Southeastern Coastal Center
for Agricultural Health and Safety

www.sccahs.org

ANNUAL REPORT

2022 / 2023

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growing safety and health for
Southeast farmworkers and fishers

ACKNOWLEDGMENT

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ANNUAL REPORT

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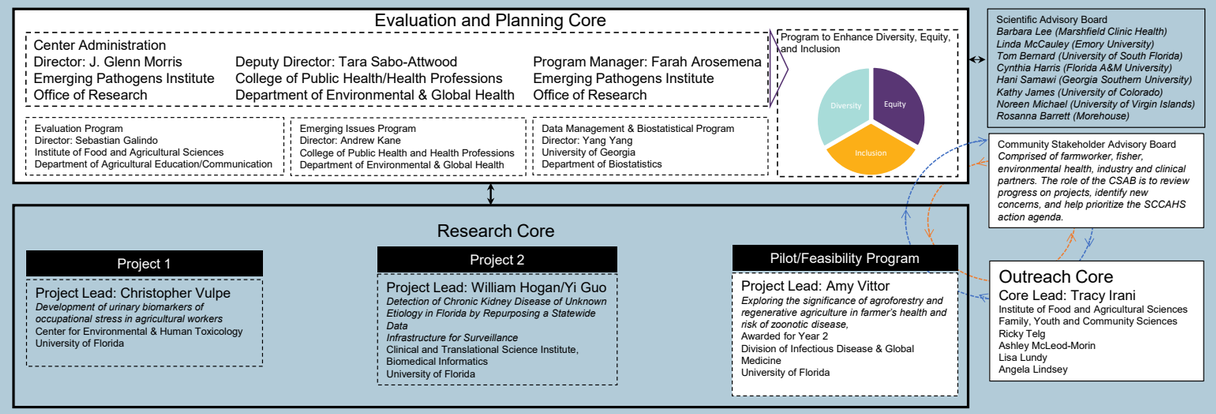
WHO WE ARE



We serve our Southeast communities offering a tailored portfolio of research and outreach initiatives.

Center Summary

The Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS) explores and addresses the occupational safety and health needs of people working in agriculture, fishing, and forestry in Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Puerto Rico, and the U.S. Virgin Islands.

The University of Florida is the lead institution of this center, partnering with the University of South Florida (USF), University of Georgia, Florida A&M University (FAMU), Georgia Southern University (GSU), Emory University, Morehouse, the University of Colorado, the University of Puerto Rico and the University of the Virgin Islands. These universities are working together on a range of interdisciplinary research and educational projects designed to promote occupational health and safety among the 240,000 farms — estimated by U.S. Department of Agriculture — to be operating in the region, their operators, families, employees, and contractors, as well as those in the forestry and fishery industries.

Our Focus Areas

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

Goals of the Center

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

YEAR 1, 2022-2023

HIGHLIGHTS

OCT

Hurricane Ian - Post Disaster Recovery

Kick-Off Meeting

Cycle 2, Year 1 kick-off Internal Operations Committee Meeting with key personnel.

NOV

Virtual Townhall Post-Hurricane Ian

Disaster Assistance for Agricultural Workers

Research Core Resubmissions

Drs. Dunleavy and Sabo-Attwood submitted revised R01 applications.

DEC

Exposure System Developed

Research Project Lead, Christopher Vulpe, established an exposure system to mimic the temperature and humidity conditions and internal core body temperature changes experienced by farmworkers in the field.

JAN

State of the Science

The 2023 SOS Meeting, *Impacts of Climate Events on Agricultural Health and Safety*, was held March 6-7, 2023.

Online PT Database

Searchable Physical Therapist and Assistant database filtered by county, language, financial aid and telehealth options.

FEB

MAR

APR

Emerging Issues Capstone

Two public health graduate students selected to lead a 12-week capstone project with a community-based organization to educate farmworkers about the dangers of heat stress and dust exposure. https://baynews9.com/fl/tampa/news/2023/04/12/uf-students-teaching-farmworkers-about-dangers-they-face?cid=share_clip

MAY

Pilot Request for Proposals Released

The 2023 request for pilot applications focuses on climate change impacts on human exposure to address AgFF populations in the Southeast U.S. and Caribbean.

JUN

Outreach Core Honored

Association for Communication Excellence honors the SCCAHS Outreach Core with three awards:
- digital-only publishing,
- issues management campaign, and
- publications for diverse audiences

JUL

AUG

Research Core Awarded Project 3

Kimberly Dunleavy, PhD joins SCCAHS in Year 2 to lead the research project titled, *Effectiveness and implementation of self-management strategies for low back pain among horticulture workers.*

SEP

Pilot Feasibility Program Award

Amy Vittor, MD, PhD will join SCCAHS in Year 2 to lead the pilot project titled, *Exploring the significance of agroforestry and regenerative agriculture in farmer's health and risk of zoonotic disease.*

EVALUATION & PLANNING CORE (EPC)

GENERAL OVERVIEW

Led by Dr. J. Glenn Morris, Administration manages the overall activities of the Center to ensure the administrative structure works synergistically to accomplish the following,

- the coordination and integration of the Core Center grant components and activities;
- oversight of the utilization of funds, including funds for pilot and feasibility studies
- support active interaction among the Director, Core leaders, research project Principal Investigators, relevant institutional Division of Sponsored Programs personnel and the CDC/NIOSH Program Officer/Grants Management Specialist.

Key Accomplishments in 2022-2023
Throughout Year 1, Administration provided project coordination for faculty/staff to manage their programs and research studies – guiding decisions and allocating resources where most strategically needed. The administration component of the Planning and Evaluation Core fulfills many organizational objectives, bringing together internal collaborators, such as biostatisticians, data managers/analysts, evaluation/content area specialists, budget management and information technology, with external collaborators who include study investigators, pilot awardees, and advisory board members.

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

Dr. J. Glenn Morris, Ag Center Director

OVERALL GOALS

Our Center goals include identification of potential hazards and development of new data sources to provide a more comprehensive picture of worker safety/health issues within the southeastern coastal region; the exploration and identification of areas needing further study; and the integration of research findings, culturally-appropriate outreach and training efforts, and new technologies to improve overall worker safety and health, working within a framework that allows us to appropriately document the impact of these improvements.

WE STRIVE TO MOVE FLORIDA AND THE SOUTHEAST REGION FORWARD THROUGH A STRONG COLLABORATIVE SPIRIT AND INNOVATIVE RESOURCES

OBJECTIVES

Administration

- Provide overall Center leadership.
- Provide administrative support services for the Center.
- Coordinate and integrate Center components and activities, and facilitate communication among investigators, staff, and research partners.
- Organize and provide administrative support for the Scientific Advisory Board, Internal Operations Committee, and other committees which may be necessary for Center activities.
- In conjunction with the Evaluation program, establish a formal planning process.
- Provide biostatistics consultation on study design, data management, and data analysis for all research projects.
- Implement strategies and resources to achieve greater diversity among pilot project investigators and community-based partners.

Evaluation

- Engage stakeholders to maintain a responsive and focused evaluation program.
- Collect relevant monitoring and evaluation data from the Center as a whole, its cores, and individual research projects.
- Analyze and interpret data to establish the quality and impact of the center as a whole, its cores, and the individual research projects.
- Report and share evaluation findings and recommendations with key stakeholders.
- Maintain an open line of communication and engagement with the Evaluation Programs of other Ag Centers across the country.

EVALUATION PROGRAM
ANNUAL REVIEW

Dr. Sebastian Galindo
Evaluation Program Director

Improving quality

The Evaluation Program provides leadership and guidance to connect program activities and goals for strengthened PI evaluation capacity and improved quality measurement.

- The team joins the PI-to-PI/Director meetings to review ongoing work through the lens of each project's logic model – assisting PIs/Director's in connecting their short-term outcomes with broader long-term goals.
- The Evaluation Program continues to build a culture of evaluation that internally is broken down into a simpler set of steps, beginning with brief indicator reporting forms that help guide the PI-to-PI meetings and externally links NIOSH Ag Centers core evaluation strategies.

01 FIRST OBJECTIVE REVIEW

Onboarding of new strategies, initiatives, programs, and research projects. A new planning process began in October 2022. The main tasks were to build a framework that was flexible and adaptable to collect progress data more successfully. Three types of evaluation are currently being deployed. All three evaluation types are being conducted simultaneously across projects.

02 SECOND OBJECTIVE REVIEW

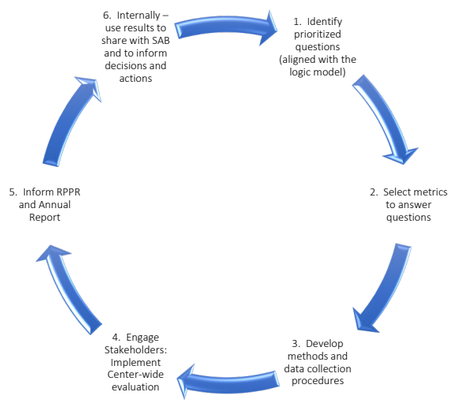
Performance Monitoring

- Ensures accountability for completion of program activities.
- Demonstrates that resources for the program/project/meeting, are used as intended and managed well.
- Monitors and reports on progress toward established specific aims.
- Provides early warning to Center Director of challenges.

03 THIRD OBJECTIVE REVIEW

Process Evaluation

- Are the activities of a program/project/markers?
- Assesses if the program/project/SOS meeting is producing the intended outputs.
- dentifies strengths and weaknesses of the effort.
- Critical for informing revisions/modifications.



Evaluation priorities.

04 FOURTH OBJECTIVE REVIEW

Outcome Evaluation

- Investigates whether the program/project/SOS meeting achieved the desired outcomes and what made it effective or ineffective.
- Assesses if the program/project/SOSmeeting is sustainable and replicable.

IN-DEPTH ANALYSIS OF CENTER OBJECTIVES HELP US TO EVALUATE AND IDENTIFY PROBLEMS EARLY.

MONITORING, EVALUATION, AND LEARNING

Recommendations

1. Strengthened communication and collaboration. Continue to provide services to investigators engaged in research. The Outreach Core is a valued Center resource assisting with public health education, health communication, programming for wide-reach community needs assessments, and planning for community-based research components.

FOCUS

Core/Project/Program Components

1. Addressing AgFF public health challenges (Emerging Issues Program)
2. Partnerships and collaborations (Outreach Core)
3. CSAB Meeting (Outreach Core)
4. State of the Science Meeting (Outreach Core)
5. Webinar/Seminar Series (Outreach Core)
6. Project implementation timeframe adherence (Research Core)
   - Animal studies initiated (Vulpe, Research Core)
   - Migrant Health Center (MHC) integration with OneFlorida electronic health records data infrastructure (Research Core)
7. Challenges in implementation (Research Core)
8. Seed funding RFA and application (Pilot/Feasibility Program)
9. Bibliometrics to measure publication impact (Cumulative Publications)
10. Social network analysis to map, track, and record the SCCAHS network of community partnerships and to demonstrate impact of the current collaborative strategy (Center-wide)

Recommendations (continued)

2. Foster culture of continuous learning. Encourage a culture of continuous learning within the SCCAHS by promoting the dissemination and utilization of knowledge gained from projects and activities to fine-tune existing processes of the organization and strategically plan for required changes. The Center can create more opportunities for dialogue and involvement of its many internal members.

3. Expand utility of advisory boards. Strategically plan for how input and feedback from the SAB and CSAB will be utilized to inform decision making and prioritize center activities, including how these key stakeholders will be informed about how their participation supports SCCAHS; embed a structured feedback loop within annual events or meetings.

4. Support the Emerging Issues Program with graduate student engagement. Select advanced graduate students to complete a degree requirement Capstone Experience, a novel use of an established structured program to meet community reported needs.

EMERGING ISSUES PROGRAM

The Emerging Issues Program (EIP) serves to monitor AgFF health and safety issues by scanning literature and media sources, consulting with SCCAHS stakeholders, and attending relevant local, regional and national meetings and conferences.

Report on emerging issues to SCCAHS personnel and prioritize emerging issues. EIP networks across national and regional conferences to build working relationships with federal, state and local partners in both the public and private sectors to get more in-depth information on emerging issues in our target region. The meetings include but are not limited to the SCCAHS Annual Community Stakeholder Advisory Board Meeting, the Southeast Regional Research Symposium, the International Society for Agricultural Safety and Health Conference, the Agricultural Safety and Health Council of America Safety Summit and the International Society of Exposure Science Conference.

Release of EIP ancillary project funds. Year 1 EIP funds have been allocated for highly prioritized public health and safety issues of disaster recovery, built environment and dust exposure. The Emerging Issues Program (EIP) has played an integral role in exploring critical community concerns. EIP is credited with providing a better understanding of the nature and cause of farmworker health disparities so that research PIs and the Outreach Core can have a better understanding of community priorities and work synergistically to address health and safety concerns and develop solutions.

Hurricane Ian

During Year 1 EIP assisted with Hurricane Ian Disaster relief and recovery. The EIP facilitated Outreach in South Florida following Hurricane Ian that struck the state on September 28, 2022. Deputy Director, Dr. Tara Sabo-Attwood, Dr. Andrew Kane and community partner, Redlands Christian Migrant Association (RCMA) mobilized to assist farmworkers and their families across Collier and Lee counties, two of the worst hit areas among the 10-county region devastated by the disaster. RCMA facilities were a hub of support. SCCAHS supported a range of resources including essential hurricane preparedness information and supplies as well as navigation to emergency relief after the storm. In collaboration with RCMA, SCCAHS was also able to assist farmworkers with essential items like water, food, clothing, and home/property/road repair supplies.

Environmental Global Health faculty and students who assisted

Andres Manrique, doctoral candidate in Environmental and Global Health, receives award from Tracy Irani for his work with MPH research asssitant Sal Millitich on a Capstone Project to address emerging issues in our region.

in Hurricane Ian recovery met with community leaders and identified the issues of destroyed agricultural worker housing and significant fruit drop in Southwest Florida groves. Using what was learned, the Emerging Issues Program prioritized continued work in Collier and Lee counties to explore home risk conditions, housing inequities, the built environment and how to recover fruit drop and distribute to regional food banks post-disaster.

The Capstone Experience

Following the success in reaching vulnerable populations during Hurricane Ian recovery, the EIP forged a new pathway to continue outreach working with RCMA and other community-based organizations; University of Florida graduate students; and SCCAHS key personnel to complete capstone projects. The Capstone Experience offers an integrative learning experience for public health graduate students. In Year 1 Deputy Director, Tara Sabo-Attwood and RCMA, facilitated an emerging issues project with a Master of Public Health student and doctoral candidate. The EIP supported the emerging issue of farmworker dust exposure hazards and built environment risks. The team surveyed dust exposure and the built environment and designed relevant educational materials. RCMA asssted with development of the educational materials and the dissemination plan. Dr. Sabo-Attwood, SCCAHS Deputy Director, served as a mentor on this community-based project in environmental health.

Results. The findings confirm that although crop farmworkers (migrant/seasonal and H2A) are aware of occupational dust exposure (ODE) and have some prior knowledge, the EIP intervention is considered to be valuable for workers to receive

continued exposure to ODE. The Capstone study team is the first group to perform an educational intervention on ODE in the region. The results indicate that only 17% (20) of participants reported having received any training that covered respiratory health in the last year. Additionally, only 39% (47) reported having received the worker protection standard training, which is a requirement for handling pesticides.

Findings demonstrate that heat related illness components were valued more by workers and they performed better in post testing. It is important to consider the characteristics of crop farmworkers when creating interventions. This population preferred short, concise interventions that included group discussions and interactive activities. Repeated exposure to training was an important factor for improvements in both interventions. The study also demonstrated that migrant/seasonal farmworkers are a more vulnerable population than their H2A counterparts to adverse health outcomes. The study was able to show that they have a higher prevalence of chronic coughing, a symptom that can indicate the early onset of chronic respiratory disease. Additionally, the findings showed that migrant/seasonal farmworkers had a higher prevalence of severe HRI symptoms versus H2A workers in this study, which can have detrimental effects on their health including death. More culturally appropriate interventions should be tailored for this population - an aging workforce, more likely to speak indigenous languages - to mitigate morbidity and mortality.

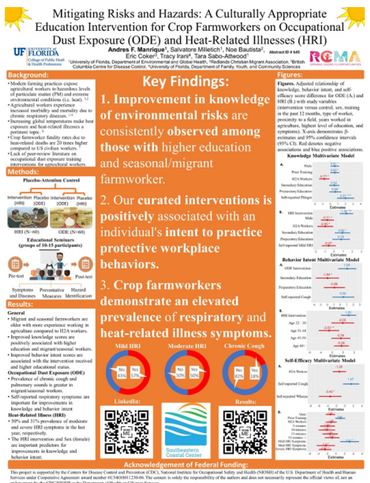
Center Deputy Director, Tara Sabo-Attwood has mentored both Andres Manrique and Sal Millitich to continue their research interests respectively through a CDC/NIOSH Diversity Supplement Award and the continued educational pathway for Sal into a doctorate program (attending Johns Hopkins University Fall 2023).

Food Recovery

The Emerging Issues Program partnered with the Florida Department of Agriculture and Consumer Services (FDACS), Food Recovery Program. In the aftermath of Hurricane Ian, considerable crop loss was experienced by growers. However, not all the fruit drop in groves had to be destroyed. A gleaning process could have been initiated to identify produce still acceptable for consumption, but not viable for marketing. The produce could then be transported to a food bank/pantry and returned to vulnerable farmworker communities. During the

June through November hurricane season in the Southeast, EIP has a protocol developed that will allow for rapid mobilization of a team to partner with FDACS Food Recovery Program. I the aftermath of severe storms, the team will visit farms and glean produce from the field, transport the produce to a food distribution agency committed to food recovery and farmworker health, and deliver produce to farmworker families in need.

Sal Millitich, Capstone Project MPH student in the field.



2023 International Society of Exposure Science, Capstone poster presentation

OUTREACH CORE

TRACY IRANI

Dr. Irani, Outreach Core Lead

Knowledge transfer through educational and extension activities, culturally competent communication and stakeholder engagement.

SCCAHS Co-Investigator, Ricky Telg (right) and Ashley McLeod-Morin, Associate Director of Communications (center), receive Association for Communication Excellence awards for the second year in a row.

OVERVIEW

The work of the Outreach Core is vital to understanding the burden and addressing the needs of agricultural health and safety in the Southeast coastal region. The Outreach Core prioritizes Center-developed research projects and pilot projects to ensure that the messages tested, materials produced, and collaborations fostered are inclusive of issues unique to the Southeast coastal region and include underrepresented and vulnerable subpopulations. Effective and efficient strategies and tools are shared with project leads and stakeholders and, based on their input, science communication strategies will be evaluated and adapted where possible. The Outreach Core's ongoing work includes continued partnership with the Center's Community Stakeholder Advisory Board (CSAB), which is comprised of relevant intermediaries in agriculture and public health, and will continue to be a significant research to practice (r2p) mechanism designed to engage stakeholders, communicate research findings, and review and evaluate interventions and materials.

OUR PURPOSE

The purpose of the Outreach Core is to develop, disseminate, and evaluate evidence-based, innovative and culturally effective educational and communications approaches and materials to proactively address health and safety issues in the Southeastern coastal area's agriculture, forestry, and fishing (AgFF) sectors. The Outreach Core pushes the needle of research-to-practice (r2p) impact toward greater success in reducing workers' exposure, mortality, and morbidity caused by the work environment and associated unsafe or unhealthy practices. The plan for the Outreach Core is always comprehensive in nature, providing knowledge transfer support for the proposed research projects, integration with priority educational and extension activities, and effective and inclusive communication and information dissemination to stakeholders across the Center's six-state and two U.S. territory coverage area.

ACCOMPLISHMENTS

The Outreach Core has focused on several major initiatives that align with project aims, including expansion of the Center membership, development of relationships in the Caribbean, and addressing unique concerns amongst agricultural workers post-Hurricane Ian. Center membership is a key initiative to grow the centers audience and serve as a public relations procedure. Outreach regularly communicates with this membership through a monthly newsletter, as well as special event invitations and requests for proposals. Compared to the 2021-2022 year, the newsletter open rate increased by 17% and click rate increased by 23%. The membership currently has 481 subscribers, an increase of 88 subscribers.

Initiatives have also been made to further develop key relationships in the Caribbean. The Outreach Core has made it a priority to ensure that at least one invited speaker at the State of the Science meeting include a scientist or stakeholder working in the Caribbean. This year's State of the Science meeting included a researcher from the University of Puerto Rico. Outreach Core Co-PI Ricky Telg attended the 2023 Joint Conference of the Caribbean Agricultural Extension Providers' Network (CAEPNet) and the 56th Annual Meeting of the Caribbean Food Crops Society (CFCS) in Grenada to meet with potential partners and key stakeholders in the Caribbean, where he also presented a poster related to SCCAHS work. The Outreach Core also worked with the Center's Administration to develop relationships with the Gulf Caribbean Fisheries Institute's (GCFI) leadership to discuss future collaboration related to the Center's State of the Science meeting.

The 2022-2023 year kicked off with Florida and other states in the southeastern United States being greatly impacted by Hurricane Ian. The agricultural community and Florida farmworkers faced unique challenges after Hurricane Ian, including loss of housing and business infrastructure, loss of work, and a lack of Spanish resources for the farmworker community. The Outreach Core reached out to partners with the Federal Emergency Management Administration to host a Virtual Town Hall for agricultural workers. The town hall included a moderated discussion on topics, such as assistance available for residents and businesses, how to apply for assistance, and recovery activities in migrant communities. Attendees also had the opportunity to ask FEMA experts questions related to disaster assistance. The town hall was intended to serve as a resource for those who worked with Spanish-speaking farmworkers but was translated to Spanish.

Aim 1. Translate and disseminate research-to-practice (r2p) 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.

- Hurricane Ian response
- Virtual Town Hall on Disaster Assistance for Agricultural (45 attendees) – information was also translated into Spanish resources
- Annual State of the Science meeting focused on climate change with nearly 100 attendees, 9 presentations, and 12 posters
- Article in Florida Grower magazine on heat-related illness
- Physical therapy database
- Monthly webinars

Aim 2. Develop, test, and implement inclusive communications and education materials utilizing a wide range of traditional and digital media.

- Conducted public opinion survey to determine agricultural health and safety issues of key concern among population
- Website
- Social media
- Academic posters

Aim 3. Grow SCCAHS network by partnering with key industry leaders to foster collaborations with intermediaries (news media, educators, public health specialists, opinion leaders etc..). Expand awareness of the Center and its resource materials targeted to end users.

- Regular communication with Community Stakeholder Advisory Board through email and issues identification
- Representation at stakeholder meetings including the Florida Department of Agriculture and Consumer Services Worker Protection Standard Meeting, Agricultural Labor Relations Forum, Caribbean Agricultural Extension Providers' Network, and others.
- Revamped newsletter/ center membership
-

STATE OF THE SCIENCE MEETING

There has been an increased focus on moving beyond generating evidence to translating evidence into practice and policy actions to ensure that scientific discoveries actually reach the populations for whom they are intended and are implemented with fidelity. The State of the Science (SOS) meetings were developed in response to this increased focus, and the dissemination approach is accomplishing its work by deepening multidisciplinary relationships, building capacity for public health professionals to collaborate effectively with other–related disciplines, and developing a research agenda on farmworker/fisher/forestry health translation, dissemination, and implementation through interdisciplinary collaboration. The SOS meeting is held annually and serves as a vital component to the Center's r2p approach in seeking science that answers relevant questions to agricultural health and safety. In 2023 the Outreach Core convened an SOS titled, "Impacts of Climate events on Agricultural Health and Safety". The meeting had 89 attendees, with 9 key note speakers and 12 poster presentations.

2023 SOS attendees

Whitney Stone

David F. Zierden

Chad Reznicek

Clyde Fraisse

Webinar Schedule

November 9, 2022 - Virtual Town Hall: Disaster Assistance for Agricultural Workers

February 22. 2023 - *Using Creative, Non-fiction Portraits to Promote Awareness About Migrant Agricultural Workers*
Whitney Stone, Assistant Professor of Agricultural Sciences and Natural Resource Communication, Oregon State University

April 26, 2023 - Detection of Chronic Kidney Disease of Unknown Etiology in Florida by Repurposing a Statewide Data Infrastructure for Surveillance
William Hogan, SCCAHS Research Core Project Lead, University of Florida

May 18, 2023 - Wastewater Surveillance as a Public Health Tool for Community Wellbeing
Tara Sabo-Attwood, SCCAHS Deputy Director, Professor and Chair Environmental and Global Health, University of Florida

June 6, 2023 - Climate Trends and Variability –Applications to Agriculture in the Southeast
David F. Zierden, State Climatologist, Florida State University

August 22, 2023 - Promoting Resilience through SAMHSA's 8 Domains of Wellness
Chad Reznicek, Behavioral Health Specialist, Colorado AgrAbility Project

September 13, 2023 - AgroClimate: Tools for managing climate risk in agriculture
Clyde Fraisse, Professor of Agrometeorology, University of Florida

NEXT STEPS

Next steps include publishing recommendations related to the public opinion survey, begin planning the 2024 State of the Science meeting, and develop outreach related to newly funded projects related to the Center (Dunleavy and pilot projects). The Outreach Core will also continue several initiatives including the center's membership and social media.

PRODUCTS

- Detection of Chronic Kidney Disease of Unknown Etiology project promotion video with Dr. Hogan - https://youtu.be/xUA_Gjv7Mo8
- HRI article in Florida Grower – https://floridagrower.net/2023/07/17/take-precautions-when-the-heat-is-on/
- Physical therapy database – Searchable Physical Therapist and Physical Therapist Assistant database filtered by county, language, financial aid and telehealth options, https://www.sccahs.org/index.php/physical-therapy-resources/
- Virtual Town Hall on Disaster Assistance for Agricultural Workers – https://www.sccahs.org/index.php/webinars/virtual-town-hall-disaster-assistance-for-agricultural-workers-november-9-2022-1-p-m-et/
- Science by the Slice, A SCCAHS UF/IFAS PIE Center Podcast
- Monthly webinar archive - https://www.sccahs.org/index.php/media/past-webinars/
- Monthly newsletters archive – https://www.sccahs.org/index.php/media/newsletter/
- McLeod-Morin, A., Lundy, L., Lindsey, A. B., Kandzer, M. S., Telg, R., & Irani, T. (2023). "It all goes back to trust": A qualitative exploration of extension professionals' perceptions of COVID-19 vaccines in rural Florida. Journal of Agricultural Extension and Rural Development, 15(1), 55-62. https://doi.org/10.5897/JAERD2022.1358
- Sadler, K., & McLeod-Morin, A. (2023). If You Build It, They Will Come: Agricultural Health and Safety Programming Perceptions of Extension Professionals in the Southeast. Poster presented at the 2023 Association for Communication Excellence Conference, Asheville, NC.
- McLeod-Morin, A., Telg, R., Anderson, S., Sadler, K., Irani, T., Lindsey, A., & Lundy, L. (2023, June). Exploring Public Opinion of Agricultural Health and Safety in the Southeastern Coastal United States. Abstract presented at the 2023 International Society for Agricultural Safety and Health, Tampa, FL.
- Telg, R., McLeod-Morin, A., Irani, T., Lindsey, A., & Lundy, L. (2023, July). Southeastern Coastal Center for Agricultural Health and Safety: Bridging Agriculture and Public Health in the Southeastern U.S. and Caribbean Region. Abstract presented at the 2023 Joint Conference of the Caribbean Agricultural Extension Providers' Network (CAEPNet) and the 56th Annual Meeting of the Caribbean Food Crops Society (CFCS), Grenada, W.I.
- Arosemena-Murfee, F., McLeod-Morin, A., Irani, T., Telg, R., & Morris, G. (2023, August). The use of State of the Sciecne Meetings for interdisciplinary dissemination and improvement of AgFF-related research. Abstract presented at the International Society of Exposure Science Annual Conference, Chicago, IL.
- Association for Communication Excellence Critique Contest Award Winner
- SCCAHS Trade Show Booth, Exhibits (Gold)
- Hurricane Recovery for Migrant Farmworkers, Issue Management (Silver)
- McLeod-Morin, A., Lundy, L., Lindsey, A. B., Kandzer, M. S., Telg, R., & Irani, T. (2023). "It all goes back to trust": A qualitative exploration of extension professionals' perceptions of COVID-19 vaccines in rural Florida. Journal of Agricultural Extension and Rural Development, 15(1), 55-62. https://doi.org/10.5897/JAERD2022.1358

The use of

STATE OF THE SCIENCE MEETINGS

FOR INTERDISCIPLINARY DISSEMINATION AND IMPROVEMENT OF AGRICULTURE, FORESTRY, AND FISHING (AGFF)-RELATED RESEARCH

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[2]Director of Communications, Public Issues Education Center, Institute of Food and Agricultural Sciences and SCCAHS, University of Florida
[3]Director of SCCAHS Outreach Core; Professor and Chair, Family, Youth and Community Sciences Institute of Food and Agricultural Sciences, University of Florida
[4]Professor and Director, Public Issues Education Center, Institute of Food and Agricultural Sciences, University of Florida
[5]Professor and Director, Emerging Pathogens Institute and SCCAHS, University of Florida

STATE OF THE SCIENCE MEETING

The meeting is a vital component to the Center's **research-to-practice approach in seeking science that answers relevant questions related to agricultural health and safety.** The meeting is also an opportunity for scientists from various disciplines to network and build valuable collaborations that will address future needs in agricultural health and safety. Since 2018, the Center has hosted five State of the Science meetings that have focused a range of topics.

Learn more about past State of the Science meetings and thematic focus areas.

PLANNING PROCESS

STAKEHOLDERS DETERMINE EMERGING ISSUES

SCCAHS SEEKS SCIENCE TO ANSWER QUESTIONS

SCIENCE IS SHARED AT STATE OF THE SCIENCE MEETING

OUTREACH TRANSLATES RESEARCH TO PRACTICE

MEETING OUTCOMES

The meetings have served to create a forum that **addresses the effectiveness of practices and policies on AgFF communities, to encourage collaboration between regional researchers and to disseminate research findings more broadly to community stakeholders.** Outreach materials are developed after each meeting to further share research and collaborative solutions. Materials include a white paper, monthly webinars, video interviews, and more.

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Southeastern Coastal Center for Agricultural Health and Safety

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RESEARCH CORE

CHRISTOPHER VULPE

DEVELOPMENT OF URINARY BIOMARKERS OF OCCUPATIONAL STRESS IN AGRICULTURAL WORKERS

OVERVIEW

Record summer temperatures in the US and across the world highlight the increasing danger of heat stress, both alone and in combination of other stressors, to our agricultural workers. In addition to the potential acute effects of heat on agricultural workers, the often neglected chronic effects of long term heat stress and other occupational stressors on the continued health and consequent interrelated impacts on work capacity, and economic security of agricultural workers are increasingly being recognized as a major concern.

One of the hidden costs of agricultural work especially in hot and humid climates is an increased risk of kidney disease, particularly a form of chronic kidney disease (CKD) distinct from better understand forms of CKD such as diabetic CKD, which is known as CKD of unknown etiology, or CKDu. As the name implies, the cause of CKDu is still uncertain but epidemiological data suggests that heat stress, likely in combination with other occupational stressors, such as agricultural chemical exposure, may play an important role in the risk of development of the disease. Key agricultural chemicals of potential concern in development of CKDu include the herbicides, glyphosate, paraquat, and 2,4 D. CKDu is particularly devastating as it is an insidious disease that can clinically manifest as sudden and unexpected onset of kidney failure in young or middle-aged workers without any other risk factors of kidney disease. The group's long-term goal is to identify the key stressors involved in the development of CKDu to enable development of effective mitigation strategies or therapeutic interventions. In addition, we hope to address the lack of clinical screening tools by identifying urine-based tests of incipient and developing CKDu.

OUR PURPOSE

The focus in this project is to investigate the role of heat stress and agricultural chemicals, alone or in combination, in contributing to kidney disease.

To this end, we are using a combination of longitudinal studies of agricultural workers at risk of developing CKDu as well as controlled animal studies to investigate the potential stressors contributing to kidney disease. In both of these approaches, we are exploring existing and novel urine biomarkers, (e.g. measurable biological changes in the urine which are indicative of kidney damage) associated with exposure to heat stress and/or agricultural chemicals. Such urine biomarkers could be used to develop pre-symptomatic screening tests for CKDu to enable effective detection of early stages of the disease and enable appropriate action.

ACCOMPLISHMENTS

The investigtive team is developing and implementing three key experimental innovations in the study of CKDu to help understand its causes, enable

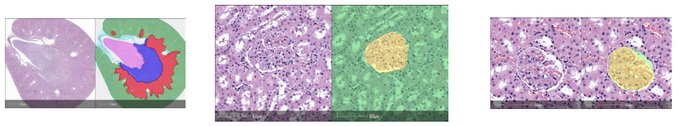

Figure 1.

TISSUE SEGREGATION AI

GLOMERULI IDENTIFICATION

REMOVAL OF CAPSULE ON GLOMERULI

ACCOMPLISHMENTS (CONTINUED)

early diagnosis, and the progression of the disease. First, we have established a novel exposure model to evaluate potential causes. Second, we are developing AI guided histology tools to evaluate kidney damage and disease. Third, we are investigating the diagnostic capabilities of existing and novel urinary biomarkers to enable pre-symptomatic identification of CKDu.

Aim. 1. Characterize urinary EV biomarkers (uEVBs) of heat and agricultural chemical stressors

Controlled studies are needed to investigate the potential contribution of individual stressors and combination of stressors to the development of CKDu. We established an exposure system to mimic the temperature and humidity conditions and internal core body temperature changes experienced by farmworkers in the field. We are using this exposure system with a well characterized animal model, the rat, for studying the effects of heat and pesticide exposure on the kidney. We evaluated the effects of chronic exposure to individual stressors, heat or pesticide exposure, on the kidney in pattern designed to be similar to that experienced by farmworkers. Chronic intermittent heat/humidity exposure (8 hrs/day for 5 days a week, for up to 8 weeks) resulting in ˚1C increase in body temperature was evaluated for potential pathologic effects on kidney. Similarly chronic, intermittent exposure to the herbicides, glyphosate and paraquat, were evaluated for effects on the kidney. In both these studies, samples were taken on a weekly basis including urine from all animals and kidney tissues from a subset of exposed animals over the exposure period. We assessed the effects on the kidney by using novel AI assisted histopathology analysis and urinary biomarkers of kidney damage.

Histopathology, in which kidney sections are examined by an expert histopathologist for evidence of changes or damage using a variety of specific histology stains or immunohistochemistry, has provided an important screening approach to identify evidence of gross kidney damage and toxicity. However, one of the challenges in the analysis of kidney disease is to identify early signs of kidney damage (before gross morphological (obvious) changes are apparent.) Recent advances in AI guided histology is enabling more systematic evaluation of tissues to detect subtle changes in specific structural features in tissues such as the kidney. We are therefore using expert guided training of AI assisted histology software tools (Halo) to automatically identify specific morphologic features (such as the glomerulus), specific cells (such as podocytes of the glomerulus), and regions of the kidney (cortex vs medulla).

The automated expert trained AI driven identification tools have allowed us to carry out rapid, high throughput, and comprehensive identification of morphologic features in our kidney histopathology studies which previously required slow, laborious, individual identification by an expert pathologist. As a result, we can carry out qualitative analysis of morphological features to look for histologic alterations in the kidney attributable to the individual stressors. We are currently actively engaged in the expert training of these AI tools to identify different morphologic features in combination with specific histology stains and cell type specific immunohistochemistry as these tools do not currently exist for the evaluation of the rat kidney.

Initial results with these tools demonstrate their capability to identify key kidney regions, features, and cell types using the Hematoxylin and Eosin stain (H&E), a general workhorse, for

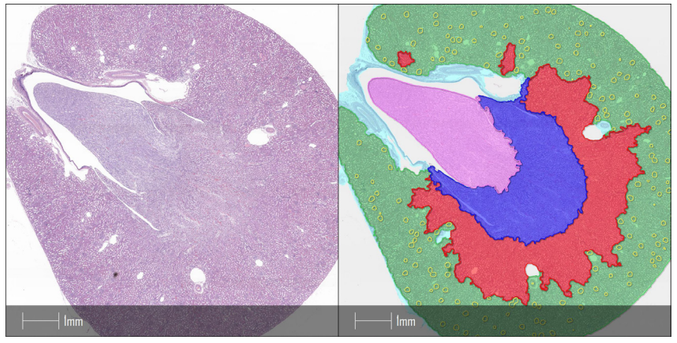

Figure 2. AI assisted kidney region identification of H&E stained rat kidney section. The cortex is indicated in, the outer medulla in red, the inner medulla in blue, and papillary region in pink.

ACCOMPLISHMENTS (CONTINUED)

identifying a wide variety of cell types as well as several specialized stains, such as Periodic acid Schiff (PAS). The wealth of qualitative and quantitative data provided by AI guided histology requires new approaches for statistical analysis than generally used for traditional data sets generated in histology. Thus we are working with Center Bio-statisticians in the evaluation of the appropriate statistical analysis approaches to deal with these novel data sets. While analysis is ongoing, initial analysis has identified a potential effect of heat stress on glomerular tuft size. Similarly, glyphosate exposure was associated with a potential effect on podocytes, a key cell type in glomerulus. These preliminary results will require further validation to confirm the effects. **(Figures 1 and 2)**

Pre-symptomatic diagnosis of CKDu before the onset of severe, largely untreatable clinical disease, is an urgent clinical need. Current diagnostic tests are insensitive, non-specific, and may require blood samples. We are therefore working to identify potential novel diagnostic approaches based on urinary biomarkers which represent measurable changes in biological components found in easily accessible urine samples. These measurable components released into the urine in response to stressors by kidney cells include cellular building blocks such as protein, lipid, metabolites, or nucleic acids or more complex components such as extracellular vesicles (EVs) which themselves may have characteristic components or cargo.

Our goal is to identify individual biomarkers or combinations of biomarkers which are correlated with and predictive of heat and/or pesticide exposure. The use of a controlled exposure system and an animal model allows us to carry out a systematic analysis of the relationship between measured urinary biomarkers and kidney damage as evidence by histology. Our group is measuring different potential biomarkers in the urine samples from the controlled exposure studies to identify candidate individual or sets of biomarkers of renal damage. We can compare these results to similar urinary biomarker studies in farmworker studies to help identify potentially clinically relevant biomarkers. We focused initially on analyzing previously identified protein biomarkers that have proven useful in other forms of kidney disease. We will subsequently focus on identifying potentially novel biomarkers based on extracellular vesicles (EVs) found in urine. EVs have been isolated from the urine samples and analysis of their unique lipid content (lipidomics) and their nucleic acid cargo (miRNA) is ongoing. Together, these existing and novel biomarkers could enable more effective clinical screening tools for identification of CKDu in at risk farmworkers.

Aim 2. Identify urinary EV biomarkers (uEVBs) of renal disease in farmworkers.

Careful longitudinal studies of renal health in agricultural workers at risk for developing CKDu are needed to identify early stage disease and pre-symptomatic diagnostic criteria to enable more effective interventions and potential therapeutic options. We are

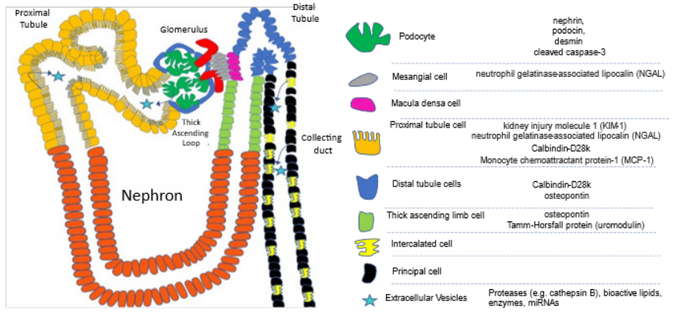

Figure 3. Cell type specific urinary biomarkers. Some kidney damage biomarkers are not exclusive to a particular cell type in a given segment of the nephron. Other common biomarkers of kidney injury/disease include beta-2-microglobulin (beta2M), a light chain of HLA class I molecule that is filtered by the glomerulus, reabsorbed, and catabolized by proximal tubule cells. Circulating levels of cystatin C is a common marker for acute kidney injury (AKI) and chronic kidney disease (CKD). Elevations in urine alpha-1-microglobulin (Uα1m) indicate proximal tubule dysfunction.

ACCOMPLISHMENTS (CONTINUED)

focused on evaluating in this project on evaluating existing and novel urinary biomarkers of kidney disease for their utility in identifying acute kidney injury and chronic kidney disease in agricultural workers. To maximize the utility and interpretation of potential biomarkers, we are using the corresponding human equivalent of the urinary biomarkers used in the controlled exposure studies. These candidate biomarkers include existing protein biomarkers and the novel extracelluar vesicle (EV) based biomarkers.

We carried out an initial analysis of urine samples from a previously conducted longitudinal study among adult male sugarcane field workers employed at an agribusiness in Southwest Guatemala during the 6-month harvest season from November 2016 to April 2017. In January 2017, 105 male workers were randomly recruited to participate in the study. Data collection occurred during three time points during the harvest, February, March and April 2017. For this project, we identified 34 participant workers based on current clinical criteria for kidney function. Workers with an estimated glomerular filtration rate (eGFR) that was ≥ 90 mL/min/1.73m2 and no evidence of acute kidney injury (AKI) based on the change in creatinine across the work shift were considered to have normal kidney function for the analysis. Workers with an eGFR <90 mL/min/1.73m2 at the start of the work shift were placed in the reduced kidney function (RKF) group. Worker with an increase in blood creatinine greater than 0.3 mg/dL over the work shift were considered to have AKI. There were three workers with both RKF and AKI.

Previously stored urine samples from these 34 workers were analyzed for 21 kidney biomarkers using a custom human kidney biomarker magnetic Luminex Performance Assay. Pre-work shift (AM) and post-work shift (PM) urine samples were analyzed. The urine samples for all of the individuals were collected during the last study time point in April. Urine samples that were collected in March were also analyzed for 3 individuals. We hypothesized that a panel of existing urinary protein biomarkers, including markers and mediators of renal disease, representing different areas of renal injury (see **Figure 3** could provide more sensitive and timely information on renal disease.

We investigated potential relationships between individual biomarkers, combinations of biomarkers, and the disease groups. We conducted three different Principal Components Analyses (PCAs) to explore biomarker patterns: 1) AM biomarkers only, 2) both AM biomarkers and change in biomarkers, and all (both AM and PM). The PCA used up to a total of 34 observations and included 21 biomarker variables. The observations included 17 workers: 4 workers with AKI, 10 workers with RKF, and 3 workers with both an AKI and RKF on the study work day.

The principal component analysis (PCA) of the biomarker data for the AM and PM timepoints together clearly separated the individuals with AKI and RKF (red dots) from the healthy control group (green dots) **(Figure 4).** However, the separation between the AKI and RKF groups was less apparent. The urinary biomarkers, β2-microglobulin, α-1 microglobulin, TFF3, Cystatin C, and NGAL, appear to have the largest effect. For the AM + change across the work shift, the "Both AKI and RKF" group (red dots) were slightly separated from the healthy control group (green dots) (Figure 2) but the separation between the AKI and RKF groups were less apparent. A different set of biomarker measurements, the change in NAG, change in VEGF, and change in Clusterin APOJ as well as AM

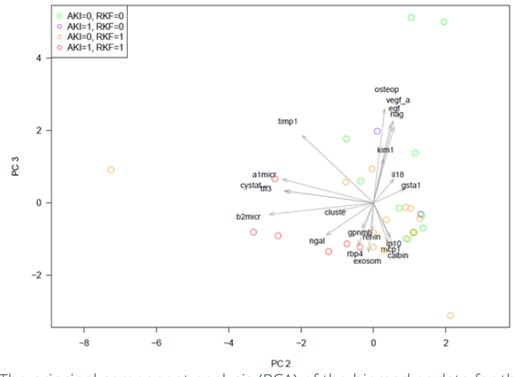

Figure 4. The principal component analysis (PCA) of the biomarker data for the AM and PM timepoints

ACCOMPLISHMENTS (CONTINUED)

NGAL and AM Clusterin APOJ seem to have the largest effect. These initial studies of small study population indicated that workers with both acute kidney injury in the context of ongoing reduced kidney function had stronger relationships with the measured urinary biomarkers than those workers with either acute kidney injury alone or reduced kidney function.

NEXT STEPS

The investigative team will focusYear 2 on combined chronic intermittent exposures to heat and pesticides in the controlled exposure model. We will continue analysis of existing urinary protein biomarker studies as well as initiating work to identify exosome based candidate biomarkers. We will continue to develop the AI assisted histopathology analysis with an increasing focus on the development of appropriate statistical analysis approaches for the large data sets generated by these studies. In the human studies, we will carrying out a urine biomarker study are a larger set of existing samples from farmworkers with clinical data on kidney disease. We will carry out both protein and exosome based biomarker analysis.

VULPE LAB AT A GLANCE

Dr. Chris Vulpe presents at the 2023 State of the Science


Dr. Nancy Denslow,
Co-Investigator


Dr. Abdel Alli
Co-Investigator


Dr. Jie Zhou,
Post-Doctoral Fellow


Julia Bartel,
Research Scientist

RESEARCH CORE

WILLIAM HOGAN /YI GUO

DETECTION OF CHRONIC KIDNEY DISEASE OF UNKNOWN ETIOLOGY IN FLORIDA BY REPURPOSING A STATEWIDE DATA INFRASTRUCTURE FOR SURVEILLANCE

OVERVIEW

This study will test the hypothesis that chronic kidney disease of undetermined etiology (CKDu), also known as Meso-american Nephropathy or MEN, exists among migrant farmworkers in the state of Florida. There is circumstantial support for this hypothesis: prior research has detected acute kidney injury (AKI) in this population, and repetitive AKI is believed to be the etiological process behind CKDu. We will test our hypothesis using the existing, extensive data infrastructure of the OneFlorida Clinical Research Consortium, which is one of nine Clinical Research Networks in the National Patient Centered Clinical Research Network (PCORnet). The OneFlorida Data Trust comprises electronic health record (EHR) data from ten health systems that geographically cover the entire state of Florida, statewide Medicaid claims data, and a growing Medicare claims dataset. The Data Trust has been used for surveillance of both infectious and chronic diseases in the past including current uses for type 1 diabetes mellitus and COVID-19, increasing confidence that our surveillance for CKDu in this dataset will yield strong results. We will augment this dataset by selecting two community and migrant health centers (CMHCs) in collaboration and partnership with the leadership of the Southeastern Coastal Center for Agricultural Health and Safety (SCCAHS). The primary decision criterion will be proximity of the CMHC to our target population of migrant farmworkers, with also a goal of incorporating occupation data. We have verified that our current list of 10 candidate CHMCs (developed in conjunction with SCCAHS leadership) already collect structured, coded occupation data, and we have done preliminary queries demonstrating both our ability to use the occupation data and the existence of migrant farmworker populations at these CMHCs. We will then add the CMHCs and their EHRs as partners and data sources in OneFlorida and its Data Trust, respectively. We will harmonize the occupation data into the common data models used in the Data Trust. Our data analyses will look at all OneFlorida as well as the migrant farmworker population identified in the two CMHCs that join OneFlorida. We will develop and validate a computable phenotype for CKDu, apply it to our data analyses, and generate matched control populations. We will conduct geospatial analysis to identify clusters of CKDu both generally and in patients who are known migrant farmworkers. Through chart review, we will validate the computable phenotypes as well as verify our main results in followup. We will assess the proximity of any such clusters identified to agricultural operations in Florida known to the SCCAHS. We will disseminate our results to SCCAHS stakeholders, to the broader agricultural center research community, to funding agencies, and to the relevant communities in Florida.

OUR PURPOSE

Although CKDu has not been documented in the U.S., AKI associated with heat stress among agricultural workers has in Florida and California. Initial studies of this AKI show associations with dehydration and elevated inflammatory markers. This evidence, in combination with the hypothesized role of AKI and inflammation in the development of CKDu, suggests that CKDu might be occurring in these regions. In addition, as climate warming increases global temperatures, the potential exists either for CKDu to appear in these regions (if not present already) or for the existing incidence and prevalence of CKDu to increase. Taken together, these considerations motivate an urgent need for surveillance of agricultural workers for CKDu. The study will mprove a statewide infrastructure that includes EHR and administrative claims data to assess the incidence and prevalence of CKDu in Florida. The overall goals are to create a component of the data infrastructure that is focused on agricultural worker surveillance and then to use that component to study CKDu.

ACCOMPLISHMENTS

Aim 1. This aim focuses on the development, testing, and refinement of the CKDu computable phenotype and its use to conduct geospatial hotspot analyses of CKDu incidence/prevalence rates in Florida. During Year 1 of the project we performed a review of existing CKD phenotypes to determine a best starting point. We then conducted a review of known causes for CKD (Diabetes, Hypertension, nephrotoxic drugs, etc) and coded their associated diagnosis and lab codes as exclusions in our CKDu phenotype. We have also acquired the medical records and notes necessary to test the phenotype and validate its results via chart review in Year 2 of the project.

Aim 2. This aim focuses on outreach to health clinics that serve migrant worker populations in order to onboard their data into the OneFlorida+ Data Trust. Unfortunately due to resource constraints and fallout from both leadership changes in some clinics and damage/impacts from the hurricanes Florida has suffered these clinics have not been able to be onboarded. The addition of Dr. Beatty as Co-Project lead overseeing the outreach and onboarding activities has helped to improve the project's efforts in onboarding in the last several months of Year 1. He has been able to leverage his contacts with the UF Mobile Outreach Clinic and garnered their interest in the project.

Aim 3. This aim focuses on re-running the geospatial analyses from Aim 1 on the OneFlorida+ Data Trust after the migrant worker health clinic data has been onboarded. These activities begin in Year 3 of the project.

Year 1 of the project was successful for Aim 1 activities as the team successfully developed an initial draft of the computable phenotype and acquired the EHR and clinical notes necessary for testing and validation.The onnboarding of clinics is picking up momentum and it is expected that much of the detailed administrative contract work will be ocmplete in Year 2.

NEXT STEPS

Moving into Year 2 of the project the goals are twofold for Aim 1. The investigative team will begin testing of the computable phenotype on the EHR dataset and clinical notes they have acquired and validate the results via chart review. After refinement of the phenotype through this process, the team will then begin calculating the prevalence/incidence rates of CKDu in Florida and conducting the geographical hot spot analyses (the analysis work will extend into the beginning of Year 3).

For Aim 2 the group will be focusing on leveraging new Project Lead, Dr. Norman Beatty's experience and connections to onboard clinics to the OneFlorida+ Data Trust that have a focused migrant worker patient population and begin ingesting and standardizing their data. This work will continue through the remaining years of the project to support Aim 3.

Dr. Bill Hogan at work.

The SCCAHS offers Pilot and Feasibility Grants in research areas directly related to occupational health and safety, including agriculutre, forestry and fishing sectors - from basic, translational or clinical perspectives. Pilot grants are offered for up to $30,000 per year, for a duration of one year.

PILOT FEASIBILITY PROGRAM

NEW AND EARLY STAGE INVESTIGATORS CONDUCTING PROMISING AGFF RESEARCH

The SCCAHS Research Core Pilot & Feasibility Program has been providing seed funding for new and innovative research projects for 7 years. Projects funded in past years have covered a wide range of topics in the fields of AgFF worker safety and health, including chronic low back pain among fishers, pesticide exposure monitoring, respiratory health, heat related illness, post disaster mental health and the impacts of climate change. The approaches have also been very diverse, covering wide varieties of strategies. This breadth of topics and efforts also reflects the diverse interests of SCCAHS' Research Core as a whole.

Recruiting a cadre of multidisciplinay early-stage investigators and encouraging promising new experimental strategies or methods is critical to advancing science. This program has traditionally provided support to three types of researchers:

- New and early-stage investigators who have not previously received substantial federal funding
- Experienced investigators who wish to branch out in a novel direction
- Investigators from other fields embarking on a occupational health-related project for the first time

In Year 1 the first pilot was awarded to the University of Florida's Dr. Amy Vittor. She will lead the project titled,

Dr. Amy Vittor awarded a pilot to condut research in Florida comparing arthropod-borne zoonotic exposure rates amongst smallholder farmers of conventional farms and A/RA farms.

Exploring the significance of agroforestry and regenerative agriculture in farmer's health and risk of zoonotic disease.

The study team will address the gap in studies examining the impact of agroforestry and regenerative agriculture (A/RA) on infectious disease risk vis-à-vis conventional cropping or grazing practices. Dr. Vittor will compare arthropod-borne zoonotic exposure rates amongst smallholder farmers of conventional farms and A/RA farms.

Year 1 Pilot Project Lead,
Amy Vittor, MD, PhD

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MEMBERS

Scientific advisors who are leaders in research, clinical practice and advocacy committed to furthering SCCAHS' mission

LINDA MCCAULEY, RN, PHD, FAAN FAAOHN
EMORY UNIVERSITY

Key Strengths:

- **Leader at the intersection of environmental health and nursing**
- **Underserved populations**
- **Farmworkers and heat exposure**

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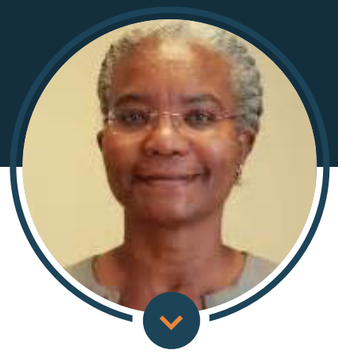

Key Strengths:

- **Community-based participatory research**
- **Health equity and health disparities**
- **Translational research**

Associate Professor and Director
Caribbean Exploratory (NIMHD) Research Center of Excellence (CERC)
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- **Environment/climate risk factors**
- **Kidney disease**

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Department of Epidemiology

2022-2023 PUBLICATIONS

Chicas, R. C., Wang, Y., Jennifer Weil, E., Elon, L., Xiuhtecutli, N., C Houser, M., Jones, D. P., M Sands, J., Hertzberg, V., McCauley, L., & Liang, D. (2023). The impact of heat exposures on biomarkers of AKI and plasma metabolome among agricultural and non-agricultural workers. Environment international, 180, 108206. https://doi.org/10.1016/j.envint.2023.108206

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Southeastern Coastal Center
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