF health and safety experts in the Southeast. We contacted the Southeast Center for Agricultural Health and Injury Prevention, members of the International Society of Agricultural Safety and Health in the Southeast and Dr. Glenn Morris' contacts in occupational medicine and public health. These conversations have yielded additional contacts that we will continue to follow up with in the future.

Following the success of the first State of the Science Meeting, the outreach core is planning to repeat the event annually focusing on different timely topics. We are delving further into the idea of opening the 2019 meeting for stakeholders in the region, including the Southwest Center for Agricultural Health, Injury Prevention and Education, the three NIOSH Education and Research Centers in our region (Florida, Alabama, North Carolina), and the North Carolina Agromedicine Institute.

Specific Aim 2

"Translate r2p best practices and approaches to the workplace through prevention and promotion activities targeted to farmworkers, farm employers and supervisors and farm family members."

Prevention and Promotion Activities

Product Indicator: Farm Risk Management

Following the release of the SCCAHS Farm Risk Management educational package in Fall 2018, the outreach core is developing corresponding EDIS publications to go with the published webinars.

The topics include an overview of risk management and general liability insurance, property and liability risk management, worker liability, and planning for healthcare expenses. Following these publications, the outreach core will develop a line of research to investigate adverse childhood experiences among migrant farm workers and their families, specifically those who travel with their families. This would include a systematic review of the literature that will result in article publications and conference presentations.

Activity Indicator: CBSM with Stakeholders

Grant Proposal Text

We will work closely with the CSAB to determine what practice changes and risk reduction and mitigation strategies are relevant for farmworkers, operators and crew leaders and then develop appropriate tools and trainings to enhance adoption. The use of social marketing will focus our efforts on developing best practices and materials for dissemination as well as the means of promotion for these activities.

Description of Progress

For the upcoming CSAB meeting we are planning focus groups during breakout sessions. These breakout sessions will either be organized by geography, stakeholder type, or research project subject matter. We are gathering feedback from CSAB members on how they preferred to be organized.

Portions of the CSAB meeting will be used to solicit input from our stakeholders about HRI, by identifying needs and gaps regarding HRI prevention and response, and barriers to implementation. We will also work with members to develop messages about HRI to varied target audiences.

Activity Indicator: Monthly Seminars/Webinars in Agricultural Safety and Health

Grant Proposal Text

"Monthly SCCAHS seminars/webinars in agricultural safety and health/occupational health. The seminar series will draw on SCCAHS investigators as well as external speakers. At least one of the sessions will be devoted to short project presentations by investigators in the pilot/feasibility grant program. All seminars will be webcast and archived on the SCCAHS website, to facilitate inclusion of investigators at collaborating institutions. Our group at UF routinely webcasts all seminars, and the IT group from the Administration Program will work with each collaborating institution to assure that necessary facilities are available for webinar participation."

Description of Progress

In the SCCAHS monthly webinar series, Dr. Andrew Kane presented in a webinar on October 24, 2018 titled, Occupational Health and Safety Surveillance of Gulf Seafood Workers. Dr. Kane is an associate professor of environmental & global health at the University of Florida and the deputy director for the Southeastern Coastal Center for Agricultural Health and Safety. A total of 17 people participated live in the October 2018 webinar, and there have been 12 unique views of the recorded webinar. A voluntary evaluation survey is sent out to everyone that registered for the webinar and 5 people completed the evaluation. The webinar is available at:

http://www.sccahs.org/index.php/2018/10/22/upcoming-webinar-the-need-for-a-safety-focus-in-agriculture-nov-6-2-3pm/

Webinars have been planned for the monthly webinar series for January 2019 through June 2019. The first speaker of 2019 is Dr. Joseph Grzywacz on January 22 titled, Pesticide & Heat Stress Education for Latino Farmworkers that is Culturally Appropriate, followed by Dr. Linda McCauley on February 12 titled, Heat Stress and Biomarkers of Renal Disease, and Dr. Lynn Grattan on March 12 titled, Acute Psychological and Health Impacts of Hurricane Irma in UF/IFAS Extension Workers. The Center chose not to host a webinar in December 2018. Y3Q1 webinar analytics were fairly similar to the first webinar hosted by the Center in Y2Q4, as there were 19 people that participated live in the September 2018 webinar. As more people learn about the webinar series, there should be more participants in future webinars. The Center created a webinar schedule graphic for the 2019 webinars of January through June, and this can be distributed to promote all webinars together, as well as each one separately.

SCCAHS also hosted a seminar on November 15, 2018 with Jose Perez, Senior Manager of Environmental Health & Safety for the Wonderful Company. During his visit, the outreach core arranged for Perez to meet with UF/IFAS deans, SCCAHS PIs, UF department chairs, and gave a guest lecture in an intercultural communication class. In his seminar, which was also streamed live, Perez discussed how he incorporates servant leadership to promote a safe work environment that is employee-driven. He also shared how leaders at different levels of The Wonderful Company are empowered to improve workplace safety and help grow a culture of safety in the industry. In addition to approximately 15 in-person participants, four people participated in the live stream of the Fall 2018 seminar, and there have been four unique views of the recorded seminar, which is available at: http://www.sccahs.org/index.php/2018/09/27/upcoming-fall-2018-seminar-featuring-jose-perez/

The outreach core produced two special webinars to highlight events this quarter. First, as a promotion for his November 15, 2018 seminar, Jose Perez spoke in a webinar on November 6, 2018 titled, The Need for a Safety Focus in Agriculture. Twelve people participated live in the November 2018 webinar, and there have been 12 unique views of the recorded webinar. A voluntary evaluation survey was sent out to everyone that registered for the webinar and 1 person completed the evaluation. The webinar is available at: http://www.sccahs.org/index.php/2018/10/22/upcoming-webinar-the-need-for-a-safety-focus-in-agriculture-nov-6-2-3pm/

Following the Heat Related Illness State of the Science meeting on October 25, 2018, Dr. Tracy Irani, SCCAHS Outreach Core Director, hosted a webinar with colleague Dr. Tom Bernard from the University of South Florida's NIOSH funded Sunshine Education & Research Center. The webinar was entitled SCCAHS Community Stakeholder Advisory Board Heat-related Illness Recap. They were pleased to share about several upcoming and past events, as well as affiliate faculty opportunities and a new webinar series. Irani and Bernard summarized and reported findings and

future directions from the SCCAHS Heat-Related Illness State of the Science Meeting. The webinar is available online at: https://vimeo.com/300998544

Specific Aim 3

"Develop, test and implement culturally competent communications and education materials utilizing a wide range of traditional and social media on agricultural and seafood workers' health and safety issues."

Communications Activities

Activity Indicator: Website Update

Grant Proposal Text

"We will provide... effective utilization of cutting edge communication techniques, including an interactive public outreach web site containing information databases, downloadable print fact sheets for use by county extension faculty and Sea Grant agents, and brochures, video interviews, blogs and social media. (The public outreach web site will include a link to the project web page maintained by the Planning and Evaluation Core)."

Description of Progress

A number of materials were added to the SCCAHS website this quarter. We released a video interview with Linda McCauley discussing her research project about the impact of heat stress on kidneys. SCCAHS sent its first official newsletter to CSAB members to ensure they are kept up to date on news, upcoming events, and training opportunities. The newsletter will be archived on the SCCAHS website. The SCCAHS website had 2,152 web views over the past quarter. Popular pages included the State of the Science web page, the State of the Science news release, and the research project page. The website was restructured to more effectively display the resources that SCCAHS has curated for users. Two new pages were added to the website to archive CSAB newsletter and past webinars. We hope to increase page views by 10% as we better promote resources on the website and host more current webinars.

Activity Indicator: Social Media Update

Grant Proposal Text

"We will provide... effective utilization of cutting-edge communication techniques, including an interactive public outreach web site containing information databases, downloadable print fact sheets for use by county extension faculty and Sea Grant agents, and brochures, video interviews, blogs and social media. (The public outreach web site will include a link to the project web page maintained by the Planning and Evaluation Core)."

Description of Progress

The SCCAHS social media efforts were focused on promoting events and webinars this quarter. Updates and communication outputs from the State of the Science meeting were also shared in order to raise awareness about the science behind heat illness. No campaigns were developed for this quarter. From October to December, we gained 11 new Twitter followers and 76 new Facebook page likes. The most popular posts were Dr. Kane's webinar promotion and the State of the Science recap video.

Other Activities and Products

Products

Poster submitted

Rogers, T., Lundy, L.K., Lindsey, A.B., Irani, T., Telg, R.W., McLeod, A., Stokes, P., Mitchell, R.C., (Upcoming- February 2019). Identifying Influencers in Agricultural Health and Safety Twitter Conversations. *Southern Association of Agricultural Scientists Conference.*

> Though the public's concern about the risk to agricultural workers is often driven by emotion, rather than science, they maintain a stronghold and subsequent effect on agricultural health and safety regulations and practices through communication channels such as social media (Donham & Thelin, 2016). Due to this influence, the purpose of this study was to identify and describe the most authoritative Twitter users regarding conversations around agricultural health and safety topics for the states covered by the Southeastern Coastal Center for Agricultural Health and Safety.

Article submitted

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.

> Farming, by the very nature of the occupation, is riddled with uncertainty. The risks associated with the agriculture industry are just as diverse as the industry itself. For all risks, one challenge is the development and dissemination of safety communication materials tailored for diverse audiences. Valkenburg, Semetko, and Vreese (1999) examined common frames used in news media. Their analysis pointed to four commonly used news frames: conflict, human interest, responsibility and economic consequences. The purpose of this study was to describe the agricultural and health safety issues discussed in Florida news media during the year 2016, discussing the prominence of the frames outlined by Valkenburg et al. (1999). In this study, the most prominent frame was the human interest frame, followed by responsibility, economic consequences, and conflict. Frames carry a great deal of weight in shaping individuals' opinions, attitudes, and actions towards agriculturally based messages; therefore it is essential for agricultural communicators to understand the framing of agricultural health and safety issues. Acknowledging the frames used in the reporting of agricultural issues allows agricultural communicators to enter into informed interactions with media outlets and better prepare the resources they provide to them. These framing analyses also provide agricultural communicators with a solid foundation on which to best position and frame their messaging on behalf of the industry. Further research is recommended to examine frames from an audience perspective and to investigate the impact of human interest frames in the presentation of agricultural news articles.

Planning and Evaluation Core

Administration

Program Description

"The Administration Program will provide support for Planning and Evaluation Core and SCCAHS activities, including communication, Advisory Board and Committee support, administrative infrastructure, and biostatistics and IT/data management."

Task 1

"Coordinate/integrate Center components and activities."

Coordinate Center Activities

Description of Progress

The planning/administrative core continues to work directly with the outreach cores media specialist to provide infrastructure, access and support for SCCAHS. This is achieved by hosting the SCCAHS website (www.sccahs.org), organizing monthly PI meetings, and facilitating activities on the Center's project management website.

Quarterly PI Meetings

Grant Text

Quarterly one-on-one meetings with the Center Director/Associate Center Director and each PI and Core Director. Meetings will focus on reviewing results to date, and assuring that work is moving forward appropriately. Ways in which the Administration Program and other Center staff/investigators can facilitate progress will be identified. If there appear to be major challenges with a project, meeting frequency will be increased to monthly. Meetings will be in person, or by Skype.

Description of Progress

PI-to-PI Quarterly meetings began in June 2018 with Research Core/Pilot PIs, as well as Core and Program Directors. The initial meetings were attended by Dr. Glenn Morris, Farah Arosemena and each of the SCCAHS PIs or Core/Program Directors. The Evaluation Program was determined a necessary strategic partner in trouble shooting any challenges and modifying logic models with PIs in real-time. An Evaluation Program team member will be invited to attend all future meetings.

PLANNING/EVALUATION CORE
Glenn Israel (June 5 and September 24)
Joan Flocks (June 20 and September 28)
Babette Brumback (June 8 and September 11)

OUTREACH CORE
Tracy Irani (June 8 and September 20)

RESEARCH CORE
Andrew Kane (June 19 and September 26)
Linda McCauley/Valerie Mac (June 20 and September 25)
Joseph Grzywacz (June 5 and September 11)

Gregory Glass (June 29 and September 28)
Paul Monaghan (September 21)

PILOT/FEASIBILITY PROGRAM
Lynn Grattan (project closed – no quarterly meetings attended)
John Luque (July 23 and October 9)
Gulcan Onel (July 23 and October 9)
Kim Dunleavy (July 24 October 10)
Antonio Tovar (July 31 and October 17)
Heidi Radunovich (August 2 and October 10)
Gregg Stanwood (July 25, missed the October meeting, PI sent an email on 11/9 with budget update only)

Description of meetings (agendas, action items, issues resolved etc)

1. Budget Review – Evaluation of spending: must adhere to budget justification approved by CDC/NIOSH, prior approval review process.
2. Provide accrual data for human subjects research – number of prospective subjects contacted, number consented, number completed (by phase if applicable), number lost to follow-up and reported adverse events (unlikely, but I ask). If not a human subjects study, please describe source from where data was collected and a preliminary findings summary.
3. What is expected to happen to participants as a result of their study participation and/or their participation in any trainings (i.e. skills gained or change in behavior)?
4. How has the project influenced the stakeholder community, and what capacities has it built?
5. What are the obstacles to implementation, if any?
6. Is there evidence that the initiative can be sustained – scaling up and out – beyond the project life?
7. New for upcoming meeting - Have you reviewed your initial submission of your Year 4 budget? Has anything changed? If so, what revisions to the budget and justification would you like to submit?

Task 2

"Organize and staff Advisory Boards and key SCCAHS committees"

Activity Indicator: External Scientific Advisory Board

Discussion began at the October 5th IOC meeting to increase ESAB to seven members. Priority areas of expertise to add are:

- Occupational Health Nurse or Physician (UF nurse or University of Miami MD)
- Research Faculty/Caribbean Academic Institution

To date no new members have been added – follow-up is needed.

Task 4

Provide Biostatistical Support for Research Projects

Grant Proposal Text

"Strong biostatistical support is critical to research, and is an essential part of the IRB and IACUC approval process. In our experience, integration of biostatistical support into the core infrastructure of Center grants is a highly effective (and cost-effective) way to assure that studies are appropriately designed, with a sufficient sample size, and that plans for data analysis are in place from the start of the project. We have also found that by having a single statistical teamwork across all projects within a Center, there is often recognition of opportunities for collaborative studies which might not otherwise have been recognized. Oversight of the biostatistical group will be provided by Dr. Babette Brumback, Professor and Associate Chair of Biostatistics in the UF College of Public Health and Health Professions and the UF College of Medicine."

Description of Progress

We worked with Dr. Grzywacz to complete a poster on his pilot study that Yian Guo presented at the State of the Science meeting. We also worked with Dr. Luque to complete the data analysis and a manuscript for his pilot project survey of heat stress in farmworkers.

Evaluation Program

Program Description

"A formal monitoring and evaluation (M&E) strategy is a critical, interwoven component in SCCAHS. Evaluation tools provide meaningful data to guide the work of the Center as well as accountability information to the sponsoring agency. The Evaluation Program places special emphasis in managing the evaluation process and meeting evaluation standards for utility, feasibility, propriety, and accuracy."

Task 1

"Engage key stakeholders to maintain a responsive and focused evaluation program."

Activity Indicator: Communication with SCCAHS Teams

Evaluation Program personnel attend monthly Internal Operation Committee meetings. We met with the newly-funded research project- Using Social Marketing to Prevent HRI and Improve Productivity Among Farmworkers (Paul Monaghan is PD)- to receive feedback on the logic model, indicators, and indicators calendar our team created for the project. We also clarified research goals, outreach opportunities, and potential partnerships.

Activity Indicator: Strategic Growth Planning Initiative

The objective of this project is to develop a strategic growth plan to guide SCCAHS to fulfill and excel at our involvement and impact throughout our designated geographical region and occupational health and safety focuses. By engaging our Center's internal faculty and staff and external stakeholders, a participatory and collaborative process will be utilized to gather input and feedback in designing our Center's growth strategy. This strategic growth planning initiative will be facilitated by Haaris Saqib, a Master of Sustainable Development Practice (MDP) student and graduate assistant working with the SCCAHS Evaluation Core through the summer semester 2019. It is anticipated that the products from this activity will be invaluable for focusing our involvement

and impact over the coming years. This will also be a key element to strengthen our re-application for the next cycle of funding. The strategic growth planning initiative was proposed at the December 2018 IOC meeting. Please contact Dr. Sebastian Galindo or Haaris Saqib with questions and comments about this initiative.

Task 2

"Collect relevant M&E data from the Center as a whole, its Cores, and individual research projects."

Activity Indicator: Quarterly M&E data collection

The evaluation team collected data to create both this report and upcoming RPPR report. M&E indicator forms were distributed to project leaders approximately one month before Q1 ended.

Task 3

"Analyze and interpret data to establish the quality, effectiveness, and impact of the center as a whole, its cores, and the individual research projects."

Activity Indicator: Return on Investment project

The evaluation team continued work on developing a return on investment (ROI) assessment plan. This quarter we held meetings with several partners and consultants to hone in on details of how we will proceed with evaluating the economic impact of SCCAHS' heat related illness (HRI) research.

First, we spoke with Dr. Jaclyn Kropp, an associate professor in the Food and Resource Economics Department at the University of Florida. Dr. Kropp offered suggestions on how to calculate baseline costs of HRI, including hours lost to HRI injuries, current activity rate, and travel and housing costs for workers. In order to estimate the value of shade breaks and water breaks, she suggested we factor in productivity and lost wages, but cautioned that it is difficult to measure health benefits. The major takeaways of the meeting were to choose the audience that our study will focus on: producers, workers, or society at large. She suggested we collect data on the research project level, that can be aggregated later.

The Evaluation Program met with Dr. Melvin Myers, who serves as a consultant with SCCAHS on the *Occupational Health and Safety Surveillance of Gulf Seafood Workers* project. Dr. Myers also worked with the Northeast Center for Occupational Safety and Health in Agriculture to facilitate an economic evaluation of a rollover protection systems (ROPS) rebate program for farmers to retrofit tractors. He directed us to articles he had written describing the cost of the intervention compared to the cost of not doing the intervention, and determining the cost savings. With our study, he suggested we use a pre/post survey with the same population to determine if productivity increased, and if negative health effects decreased. Dr. Myers also urged us to choose an audience for our study.

We spoke with Dr. Marc Schenker, former director of the Western Center for Agricultural Health and Safety. He is currently the PI on an HRI study at that center, which is investigating the effect of an app to prevent HRI. Dr. Schenker has also begun work with an economist to measure economic impact, but they have yet to identify any findings. He told us about two upcoming conferences focusing on HRI—the Epidemiology in Occupational Health meeting in New Zealand in April, and the Western Regional Ag Safety and Health conference in August in Seattle. Dr. Schenker would like

to see more collaboration between the NIOSH Centers, particularly since the Pacific Northwest Center for Agricultural Safety and Health is also researching HRI.

In December, we invited Dr. Fernando Wilson to UF for a one-day meeting with the SCCAHS Evaluation Program and SCCAHS stakeholders. Dr. Wilson is an economist who works with the Central States Center for Agricultural Safety and Health on an economic evaluation project. He has been instrumental in advising us on how to frame our own project. We divided the meeting into three parts. The first meeting was to discuss the economic impact of HRI on employers. Two Extension agents and Community Stakeholder Advisory Board members-- Laurie Hurner and Vanessa Campoverde-- attended, as well as Dr. Paul Monaghan. The major highlights of this meeting included the following. First, our study needs to be specific in choosing one audience, because costs and benefits will be different for each audience. Second, identifying costs of HRI are going to be difficult because the process will require primary data collection from producers who we cannot access without partners. Finally, unlike tractor rollovers or hearing loss, there is no literature on HRI to calculate costs of HRI injuries, and these calculations will need to be performed in our study.

The second meeting focused on the economic impact of HRI on workers. This meeting was attended by Dr. Maria Morera from the Using Social Marketing to Prevent HRI and Improve Productivity Among Farmworkers project, Maribel Trejo from the PISCA project, Dr. Monaghan, Dr. Jaclyn Kropp, and Laurie Hurner. The key points from this meeting included the following. Using the Euroqol survey to calculate quality of life among workers could be easily used across projects, but would require administration before and after HRI intervention. However, this survey does not calculate economic benefits, and Ms. Trejo informed us that following up with workers in her current study has been very difficult. Dr. Monaghan discussed possibilities of partnering with migrant clinics to collect data from workers, which he has done with past studies. However, many workers are H2A guest workers, and return to their home countries and may not visit the same clinic again. Ms. Trejo said often H2A workers return to work with the same grower year after year. Two other data sources that were mentioned were workers' compensation, which is listed publicly in each county, and lawsuits against employers, which would require more rigorous investigation.

The final meeting focused on the economic impact of HRI research on society at large. Though there are more beneficiaries, we focused on taxpayers and insurance companies. When insured workers seek medical care after HRI, that is a cost to insurance companies or Medicaid. When uninsured workers seek medical care after HRI, hospitals and taxpayers have the economic burden of compensating for unpaid medical bills. There are several databases that track incidence of HRI, but not all of them filter by occupation.

After the meeting with Dr. Wilson, we discussed next steps. We chose to focus on the economic impact of HRI research on employers, and are working to determine how to calculate costs to employers using primary data collection and secondary data.

Task 4

"Report and share evaluation findings and recommendations with key stakeholders."

Product: Quarterly report

Data from quarterly indicator forms were compiled into the Y2Q4 report, which was shared with project and core leaders. The quarterly report was shared among SCCAHS team members, addressing communication challenges outlined in the Process Evaluation Report, to facilitate keeping staff from various Center projects updated about the progress made by colleagues on different teams. The Quarter 4 report was shared on Basecamp for SCCAHS team members to review, and also published to the SCCAHS website for public review: http://www.sccahs.org/wp-content/uploads/2018/08/Y2Q3-Report.pdf

Task 5

"Maintain an open line of communication and engagement with the Evaluation Programs of other Ag Centers across the country."

Activity Indicator: Moving forward with common metrics

The Evaluation Program participated in the NIOSH ECO call on October 10, 2018. Topics for this call included a review the National Farm Safety and Health Week campaign, and the introduction of July's common metrics project, with the possibility of collaborating with NIOSH with future reporting.

Other Activities and Products

Product Indicator: Poster presentation

SCCAHS Heat Related Illness State of the Science Meeting

Israel, G.D., Diehl, D.C., Galindo-Gonzales, S., Mitchell, R.C., Saqib, H., & Galindo, P.H. (October 2018). Assessing SCCAHS' Economic Impact: A thematic approach Focusing on Heat Related Illness. SCCAHS Heat Related Illness State of the Science Meeting. St. Petersburg, FL.

Products

Manuscript submitted

Mitchell, R.C., Israel, G.D., Galindo-Gonzales, S., & Diehl, D.C. From Plan to Action: Adapting Evaluation to Serve the Developmental Needs of a Newly-Funded Multidisciplinary Research Center. *Journal of Program Planning and Evaluation.*

> The purpose of the article is to describe the creation of a developmental evaluation program for a multi-disciplinary federal research center, specifically focused on the role that evaluation teams can play in defining project goals, bridging communication gaps and creating dynamic monitoring and evaluation structures to react to changing situations within the center.

Conferences

Attended

Israel, G.D. & Diehl, D.C. (November, 2018). *American Evaluation Association Conference*. Cleveland, Ohio.

Emerging Issues Program

Program Description

The Emerging Issues Program (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.

Task 1

Identify new AgFF worker safety and health issues in the region.

Activity Indicator: Monitor Potential Emerging Issues

In Y3Q1, EIP participated in regularly scheduled and as needed internal meetings with SCCAHS IOC, the Administrative Core, the Outreach Core, and personnel from individual research and pilot projects. The EIP regularly reminds project PIs at the IOC meeting to share any issues they encounter during the course of their research. In Y3Q1 the EIP directly contacted all research and pilot project PIs for feedback on emerging issues and compiled their responses into a document for further prioritization. The following is a brief summary of issues reported by PIs at the conclusion of Y3Q1:

- Sun damage to eyes of fishers, especially in Caribbean.
- Mental health among AgFF workers.
- Farmworker housing.
- Disaster relief in the ag industry.
- Forestry sector.
- Temporary worker programs in the state.
- Transferring research from musculoskeletal and repetitive injury among seafood workers to ag workers.
- Haitian farmworkers.

In addition, the EIP continues to work on responding to requests from stakeholders for more training/focus on respirator requirements.

Task 2

Prioritize emerging issues.

Activity Indicator: Prioritize Emerging Issues

Grant Proposal Text

"The EIP leader and assistant will meet regularly and document any emerging issues of concern monthly. They will discuss these issues during regularly scheduled meetings with the Center Director, IAB, and Community/Stakeholder Advisory Board. If there are emergency issues or no upcoming regular meetings, the EIP will request meetings with key personnel to discuss prioritization. The purpose of discussing documented issues will be to determine if any issues: 1)

can be addressed through ongoing research projects or cores; 2) can be referred to known outside resources; 3) should be addressed immediately through the provision of small amounts of funding from the EIP program."

Description of Progress

Plans were made to prioritize the PI identified emerging issues in Y3Q2.

Planning occurred with Paul Monaghan and the Outreach Core to have Carolyn Sheridan of the Ag Health and Safety Alliance address respirator working group in January 2019.

Task 3

Award EIP funds

Grant Proposal Text

"A special fund (total of $8,000) is included in the EIP budget to respond to highly prioritized emergency health and safety issues. The EIP program will develop a protocol for awarding these funds on a case by cases basis to assist stakeholders in addressing these issues. Funds will be expended after careful consultation with program administration and key advisory groups, and approval by the IOC."

Description of Progress

No EIP funds were expended on issues during Y3Q1.

Task 4

"Refer other emerging issues to appropriate resources."

Description of Progress

This is an ongoing task that involves making connections between issues and people encountered at every event. In addition to networking, the goal of this task is to consistently bring SCCAHS into the focus at relevant arenas.

During this quarter, the connections and networking occurred at the following events:

- East Coast Migrant Stream Forum, Portland, Maine, October 3-6.
- SCCAHS State of the Science meeting, St. Petersburg, FL, October 25-26.
- APHA, San Diego, CA, November 9-13.
- SCCAHS Fall 2018 seminar with Jose Perez, Senior Manager, Environmental Health & Safety, The Wonderful Company.

Products

Poster

Tovar, A., Flocks, J., Monaghan, P., Grzywacz, J.G., Kane, A., Glass, G., McCauley, L.A. & Morris, G., (November, 2018). Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS):

Current Projects at the Newest NIOSH Ag Center. *American Public Health Association conference*. San Diego, CA.

APPENDIX I- Call for Pilot Proposals

The Southeastern Coastal Center for Agricultural Health and Safety announces its Pilot/Feasibility Program call for proposals.

SCCAHS

The Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) is part of a Centers for Disease Control and Prevention (CDC) / National Institute for Occupational Safety and Health (NIOSH) Agricultural Health and Safety Initiative. 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, the U.S. Virgin Islands, and Puerto Rico.

Pilot/Feasibility Program Description

The Pilot/Feasibility Program is a key component of the SCCAHS. This program will provide seed funds to stimulate original projects relevant to health and safety in the agricultural, forestry, and fishery (AFF) industries. Projects may include basic/etiologic research, translational research, intervention studies, and/or surveillance. Our goal is to provide early pilot/feasibility support to projects that ask innovative and important questions, and which lay the groundwork for subsequent research grant submissions or interventions, including outreach or extension projects. Some of the projects we select will be "high risk, high reward" novel ideas and approaches, with limited preliminary data, but with the potential for having a major impact on AFF health and safety. While in some instances funding will be sufficient to fully answer a question or address an issue, we anticipate that most projects will provide preliminary/feasibility data for subsequent, larger proposals and projects.

Priority Research Areas

While not required, projects are encouraged which fit within the broad themes of the SCCAHS: coastal fishery worker safety and health; heat stress; pesticide/herbicide exposure; and innovative approaches to foster research to practice, including a focus on worker and supervisor training. Applications that prepare plans for new high impact activities that are not feasible with existing resources are invited in the priority areas of worker safety in forestry, occupational respiratory health, and the health status and protective behaviors of Caribbean migrant and seasonal farmworkers and fisherfolk. Investigators from Historically Black Colleges and Universities (HBCUs) and Hispanic-serving Institutions are encouraged to apply, as are "early-stage" investigators without a prior history of extramural grant or contract support. Applications must propose efforts to advance one of the listed high priority research areas in AFF health and safety.

Eligibility

Applications will be accepted from faculty members at Higher Education Institutions within the seven state/territory area covered by SCCAHS (Florida, Mississippi, Alabama, Georgia, South

Carolina, North Carolina, Puerto Rico and the U.S. Virgin Islands), as well as from governmental, non-profit, and other entities within the region.

Project Duration/Funding

Funding may be requested for periods ranging up to 18 months. We anticipate that project budgets (direct costs) will be in the range of $10,000-$20,000. These projects should not be used to supplement ongoing research or to support previously funded research that no longer has funding support. The intent of this program is to foster new and creative research and interventions, while also increasing the breadth and depth of the overall SCCASH program through interaction and support of other interested researchers and stakeholders from the Center's region.

Timeline (2018-19 grant cycle)

Item	*Date*
Announcement of program	July 16, 2018
Letter of intent	Optional
Project proposals due date	September 7, 2018
Project awards	October 5, 2018
Earliest anticipated start date	October 15, 2018

Letter of intent: A non-binding letter of intent is recommended to allow appropriate peer reviewers to be identified in advance. The letter of intent should contain the names, addresses, and institutional affiliations of the Principal Investigator and project co-investigators; the title of the proposed project; a short (2-3 sentence) description of the work being proposed; and a rough estimate of the total project budget (direct costs).

Letters of Intent should be submitted to: ag-seedfunding@ufl.edu no later than August 31, 2018.

Proposal Preparation/Content: Proposals should contain the following items:

- Specific Aims (no more than 1 page);
- Proposal Narrative, with the following sections:
  - Background and Significance: Why is this an important question/project? (no more than 1½ pages);
  - Innovation: What is new and innovative about the proposed work? (no more than ½ page);
  - Approach: How are you proposing to accomplish the Specific Aims? (no more than 4 pages);
- Budget – template to be provided on web page;
- Biosketch – template to be provided on web page.

(Note that while page limits are included, the actual text can be shorter, if appropriate. Figures, tables, flowcharts, etc. are encouraged, to highlight key elements of the proposal)

Submission: Proposals will be submitted through the **SCCAHS.org** website. Details regarding submission will follow, and will be provided to all persons submitting a letter of intent.

Grant Awards: At the time that grants are awarded, the Pilot Project Research Committee will meet briefly with each awardee (teleconference/GoToMeeting) to assure that appropriate mentorship is available, and that chances of success for the project is optimized. Awardees will meet again with the Committee at the mid-point of the grant period (9 months after the grant award for an 18 month project) to generate a mid-term report that assesses progress and provides assistance as needed to facilitate successful project completion. A final meeting will take place at the end of the grant period, to evaluate results, and discuss next steps for the investigator and project.

For questions, please contact ag-seedfunding@ufl.edu.

APPENDIX II- Pilot Research Program Scoring Sheet

Project Title: Field evaluation of N95 filtering face-piece respirators against airborne dust and microorganisms during cotton harvesting

Please provide scores for each of the Review Criteria below. Available points for each category (out of a total of 100) are shown, with an additional 10 points available for investigators from historically black or Hispanic colleges/universities. A high point total is good.

Score	***Available Points***	***Review Criteria***
	30	Overall scientific merit of the proposal.
	15	Value and clarity of the hypotheses.
	15	Likelihood of completion, with meaningful data.
	15	High risk, but high return research: Is the idea likely to result in a paradigm change, if successful?
	10	Relevance of the proposal to agricultural health and safety and to themes of the Center: farmworkers, coastal fisherfolk; heat stress; pesticide/herbicide exposure; Caribbean agricultural and fishery worker health & safety; and innovative approaches to foster research to practice.

	10	New or early-stage investigator.
	5	Interdisciplinary/community collaboration
	100	TOTAL POINTS

Written Comments for Investigator:

APPENDIX III- Pilot Proposal for *Field evaluation of N95 filtering facepiece respirators against airborne dust and microorganisms during cotton harvesting*

A.SPECIFIC AIMS

The United States in total were ranked as third leading cotton producing country worldwide in 2016/2017 [1]. Cotton farming is one of the most important factors in Georgia's agricultural economy. The state ranked second in cotton production in the US planting >1.4 million acres [2]. Crop harvest and soil tillage are the two largest anthropogenic contributors to agricultural dust and particulate matter (PM), which can be attributed to asthma and other respiratory diseases among farmers as well as children living in nearby areas or working in cotton farms with their family members. Particulate matter with <1.0 µm and ≤2.5 µm aerodynamic diameter are more inhalable in lower respiratory tract causing lung inflammations. How fine and coarse dust exposure from harvesting in cotton farms contribute to respiratory health of cotton farmers were never investigated. The purposes of this study are: (1) to collect pilot data for a future large scale study on dust exposure from cotton harvesting and associated allergic and inflammatory respiratory symptoms among farmers and (2) field evaluation of three different models of N95 respirators for protection against airborne respirable particles and total microorganisms. Before conducting a large-scale experimental and clinical investigations, a realistic and experimentally validated computer simulation modeling for dust inhalation exposure is desirable. It should be able to predict inhaled dust deposition for a set of realistic farm environmental conditions among farmers. The project team will therefore collect airborne PM_{10}, $PM_{2.5}$, PM_1 [particulate matter ≤ 10, 2.5, and 1.0 µm aerodynamic diameter; "particulate matter" (PM) is the general term used for a mixture of solid particles and liquid droplets in the air], respirable and total dust during harvesting in six cotton farms and three control farms and a computer based model will be used for estimating respiratory deposition doses of dust particles in farmers involved in harvesting. The research team will then evaluate estimated/simulated workplace protection factors provided by a personal protective equipment – NIOSH recommended N95 filtering facepiece respirators fitted on a manikin based experimental set-up – against airborne dust and total microorganisms. Respiratory protection appears to be the most widely used preventive measure against dust and bioaerosols. Farmers are, however, often reluctant to use these masks. For farmers performing heavy labor it is often inconvenient to work with respirators and their effectiveness might be questioned. They provide

insufficient protection when the protection factor is too low for a specific situation and when not used or maintained properly. To our knowledge, no data is available on the performances of N95 facepiece respirators particularly during cotton harvesting against dust and airborne microorganisms. Therefore, the second objective of the study will be field evaluation of N95 masks in cotton harvesting sites against airborne respirable particles of different sizes and total microorganisms, which will be measured by an innovative ATP based method.

Study Hypotheses and Specific Aims:

Hypothesis 1: Farmers' exposure levels to dust and microorganisms are significantly higher during harvesting in cotton farms than other rural farm locations and the alveolar (or lower respiratory tract) doses of finer $PM_{2.5}$ and PM_{1} are significantly higher during cotton harvesting.

Specific Aim 1. Collect air samples and measure PM_{10}, $PM_{2.5}$, PM_{1}, respirable and total particle levels during harvesting in cotton farms versus control farm locations using size-selective aerosol sampling methods and IMPACT sampler.

Specific Aim 2. Calculate the alveolar and lower respiratory doses of all particle categories for the farmers by using the ICRP LUDEP computer based respiratory deposition model.

Hypothesis 2: Current NIOSH-recommended N95 respirators may not provide adequate protection against aerosolized dust during various cotton harvesting jobs.

Specific Aim 3. Assessment of respiratory protection factors against airborne particles and total microorganisms during cotton harvesting by using a manikin fitted with N95 filtering facepiece respirators.

Field Evaluation of N95 Filtering Face-piece Respirators against Airborne Dust and Microorganisms during Cotton Harvesting

B. BACKGROUND AND SIGNIFICANCE

Farmers were believed to be healthier than the general population at the beginning of the 20th century due to their exposure to fresh countryside air. This myth was shown to be incorrect in many previous studies showing that farmers not only had significantly higher rates of mortality from occupational injuries, but they also had higher rates of many chronic diseases such as pulmonary and cardiovascular diseases [3]. Farmers and agricultural workers are considered as being at increased risk of asthma [4]. Several previous studies on adult farmers have shown higher [5-9] occurrences of asthma than in general populations. A recent US study on respiratory outcomes in 43,548 farmers (NIEHS Agricultural Health Study) showed that participants had lower prevalence of asthma but higher prevalence of current respiratory symptoms (wheeze, cough and phlegm) even after controlling for smoking, body mass index, and population characteristics [10]. Agricultural dust exposure and hay handling could be some of the important contributors for these increased respiratory symptoms [11-12]. Pulmonary toxins include dusts and organic dusts released during farm works and particle bound allergic and infectious agents, toxic chemicals, pesticides, inorganic dusts, etc. Exposures to these agents can occur at concentrations significantly higher than in other occupational settings or from ambient sources. An eight-year extensive field study conducted at University of California, along with previous research results obtained in the

same university, allowed development of PM_{10} fugitive dust emission factors for discing, ripping, planing, and weeding, and harvesting of cotton, almonds, and wheat [13]. As a result of more than ten-year of studies the researchers developed activity specific and crop specific emission estimates for all agricultural land preparation and harvesting activities within California. In the San Joaquin Valley, PM_{10} emissions estimates for land preparation and all harvest operations were 13,000 tons/year and 13,300 tons/year, respectively. Therefore, dust generated in agriculture should not be underestimated since the contribution of agricultural activities to air pollution is not negligible. Several large-scale population based studies have demonstrated that children and adults with asthma experience short-term increases in respiratory symptoms as well as decrements in lung function following exposure to $PM_{2.5}$ [14-20]. While this association has been well-reported in urban areas, it remains largely unexplored in rural, agricultural communities (including southern Georgia where cotton farming is very common). The associations between $PM_{2.5}$ and pediatric asthma exacerbations in an agricultural community of Washington State was recently investigated [21], which provides strong evidence that agricultural $PM_{2.5}$ contributes to elevated asthma morbidity in children. All these information described above indicate that dust released during cotton harvesting may contain various respiratory sensitizer agents including allergenic microorganisms and exposure to these particles during cotton harvesting could be associated with adverse respiratory symptoms among farmers, such as wheezing. Adequate dust exposure data and data on dust respiratory depositions among farmers during cotton harvesting is, however lacking. The proposed pilot study will address these two knowledge gaps.

Because the engineering control is not always feasible due to diverse nature of dust sources during cotton harvesting, the use of respirators is one of the most viable options for reducing the dust exposure among cotton farmers. But farmers are often reluctant to use these masks because those are uncomfortable during hard work and no apparent protective effect was observed because of inappropriate use of the respirators. The OSHA Respiratory Protection Standard (29 CFR Part 1910.134) does not apply to agricultural workplaces. Filtration efficiency of commonly used N95 masks used by farmers were previously tested in the laboratory studies (the number 95 in this designation means that the filtration efficiency of these masks are at least 95% at the most penetrating particle size of 0.3 μm size) using NaCl particles only. The performances of N95 respirators in cotton harvesting sites can be largely different from the evaluation in laboratory conditions because of the: (a) huge loading of dust particles on mask surfaces, which may change pressure drop and affect penetration, (b) high humidity levels in Georgia; and (c) ambient charged particles settled on surfaces of masks, which can interfere with the filtration efficiency of dust particles. The present study will address these knowledge gaps as well. Because of the limited budget and resources we will investigate this part by using a manikin based experimental set-up where the real-time filtration efficiency of N95 respirators will be examined against particles of different sizes and total microorganisms by simultaneously measuring particle levels inside and outside of the respirator masks fitted on a manikin head form in our existing respiratory evaluation experimental set-up. These field experiments will provide estimated/simulated workplace protection factors against aerosolized dust and total airborne microorganisms during cotton harvesting.

Relevance to National Occupational Research Agenda (NORA)

Although this study is small in scope, budget, and time, we anticipate that the preliminary data will address following NORA topic, strategic goal, and research goal: **Sector:** Agriculture, forestry, and fishing; **Strategic Goal 5:** Improve the health and well-being of agricultural workers by reducing occupational causes or contributing factors to acute and chronic illness and disease; **Intermediate Goal 5.2** - Reduce acute and chronic respiratory disease caused, or exacerbated by, agricultural exposures including asthma, chronic obstructive pulmonary disease, and interstitial and infectious diseases of the respiratory system; **Action Step 5.2.3** - Conduct continued research on chronic respiratory disease and its effects on agricultural workers, giving attention to the synergistic effect of occupational and non-occupational risk factors.

C. INNOVATION

New information at multiple levels: The proposed field experiments will provide important new information at several levels: *(a) unique exposure data for airborne dust exposure in cotton farms during harvesting; (b) total surface microbial load at the breathing heights; (c) respiratory deposition data for* $PM_{2.5}$, PM_{10}*, respirable particles and total particles for adult male and female workers, which will provide a realistic and experimentally validated computer simulation modeling for dust inhalation exposure*. These new information will be vital before conducting a large-scale clinical study on respiratory health of cotton farmers; and *(d) filtration efficiency of N95 respirators against harvesting generated fine, ultrafine, and coarse dust and microorganisms in actual field conditions*.

Innovation in the approach: Innovation in this project also lies in the concept, hypothesis and the approach. In this project we are approaching to explore the exposure levels of wide variety of dust particles as well as parallel understanding of simulated workplace protection factors obtainable from different models of N95 respirator masks (e.g., foldable, pleated, and cup shaped models) against dust of wide size ranges by utilizing a unique manikin based set-up. We will be able to recommend an appropriate respirator model to cotton farmers. Combining exposure assessment and assessment of simulated workplace protection factors offered by respirator masks is certainly an innovative approach in our proposed study.

Novel ATP bioluminescence assay for understanding N95 respirators' workplace protection factors against total microorganisms:

Previous studies have reported the feasibility of real time monitoring of bioaerosols using airborne particle fluorescence spectrometry, pyrolysis-gas chromatography-ion mobility spectrometry, or bioaerosol mass spectrometry. Instruments in which these techniques are used typically are either difficult to operate or expensive. A novel and less expensive ATP bioluminescence assay have been recently employed for bioaerosol monitoring [22]. We will first time use this novel assay for assessing real time protection against total airborne microorganisms in cotton farms during harvesting.

Technical innovation in dust exposure assessment: Accurately assessing dust exposure is highly challenging due to the unpredictable dusty environment in cotton harvesting sites. In this study we will combine three different methods of particle exposure assessment to cover wide range of

particles from 0.3 to 10 μm and we will assess both number concentrations and mass concentrations of particles.

D. APPROACH

In brief, the approach of the proposed study is based on the following tasks: (a) identify three large cotton farms in Statesboro and other southern areas of Georgia and identify three sampling locations in each farm; (b) visit the farms during fall harvesting seasons and install three air sampling set-up at downwind locations at three fields; (c) select two control rural farm locations without any cotton harvesting activity; (d) measure airborne PM_{10}, $PM_{2.5}$, PM_1, respirable and total particle levels at field test locations and control locations; (e) estimate respiratory deposition doses of all these particle categories for the adult male and female farmers in both test and control locations (by modeling only, without any human subject participation) by using a computer based ICRP Lung Dose Evaluation Program or LUDEP 2.07 (Health Protection Agency, London, WC1V 7PP, U.K.) with parameters representing adult farmers [23]. The calculations will be based on the PM concentration data collected within specific particle size ranges. Breathing rates and time intervals that simulate typical outdoor activities at farms will be used for the modeling process; (f) analyze the differences in exposure levels (μg per cubic meter of air or $\mu g/m^3$ and number/m^3) between the test and the control locations; (g) compare exposure data with previous reports from other types of agricultural occupational environments; (h) estimate the differences between upper and lower respiratory deposition doses of PM_{10}, $PM_{2.5}$, PM_1, respirable particles, and total particles during harvesting related tasks in cotton farms; (h) estimate filtration efficiency of N95 respirators against harvesting generated fine, ultrafine, and coarse dust and microorganisms in actual field conditions by measuring particles and total microbial load insider and outside of the respirators.

Task 1 (Specific Aim 1): Selection of sampling sites:

Three cotton farms and two control farms in Statesboro, Brooklet, and other areas of southern Georgia will be identified for our field experiments. The farmers will be contacted by mail and telephone for providing permission to collect environmental samples from their farms during the harvesting season in the fall. The PI is currently conducting some studies on airborne biocontaminants in local farms and these farmers will be approached first. The project team will collect 180 airborne PM_{10}, $PM_{2.5}$, PM_1, respirable, and total particle samples and 180 ATP data from the farms during harvesting in six cotton farms and three control farms [5 farms (3 test + 2 control) × 3 fields × 6 replicate samples x 2 samples per N95 mask – one from inside and one from outside = 180 measurements]. Three N95 filtering facepiece respirators will be tested in each sampling site and particle levels and ATP levels (as an indicator of total microbial activity) will be measured inside and outside of the respirators.

Task 2 (Specific Aim 1): PM monitoring in six test and control sites:

Number concentrations of airborne PM_{10}, $PM_{2.5}$, PM_1, respirable and total particles will be measured by using a 6-channel (0.3, 0.5,1.0, 2.5, 5.0 and 10 μm) particle counter 23V750 (Grainger, Inc.) with graphical interface which can stores up to 5000 sample records on micro SD card. Sampling time can be adjusted up to 60 sec. As stated above six replicate samples will be collected form each location at 10 min intervals. Air flow rate of this air sampler is 0.1 CFM (2.83 L/min). The PI is

currently using this instrument for indoor air quality related studies and he has conducted several studies on particulate matter in the US where the relationships between the concentrations of ambient inhalable airborne mold and pollen with $PM_{2.5}$ and selected trace metals (cadmium, copper, lead, and zinc), temperature, and relative humidity were previous examined [29-30]. Thus, this specific aim is accomplishable given the backgrounds and expertise of the PI. In addition to measuring the number concentrations, mass concentrations of PM_{10}, $PM_{2.5}$, and $PM_{1,}$ respirable and total particles will be measured by a DustTrak™ II Aerosol Monitor 8532 (TSI, Shoreview, MN), which is a handheld battery-operated, data-logging, light-scattering laser photometer. We will use a sheath air system that isolates the aerosol in the optics chamber to keep the optics clean for improved reliability and low maintenance. We will also utilize an IMPACT sampler recently developed by SKC Inc. (Eighty Four, PA). The new modular IMPACT sampler (U.S. Patent No. 7,334,453) comprised of two modules: a housing and a particle collecting assembly. After sampling, the impactor inlet will be unscrewed from the outlet and the particle collecting assembly (filter cassette with incorporated collection substrate). The IMPACT sampler will operate at a flow rate of 10.0 L/min; this sampler is designed for area sampling of $PM_{2.5}$ or PM_{10} and employ a 47-mm filter and 37-mm impaction substrate. This sampler has eight 1.8-mm diameter nozzles together with a battery operated pump forming a compact, portable, and simple-to-operate particle sampling system. IMPACT media will be changed by removing the filter cassette and replacing it with one already loaded with a filter and impaction disc that mounts in the top of the cassette. IMPACT's higher flow rate requirement provides increased sensitivity to low levels of PM. The samplers will be placed or attached to a sampling tripod at each field site at about 1.5 - 2 m above the ground surface at workers' breathing heights. Sampling durations will be recorded for each measurement so that the concentration of all particle types could be calculated, thus allowing estimation of particle generation rate and dispersion levels from cotton picking and stripping machines during fall harvesting seasons.

Task 3 (Specific Aim 2): Respiratory deposition modeling by the LUDEP:

Deposition of PM_{10}, $PM_{2.5}$, PM_{1}, respirable, and total particles in different regions of the adult farmers' respiratory tract will be estimated by using a computer-based respiratory deposition model, the LUDEP 2.07 with parameters representing adult farmers. The calculations will be based on the concentration data collected in PM_{10}, $PM_{2.5}$, and PM_{1} particle size ranges. Breathing rates and time intervals that simulate typical farm activities will be used for the modeling processes. The LUDEP model predicts particle deposition in five regions of the respiratory tract. The estimated deposition for the anterior nasal (relevant for rhinitis) and alveolar–interstitial (relevant for LRS) regions will be used in our study. Detailed formulas for calculating deposition percentages in each of the regions are given in ICRP paper [23]. Likewise, the deposition amount (quantity/time; e.g., number or mass of PM_{10}, $PM_{2.5}$, and PM_{1}) in the anterior nasal and alveolar–interstitial regions will be calculated as the product of the amount of intake and the percent of deposition. We will record the date, duration, area, and description of harvesting activity.

Task 4 (Specific Aim 3): Assessment of respiratory protection factors against airborne particles during cotton harvesting by using a manikin donned with N95 respirators:

In this task we will use measure concentrations of all particle categories in two sampling lines inside (Sampling probe – In) and outside (Sampling probe – Out) of a N95 filtering facepiece

respirator mask. In this task, we will examine protection levels offered by N95 disposable filtering facepiece respirators against all particle size categories. Besides standard cup shaped N95 masks we are planning to test N95 masks from two manufacturers: (1) AOSafety Pleats Plus, TC 84A-2630, Aearo Corporation (previously showed highest fit test rate and reduced 95% infection risk from Mycobacterium [24]); (2) Model FR200 Affinity Foldable, TC 84A-3156, Mine Safety Appliance Company (lowest fit test rate and reduced 70% infection risk from Mycobacterium [24]). N95 respirators are certified under NIOSH 42 CFR 84 regulations [25] after passing the tests performed using charge-neutralized sodium chloride (NaCl) aerosol with the particle size of approximately 0.3 μm or 300 nm in diameter. The certification criterion for N95 half-facepiece respirators says that the total momentary particle penetration (P = Concentration inside mask/Concentration outside mask × 100) through the respirator filter cannot exceed 5% at 85 L/min, i.e., the filtration efficiency, defined as E=100%-P, must be at least 95%. Therefore, we will conduct our experiments at simulated inhalation air flow rate of 85L/min.

Task 5 (Specific Aim 3): ATP measurement on inside and outside surfaces of N95 respirators

In this task we will measure ATP levels on outside and inside surfaces of test N95 filtering facepiece respirators as an indicator of total microbial activity. The ATP bioluminescence assay will be used to quantify ATP levels and detect living, metabolically active microbial cells present in airborne dust particles. ATP levels will be measured by swabbing 10 cm^2 area on both inside and outside surfaces of N95 filtering facepiece respirators tested in cotton farms. A rapid and user-friendly commercially available ATP test kit will be used for this purpose (UltraSnap™ , Hygiena, LLC, Camarillo, CA). According to the manufacturer, this kit uses a unique liquid-stable reagent providing superior accuracy, longer-lasting signal strength, and more reproducible results. Settled and penetrated dust samples on both surfaces of N95 respirators will be collected by sterile cotton and then extracted in the liquid chemical cell releasing reagents and luciferin-luciferase enzyme supplied in test tubes with the test kit for bioluminescence reactions, as stated in the manufacturer's instructions. The bioluminescence from ATP will be measured by a portable luminometer, which quantifies the bioluminescent reaction in terms of RLU or relative light units from the luminometer digital readout. RLU values, which are indirect estimate of overall microbial activity or microbial load on surfaces will be recorded from the collected samples and considered for data analysis.

Statistical power calculation:

We may assume approx. 4-7 times difference (approx. within group standard deviation: 10%) of mean concentration of PM1, $PM_{2.5}$, and PM_{10} based on the previous reports on PM_{10} from cotton farms in Las Cruces, NM [26] between test and control locations. A two-sided, independent sample t-test with group sample sizes of 5 and 5 can achieve approx. 80% power at significance level (alpha) of 0.05 to detect these anticipated differences. Therefore, six replicate samples - as proposed above - will provide sufficient power for statistically analyzing the data.

Potential problems and alternative solutions:

The dust particle concentration levels could be much higher above the upper detection limit of the air sampling instruments during harvesting. If we face this problem then we will reduce our

sampling time or adjust the locations of sampling spots. The amount of surface ATP levels inside the respirators could be <LOD in ATP based assay. We will adjust sampling time and may combine a few samples together to obtain detectable amounts of ATP (a few initial pilot measurements will be conducted).

Data analysis and statistical analysis:

Mean, median, standard deviation, and inter quartile range (IQR) for the concentrations of all particle categories from test and control locations will be determined. Normality of data distribution will be checked by Q-Q plots. If needed, log-transformation will be done to achieve normality. To examine differences between particle concentrations in different conditions (test and control; within the masks and outside of the masks), paired t-tests and ANOVA will be conducted when collected data is normally distributed. If the data are not normally or log-normally distributed, non-parametric Wilcoxon Signed-Rank test or Kruskal-Wallis test will be used. All statistical analyses will be performed using SPSS (SPSS Inc., Chicago, IL).

Project evaluation:

The success of this study will be evaluated through GSU research symposium presentations in spring 2019, other national conference presentations, and a follow-up large-scale grant proposal after completion of the project. The major outcomes of the proposed project will be the answers to the following questions: (1) What are the average particle exposure levels during harvesting in cotton farms and how these particles deposit in the respiratory tract of cotton farmers? (2) What are the total microbial activity inside and outside of N95 filtering facepiece respirators during cotton harvesting? (3) What are the simulated work-place protection factors for different models of N95 masks against cotton harvesting related airborne particles? These questions will be answered in 2 to 3 conference presentations in spring 2019. All data will be combined for an original research article outline in summer 2019. The data collection, analysis, archiving, and interpretation will be performed following the proposed research plan described above. The QA/QC issues will be addressed by measuring 5% samples using a second air sampler.

Implications in future research:

The pilot data from this study will be used initially for developing a R03 grant application responding to the NIOSH Small Research Program. We may also consider a full-scale proposal relevant to respiratory health and safety among cotton farmers in Georgia and other southern states. One of the main purposes of this grant program is to develop an understanding of the risks and conditions associated with occupational respiratory diseases in agricultural environments. This is an ongoing grant opportunity from NIOSH (National Institute for Occupational Safety and Health; CDC). The pilot data collected through this small grant will address one of the main purposes of the funding opportunity ("to develop an understanding of the risks and conditions associated with occupational diseases (asthma and respiratory symptoms in farmers)". This pilot grant proposal is addressing Strategic Goal 1 and Intermediate Goal 5.2 of NORA Agriculture, Forestry and Fishing Agenda (https://www.cdc.gov/niosh/nora/pdfs/nora-agff-revised-agenda-sept2016.pdf).

Project timeline: Purchasing supplies, and preparation of checklists for experiments; Recruitment of student assistants; Finalize experimental set-up, materials and verification of instruments by running them in the Public Health Core Laboratory.	October – November, 2018
Collect and combine data for all three cotton harvesting sites	November - December, 2018
Analysis of ATP samples on both surfaces of N95 respirators immediately after the field experiments	November – December, 2018
Analysis of PM data collected during cotton harvesting and respiratory deposition modeling	January – March, 2019
Perform statistical analysis	April, 2019
Present obtained data in GSU Research Symposium/one national conference and prepare the outline of a manuscript for a scientific journal	April-August, 2019
Prepare the final report	September - October, 2019

APPENDIX IV- Preliminary Findings of a *Pilot Study of Mobile App Monitoring to Prevent Heat-related Symptoms Among Hispanic Farmworkers*

Phase 1

Focus group methods

Phase 1 employed focus group methodology to collect qualitative data on HRI knowledge, attitudes, perceptions, and beliefs among Hispanic farmworkers in rural South Carolina. The research team facilitated five focus groups in trusted facilities serving Hispanic farmworkers, including two different clinics and a migrant head start facility in South Carolina (Johns Island, Lodge, and St. Helena). Facility staff assisted the research team in recruiting participants and arranging the conference rooms. For each focus group, the person who was in contact with farmworkers at each facility assisted the study team by recruiting six to 10 participants either in person or over the phone to attend the focus groups. In Johns Island and St. Helena, the farmworkers were seasonal workers who lived in their own housing (house or trailer). Participants attending the two focus groups in Lodge were migrant farmworkers who lived in temporary housing (barracks or trailer). Farmworkers at these three locations worked at different farms, but at the time of the research were primarily working with tomato crops. The focus groups occurred between October and December 2017. Each focus group was led by the same trained moderator using a structured focus group guide and assisted by a co-moderator who took detailed notes.

Upon arriving at the facility, participants completed informed consent procedures and then completed demographic data forms with the assistance of the moderators. All questions were based on self-report information. Researchers also asked participants to show them their cellphones, so they could record the type of phone and brand. Participants were introduced to HRI prevention using accessible written materials from the Occupational Safety and Health Administration (OSHA). The moderator and co-moderator assisted participants in filling out the forms and answered questions about the educational materials. The focus group began with questions about where to find reliable health information, followed by questions about farmworkers' experiences working with different crops. Next, there were questions about farmworkers' perceptions of occupational risks and hazards and coping mechanisms for working outside in the heat. Farmworkers were asked to discuss their past experiences with HRIs and other work-related illnesses or injuries. There were also questions about water, rest, and shade practices and any employer-provided training received. Finally, farmworkers were shown different types of materials educating workers about HRIs to indicate their preferences (radio, brochures, conversations with others, posters, handouts, photonovellas, and mobile apps). After the focus group discussion, the co-moderator provided a group summary with follow-up questions and then assisted participants in downloading the Spanish version of the OSHA Heat Safety Tool app to their mobile phones and demonstrated how to use it.

The co-moderator prepared notes of each meeting and the research team reviewed the notes to assess the value of the information provided in each focus group. After completing five focus groups, the research team determined that no new information was being generated from the qualitative data collection (i.e., thematic saturation). Participants received a $20 gift card incentive and food and beverages for their time spent participating in the research. Food and beverages were purchased by Dr. Luque since they were not budgeted in the pilot grant. The research protocol was submitted to and approved by the Medical University of South Carolina IRB.

The focus groups were digitally-recorded, transcribed verbatim in Spanish, coded using MAXQDA (Marburg, Germany) qualitative data analysis software, and then reviewed by members of the research team. Two research team members fluent in Spanish independently coded the transcripts using established codes from a codebook. Next, through a series of meetings, each focus group transcript was reviewed in detail to resolve any coding discrepancies and to align coding agreement for all coded segments. Data were analyzed in Spanish using a content analysis technique, which identifies emergent themes, or trends, from the written transcripts. Representative quotes were translated into English for the article. Two coders developed a codebook using the following codes: training, weather, farmwork risk, descriptions of farmwork, use of personal protective equipment (PPE), healthcare seeking, finding health information, HRI knowledge, HRI symptoms, HRI treatment, bathroom access, water drinking, and opportunities for rest or shade. These codes were then grouped into four major themes: 1) farmworker risks and protection against risks; 2) HRI knowledge, symptoms and treatment; 3) water, rest, and shade; and 4) access to healthcare and health information.

Focus group results

There were 29 research participants in the five focus groups. There was a similar number of male and female participants, and the average age was 35 years old. Most farmworkers were from Mexico and had been working in the U.S. for over 10 years. Only 14% of participants had completed high school or some form of higher education. Most participants preferred Spanish, with 83%

responding they could read Spanish "very well," but only one participant could read "very well" in English. Almost one-third of participants spoke an indigenous language. Only two participants had health insurance, and more than three-quarters of participants had a BMI placing them in either the overweight or obese category, calculated from their self-reported height and weight measurements. All participants had cellphones, and most used apps on their phones, such as popular social media apps. There were at least 17 Android phones observed among participants, but only four iPhones.

The detailed focus group results are available in the 2018 published article in the Journal of Agromedicine. For ease of presentation in this report, Table 1 below illustrates the key themes from the focus groups with representative quotes.

Table 1. Key themes and representative quotes

Themes	Quotes by Focus Group Number (FG #)
Farmworker risks and protection against risks	
Heat and sun	Risk of cancer if you spent too much time outside. (FG 1)
Pesticides	Why would they spray when we are walking around here? The wind would bring the chemicals to them and the chemicals were very strong. (FG 2)
Work arrangements	If they got too tired from working during the harvest time of piecework, then they would harvest as much as they could and then if they felt bad, they would leave and tell the bus driver. (FG 5)
Personal Protective Equipment	Most of the bosses tell them to protect themselves from the sun, use long sleeves and bandanas. (FG 2)
Heat-Related Illness knowledge, symptoms and treatment	
Weather	If it is over 105, it is better not to work. (FG 1)
Knowledge	The heat can make you feel dizzy, dehydrated, and feel bad, with headaches, dizzy spells, and vomiting. (FG 5)
Symptoms	Some people sweat or don't sweat, and it doesn't mean they are sick necessarily, it just depends on people's bodies. (FG 4)
Treatment	They used sueros (electrolyte solution) or Gatorade when feeling sick from the heat. (FG 2)
Water, rest and shade	
Water	When I have drunk too much water and I'm still thirsty, I will drink a beer and that will take my thirst away and I'll be fine for an hour or an hour and a half. (FG 2)

	The perfect temperature of water is cold, but not too cold, just fresh. (FG 5)
Rest and shade	When we finish our row…we all go into the brush...we look for shade under the trees to cool down a little…then when the crew leader says "OK fellows, your rest is over", we start a new row and at the other end we again look for shade…sometimes when it's too hot or the row is too long, we rest half way down the row… we get under the trucks…the trucks always have shade under them. (FG 2) When you feel fatigued by the heat, the first thing you should do is take a break. (FG 4)
Access to healthcare and health information	
Healthcare access	They would use household remedies first like water with lemon juice. If you were sick, you let the boss know and they would take you to the clinic (FG 4)
Health information	One could search for health information on the internet and find out about pills or medicines. (FG 3)

Phase 2

Survey Methods

In Phase 2, the study objectives were (1) to train crew leaders to use the OSHA heat safety tool app and assess the usefulness of the app; and (2) characterize heat safety knowledge, preventive practices, and perceptions of HRI risk among a sample of Hispanic farmworkers. The farmworker population is very susceptible to the dangers of prolonged heat exposure due to their occupational status, and in the larger context of a warming planet, their health will only be at greater risk in the future. The phase 2 research protocol was submitted and approved by the Florida A&M University IRB on March 28, 2018.

Before the harvest season began in April, 2018 six crew leaders in Lake Park, Georgia completed a two-hour OSHA heat illness preventing training delivered by Dr. Luque and assisted by the Lake Park staff. Following the OSHA training and instruction on how to use the OSHA heat safety tool app, the crew leaders completed the heat safety survey and two months later, a rubric specifically designed to evaluate the agriculture safety apps (Reyes, Ellis, Yoder, & Keifer, 2016). Later in the summer, farmworkers in South Georgia were recruited at their housing units to complete the 30-minute heat safety survey. Farmworkers received a $10 stipend for survey participation, and crew leaders received a $50 stipend for participating in the survey and training. In addition to the survey data collection, three field observations were conducted by Dr. Luque in late June and July to observe eggplant harvesting, hydration practices and rest periods (see photos toward end of report).

Survey Measures

Farmworkers and crew leaders responded to survey questions in Spanish related to adaptive strategies for heat stress and heat-related symptoms adapted from surveys used in

previous studies in Georgia, North Carolina, and Oregon (Bethel & Harger, 2014; Fleischer et al., 2013; Mirabelli et al., 2010). Adaptive strategies included changing work hours, changing work activities, taking frequent breaks, wearing hats and light-colored clothing, drinking more water, resting in shaded areas, and going to air-conditioned places during or after work or using other methods to cool down after work. Survey data were collected by project staff on work history, crops worked, current work activities including frequency of water consumption and breaks, payment type (hourly or piece rate), usual clothing and headwear, behaviors when working in the heat including cooling methods used, level of concern regarding HRI risk, comfort level in taking breaks to drink water, recent work activities, and health history. Health history questions included self-reported health, chronic disease status, alcohol consumption, smoking status, and height/weight. Questions about heat-related symptoms include: skin rash/skin bumps; heavy sweating; confusion; dizziness; fainting; hot, dry skin; muscle cramps/spasms; extreme weakness/fatigue; and nausea or vomiting. Demographic characteristics included age, sex, level of education, H-2A visa status, years living in the U.S. for non-H-2A workers, housing type, cell phone type and use of apps, language acculturation, and number of seasons working in agriculture. Crew leaders completed a more abbreviated version of the survey than the farmworkers.

Survey data collection

Data collection occurred in farmworker housing units in Lake Park, Georgia between August and October 2018. Surveys were administered by two bilingual Spanish-speaking female assistants from the local community who had been trained previously in survey data collection in the PISCA project. Surveys were administered using a paper and pencil survey. Survey participants received a $10 gift card for participation.

Statistical analysis

Survey data were entered into a SPSS database and then validity checks were used to correct data entry errors and cleaning. All labels were also entered into the SPSS program according to the survey questions (IBM SPSS Statistics Version 25). First, univariate analyses of all variables were calculated to characterize descriptive statistics of the study sample. A heat safety knowledge score was created based on five questions with scores ranging from 0 to 5 and was treated as a dependent variable. Independent samples t-test was used to compare mean differences of heat safety knowledge scores by sex of the respondent, educational attainment, seasons of farmwork experience, past experience of heat symptoms, and H-2A visa status. Further data analysis is currently being conducted in coordination with Dr. Babette Brumback from the University of Florida Department of Biostatistics.

Survey results

<u>Crew leader training</u>

Six crew leaders participated in the OSHA training, three males and three females. The average age of the crew leaders was 41 years old (range 26-69). The crew leaders were paid an hourly wage of $10.95/hour, but one reported being paid $15/hour. When asked how concerned they were about their health from working in hot conditions, two crew leaders reported being a "little concerned" and four crew leaders reported being "not at all concerned." Only one crew leader had experienced a health symptom related to working in the heat and had to go to the emergency room for treatment. Crew leaders answered 10 knowledge questions about heat safety, and the

average number of correct responses was 6.2 on both the pretest and posttest. Four of the crew leaders reported using mobile apps such as Facebook and WhatsApp. After two months, the crew leaders received the app rating rubric. The crew leaders ranked the heat safety tool app on relevance, functionality, and value and privacy. Individual criteria under each domain were rated on a scale of 1 "Poor" to 4 "Excellent." Value and privacy were rated the highest with an average rating of 3.8. Function had an average rating of 3.5, and relevance had an average rating of 3.6. Therefore, for all domains, the app was highly rated by crew leaders. Researchers plan to follow-up with crew leaders in the spring 2019 season to ask if they are still using the app.

Farmworker survey

Survey data collectors interviewed 101 farmworkers over 19 visits to farmworker housing units. Survey participants were comprised of a large proportion (74%) of H-2A or guest workers from Mexico, which reflects the farmworker population in the area and the fact that the research was conducted in an area dominated by a single labor contractor company (Table 2). All participants were crop farmworkers except for two individuals who reported being a supervisor or a tractor driver. Most participants were Mexican-born, except for two participants who were born in the U.S. There were more men (60%) in the sample than women (40%). The average age was 30 years old (range 19-66). Almost 70% of participants live in barracks type housing, with fewer living in a
house (13%) or a trailer (18%). Most participants completed formal schooling with 49% completing the equivalent of high school and 24% completing some postsecondary education. Only 8% of participants reported they spoke English in addition to Spanish, and 10% of participants spoke an indigenous language, primarily Mixteco.

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

Table 2. Participant demographics and work details, Georgia, 2018

Characteristic (N=101)	N (%)
Age	
19-29 years	57 (56)
30-39 years	29 (29)
40-49 years	9 (9)
50+ years	6 (6)
Sex	

Male	63 (62)
Female	38 (38)
Health insurance coverage	
Yes	6 (6)
No	95 (94)
H-2A worker	
Yes	75 (74)
No	26 (26)
Place of birth	
Mexico	98 (97)
South America	1 (1)
United States	2 (2)
Education	
Primary school or less	15 (15)
More than Primary School	12 (12)
Graduated High School	49 (49)
>High School	24 (24)
Self-reported general health	
Excellent	40 (39)
Very good	33 (33)
Good	18 (18)
Fair/Poor	10 (10)
Smoking tobacco products	
Every day	2 (2)
Some days	17 (17)
Never	82 (81)
Alcohol use in last week	

1 drink	12 (12)
2 drinks	2 (2)
None	85 (84)
Number of seasons working in agriculture	
1 season	34 (34)
2 seasons	26 (26)
3 or more seasons	40 (40)
In past week, number of days of work	
1-3 days	24 (24)
4-5 days	50 (51)
6-7 days	25 (26)
Payment type for current job	
Piece rate	17 (17)
Hourly	61 (61)
Piece rate and hourly	22 (22)
Most common crops worked in last week*	
Tomatoes	19 (20)
Cucumbers	31 (32)
Sweet potatoes	56 (57)
Most common tasks in last week*	
Picking	62 (61)
Weeding	38 (38)
Planting	21 (21)
Packing	7 (7)

Farmworkers were asked about acclimatization practices when they started working, and 60% reported they began with a few hours of work before starting to work a full day (Table 3). In terms of training, 32% responded that they had received some form of training about the health effects of working outdoors. Only 25% responded that their work was "very hard" over the last week. Regarding water consumption, 87% said they were "very comfortable" taking a break to drink water and 32% said they added something to the water, like hydration salts or flavorings. Most farmworkers reported they drank water every 30 minutes (70%), or every hour (20%). In field observations, some workers carried water bottles in their pockets or attached to their belts, but most only drank water during a prescribed break, not when they were working. The crew boss would have water coolers on the back of the truck, which would be nearby whenever it was break time. One crew leader sold pork rind snacks and a variety of cold sodas and Gatorade to the farmworkers during their breaks. In the survey, the most commonly ingested beverages besides water were Gatorade (63%), fruit juice (27%), soda (26%), energy drinks (19%), and coffee (12%). Most all participants (97%) stated that their employer provided drinks on site. A small percentage of participants (16%) stated that they did not want to take a break to drink. Some reasons for not drinking water when hot included the fear of feeling nauseous (8%) or getting sick (3%).

Table 3. Heat-related illness knowledge and practices, Georgia, 2018

Characteristic (N=101)	N (%)
When you started working, did you start with few hours then increase?	
Yes	59 (58)
No	42 (42)
During past week, take breaks in the shade	
Always	51 (51)
Usually	11 (11)
Sometimes	28 (28)
Rarely	9 (9)
Never	1 (1)
During past week, clothing always or usually worn	
Light-colored short-sleeved shirt	23 (23)
Dark-colored short-sleeved shirt	3 (3)
Light-colored long-sleeved shirt	80 (79)
Dark-colored long-sleeved shirt	5 (5)
Pants	84 (83)
During past week, head protection always or usually worn	
Baseball cap	85 (85)
Wide-brimmed hat	22 (22)
Bandana	61 (60)
Other hat	3 (3)
Hood from sweatshirt	8 (8)

During past week, type of beverages ingested	
Water	89 (89)
Gatorade	64 (64)
Energy drinks	19 (19)
Fruit juice	27 (27)
Coffee or tea	12 (12)
Soda	26 (26)
Beer	2 (2)

Farmworkers also responded to the issue of lavatory access, and 81% of participants reported that there was no toilet nearby. Usually there would be a portable toilet available; however, depending on how large the field was and where the farmworker was working, it could be a long walk to the toilet. When asked about access to shade or ways to stay cool, farmworkers reported using shade under trees (77%), shade structures (20%), fans (13%), and rest stations (10%). Other methods to stay cool included wearing wet hats or bandanas (11%). Farmworkers also responded to questions about heat prevention methods. These adaptive methods included changing work hours (21%), changing work activities (23%), drinking more water (66%), and taking rest breaks in the shade (23%). Only a small percentage of participants (2%) used a vehicle with air conditioning to cool down. In one field observation, a female worker took her lunch break in the crew leader's air-conditioned truck. Clothing choices helped to protect farmworkers from the sun, and field observations revealed that most farmworkers were covered head to toe in clothing (i.e., long sleeve shirts and pants) and wore hats and gloves, but sunglasses usage was rare. In the survey, 77% of participants reported they either rarely or never wore sunglasses. When asked why they did not wear sunglasses, one farmworker reported being uncomfortable and another said they were hard to clean. Baseball caps were ubiquitous among the men, but women wore wide-brimmed hats, baseball caps, or bandanas. Farmworkers reported wearing mainly light-colored clothing and not dark-colored clothing, which could put them at risk for heat stress.

Self-reported health status among farmworkers ranged from "acceptable" to "excellent," with most (72%) reporting "very good" to "excellent" health. Participants were asked if they had experience symptoms from working in the heat and 19% reported such experiences. Common symptoms among this group were headache, dizziness, and nausea (Table 4). Approximately 52% of participants had seen a doctor in the last five months and 14% had seen one within the last year, primarily for routine check-ups either in the local migrant clinic or back in Mexico. The most common reasons for not seeking health care were lack of time (12%), English language barriers (5%), lack of appointment times (4%), and lack of childcare (3%). After reviewing a longer list, participants only reported a few health issues which included diabetes (4%), high blood pressure (8%), and being overweight (6%), and they reported taking medications for allergies (8%), high blood pressure (7%), and depression (1%). Participants were asked if they used alcohol and tobacco in the last week, and 14% of participants answered that they drank alcohol one or two days and used tobacco either every day (2%) or some days (17%). For the few who reported alcohol use, most participants said they only had one alcoholic drink in the last week, but five participants had ingested three or more alcoholic drinks.

Table 4. Self-reported frequency of heat-related illness, Georgia, 2018

Characteristic (N=101)	N (%)
Have ever experienced symptoms from HRI?	
Yes	19 (19)
No	82 (81)
Have you ever received treatment for HRI?	
Yes	15 (15)
No	86 (85)
HRI symptoms reported in last week	
Dizziness	2 (2)
Skin rash	5 (5)
Muscle cramps	1 (1)
Light-headedness	4 (4)
Headache	14 (14)
Heavy sweating	12 (12)
Extreme weakness	3 (3)
Nausea	3 (3)
Dry skin	1 (1)
Number of HRI symptoms in last week	
0	31 (31)
1	18 (18)
2	5 (5)
≥3	5 (5)

Participants were asked if they had cellphones and the model of the cellphone. Most participants (81%) had a cellphone – primarily Android phones but some had iPhones – and 61% of participants reported using mobile apps. The most common mobile apps mentioned were Facebook and WhatsApp. Other apps reported being used included Twitter, Facebook messenger, and Instagram. Only one individual reported using an app to know the outside temperature.

Based on their responses, farmworkers did not appear to be overly concerned about heat illness since only 6% reported being "very concerned" about their health risk from working in the heat, and 53% were "not at all concerned." Farmworkers responded to six knowledge questions about heat safety. The questions addressed PPE, acclimatization, and risk factors such as age, prior history of illness and being overweight. The heat knowledge average score was 3.2 (SD = 1.3). Most farmworkers (94%) answered correctly to the first question that "wearing dark colored clothing" while working outdoors was a risk for heat illness. Fewer farmworkers (45%) knew that body acclimatization to the heat could last 2-14 days after a break from working in the fields. There were significant differences in heat safety knowledge scores by H-2A status and numbers of seasons working in the fields. Farmworkers with three or more seasons of farmwork experience had significantly higher knowledge scores than less experienced farmworkers ($t = -1.96$, $p < 0.05$). Likewise, non-H-2A farmworkers had significantly higher knowledge scores than H-2A workers (t =

4.55, $p < 0.001$). Differences in heat safety knowledge score by sex, educational attainment, and self-reported experience of heat stress symptoms were not statistically significant. Further statistical analysis is planned to examine the relationship between the dependent variable of heat safety knowledge and independent variables, such as heat safety precaution practices.

Pictures below (clockwise from left). Water Break, Drinks for Sale