OCTOBER 2020

PACIFIC NORTHWEST AGRICULTURAL SAFETY & HEALTH CENTER

Research for healthy workers, strong communities & productive agriculture

YEAR-END REPORT

Fiscal Year 2020 – 9/30/19 to 9/29/20

ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES
UNIVERSITY of WASHINGTON | SCHOOL OF PUBLIC HEALTH

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CENTER OVERVIEW

The Pacific Northwest Agricultural Safety and Health (PNASH) Center conducts ***Research for Healthy Workers, Strong Communities & Productive Agriculture.*** Visit our website: http://depts.washington.edu/pnash.

PNASH is dedicated to the prevention of illness and injury among agricultural producers, workers, and their families. One of eleven regional centers, PNASH serves Alaska, Idaho, Oregon, and Washington, integrating expertise from multiple disciplines, institutions, and community partners. The Center is focused on safe and sustainable agricultural workplaces and communities, with an emphasis on injury and illness prevention, especially among hired laborers, migrant/seasonal workers, and children.

Our approach:

1. Working in partnership with employers, workers, agencies, and other research and service organizations.
2. Conducting innovative research and intervention programs with a focus on problem-solving.
3. Taking solutions to the workplace through training, outreach, and participatory research.
4. Research priorities and project selections are based on the burden and need of our Northwest communities, including the seriousness of the hazard, the number of people affected, and the probability that research will lead to health improvements.

We are housed in the Department of Environmental and Occupational Health Sciences, at the University of Washington's (UW) School of Public Health, and have formal affiliations with multiple UW programs, as well as with Washington State University (WSU) and Oregon State University (OSU), among others. PNASH's funding base is awarded through the National Institute for Occupational Safety and Health (NIOSH/CDC).

RELEVANCE

Jobs in the agricultural industries, which include farming, fishing, and forestry, consistently rank among the most dangerous. In addition to injuries and fatalities, agricultural workers also face high risk for illnesses such as lung diseases, hearing loss, heat-related illnesses, skin diseases, and certain cancers associated with chemical use and prolonged sun exposure. Farming is a unique workplace in that families frequently live on-site. Each year, 14,000 children are injured and 100 children are killed in U.S. farms.

THIS REPORT & 2019-2020 NIOSH AWARD CYCLE

We invite you, in the following report, to learn about our Year 4 (of 6) progress and preliminary outcomes. Our work this year was impacted by COVID-19, with some research engagement put on hold and our teams pivoting to address immediate needs, such as COVID-19 safety measures for farmworkers in industries with intense labor demands.

Each project is at a stage of work with preliminary results and resources to share, so please feel free to contact us with your ideas or interest in communicating these with your networks and communities. Most important to our mission are our partnerships, which help ensure our work is relevant and reach the industries and the workers we serve.

And ***Thank You*** to our partners, advisors, and our PNASH team of faculty, staff, and students. This work is a testament to your dedication and range of expertise.

PNASH CORES

PLANNING & EVALUATION CORE

PILOT PROJECT & EMERGING ISSUES PROGRAMS

OUTREACH & EDUCATION CORE

PLANNING & EVALUATION CORE

The Planning and Evaluation Core provides the infrastructure and support for the entire Center and assists in the implementation of the individual project and program objectives. Our second year's activities have focused on launching project fieldwork, project team capacity building, and community engagement.

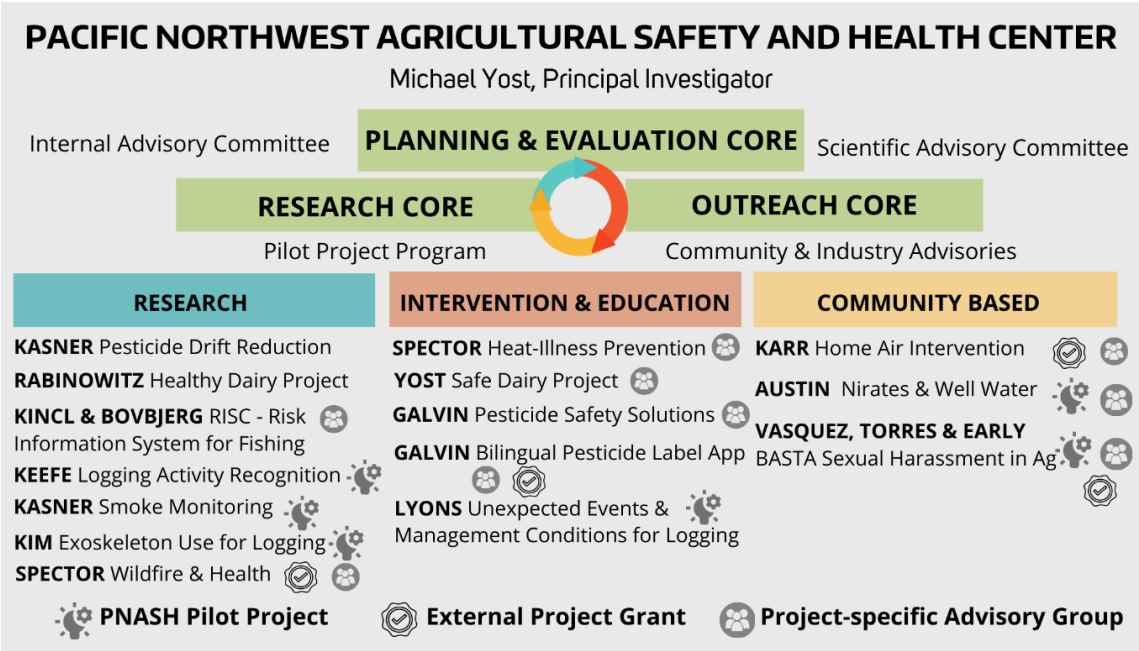
New PNASH Leadership

Edward Kasner, PhD, MPH
Director of Outreach and Education & Assistant Clinical Professor
Beginning fall 2019, Dr. Edward Kasner was appointed Outreach Director.
Dr. Kasner has worked with PNASH as a former Ph.D. Student and Fellow. He has made his mark at PNASH with not only his research and expertise, but also his spirit toward partner and stakeholder engagement. Dr. Kasner serves as a member of PNASH's Internal Advisory Committee, supporting PNASH project teams and leading the Center's Outreach Core.
Watch an interview with Eddie Kasner.

Elena Austin, ScD
Assistant Professor
Dr. Austin is a rising star in our department and with the PNASH Center. In 2019 she was appointed as an Assistant Professor in the UW Department of Environmental and Occupational Health Sciences. Dr. Austin has launched new work at PNASH with the dairy industry, leading to multiple education grant awards with a goal to reduce injuries and deaths. This partnership was recognized recently with an Agricultural Safety Council of America achievement award to PNASH's partner, Washington State Dairy Federation.
Learn more about Elena Austin, and the PNASH Partnership for Dairy Safety and Health.
Read Elena Austin's biography.

Organization & Advisories

Our PNASH internal network is comprised of over 30 faculty, staff, and students from multiple disciplines and institutions.



PNASH Internal Advisory Committee

A multidisciplinary team of current PNASH leadership, the Internal Advisory Committee (IAC), meets monthly, providing oversight and advice to the Principal Investigator and project investigators in making scientific and administrative decisions.

Michael Yost, PhD, MS	Director	airion@uw.edu
Richard Fenske, PhD, MPH	Associate Director	rfenske@uw.edu
Edward Kasner, PhD	Director of Engagement & Education	ejkasner@uw.edu
Marcy Harrington, MPA	Center Manager	marcyw@uw.edu
Catherine Karr, MD, PhD	Internal Advisory Committee	ckarr@uw.edu
June Spector, MD, MPH	Internal Advisory Committee	spectj@uw.edu

PNASH Scientific Advisory Committee

PNASH's Scientific Advisory Committee (SAC) provides the Center and the projects with guidance on effectiveness, the direction of future work, project methods, and result interpretation as well as the relevance of activities to regional and national policies and initiatives. The SAC meets bi-annually with one in-person meeting each year: in this cycle, the SAC met remotely and focused on new project directions.

In 2020 Jennifer Lincoln, Ph.D., CSP, Director, NIOSH Center for Maritime Safety and Health Studies, stepped down from service as a member of PNASH's Scientific Advisory Committee. After eight years of service and essential advice to PNASH Program's, new career advancement placed her in a position with a conflict of interest. We greatly appreciate her tenure with her and look forward to collaborations in her new capacity.

Kent Anger, PhD	Professor and Director, OHSU and Portland State joint School of Public Health, Oregon Health Workforce Center
Howard Kipen, MD, MPH	Chair and Professor, Environmental & Occupational Medicine, Rutgers University
Linda McCauley, RN, PhD, FAAN, FAAOHN	Dean and Professor, Nell Hodgson Woodruff School of Nursing, Emory University

Staff Spotlight

We are proud to announce the permanent staff appointments of these PNASHers. You may recognize the names of some of these former students and staff. After a competitive search process, we found our extraordinary matches for open positions.

Idanis Cruz, Research Coordinator. Ms. Cruz worked as a PNASH student intern on an application to deliver pesticide labels in a phone app in Spanish and English. Her work on this is now supported through two new grant awards: learn more. In addition, she brings her talents in engagement and communications to support our dairy safety education project. Visit Idanis Cruz' Bio.

Ilsa Olsen, Program Coordinator. Ms. Olsen is at the hub of PNASH operations and grant development, working to improve our internal service and our external communications. She brings a background in theater arts and is currently producing a new PNASH video. Visit Ilsa Olsen's Bio.

Student Education

Every year, the PNASH Center is fortunate to have talented students involved in our research. The **PNASH Student AgFF (Agricultural, Fishing, and Forestry) Research Interest Group** brings together faculty, students, and staff in a student-led and student-focused forum. The membership currently includes sixteen undergraduate, master, and doctorial students.

PNASH coordinates with multiple training and pathway programs for student support and research funding to work with PNASH projects. For Year 4 this included: Undergraduate Research Experiences in Environmental Health (SURE-EH). Through a NIEHS training grant and other UW support, we can provide meaningful student internships with PNASH. NIOSH's Education and Research Center (ERC) offers training grant support, including the Occupational Health at the Human-Animal Interface OHHAI training program.

We would like to express our gratitude to these students and recognize their academic achievements, inspiring stories, and accomplishments. To learn more about student research, visit the **PNASH Celebrating Students** blog post.

Erica Chavez-Santos, PhD Student
Health Services
Heat Intervention project, and Factors Affecting US Latinx Farmworker's Utilization of Health Care

Marine de Marken, MPH Student
One Health, Class of 2020
Occupational Dairy Farm Exposure and the Risk of Allergic Disease

Solaiman Doza (Abeer)
PhD Student
Environmental and Occupational Health, Oregon State University
Risk Information System for Commercial Fishing

Dennise Drury, MPH Student
Environmental and Occupational Health, Class of 2020
Sexual Harassment Prevention for Farmworkers

Kaitlyn Kelly, MPH Student
Environmental and Occupational Health, Class of 2020
N95 Respirators and their Relative Training Materials as a Public Health Intervention for Wildfire Smoke

Shraddha Malla, BS Student
Public Health, Global Health
PNASH Northwest Contact Mapping

Diana Marquez, BS Student
Public Health, Environmental Health
Evaluating Effectiveness of Heat Stress Prevention Education on Agricultural Worker Knowledge

Pauline Trinh, PhD Student
Environmental and Occupational Hygiene
robiome Differences Between Dairy Workers and Community Members

Eloise Zimbelman, PhD Student
Forest, Rangeland and Fire Sciences, University of Idaho
Evaluation of Wearable-based Activity Recognition Modeling Applications for Logging Safety

Academic Collaboration

The PNASH Center recognizes that collaboration in academia happens through the creation of space and platforms for our faculty and students to come together and foster new ideas. This year, the center was involved in conferences that served as space for collaboration, presentation, and discussion. PNASH students, staff, and faculty played key roles in their success.

Coordinating Center for AFF Center Directors

PNASH began a two-year term serving as the coordinating center for the NIOSH Ag Directors. This group of 42 leaders of NIOSH AFF and Ag Centers coordinates on national issues and cross-center initiatives. Meetings take place monthly by video conferencing and in-person twice annually.

Association of University Programs in Occupational Health

Ending in February 2020, Dr. Michael Yost served a one-year term as President of the Association of University Programs in Occupational Health & Safety (AUPOHS). This umbrella organization is representative of the membership of the National Education and Research Centers, Agricultural Safety and Health Centers, and the Total Worker Health Centers, sponsored by National Institute for Occupational Safety and Health (NIOSH). It serves to coordinate priorities and communications between these Center programs. AUPOHS largely meets remotely and in-person annually.

Western Regional Agricultural Safety and Health Conference: Cultivating Collaborations

In FY 2019, PNASH hosted Cultivating Collaborations, a conference to build collaborative partnerships and foster the exchange of ideas. Our program addressed forward-thinking research for the safety and health of the western agricultural workforce, including farming, fishing, and forestry. Cultivating Collaborations was supported by a NIOSH/CDC Conference Grant (Award# U13OH011391). Year 4 concluded the final evaluation and reporting, and a dedicated issue of the Journal of Agromedicine with papers submitted in January 2020.

See conference website: https://deohs.washington.edu/pnash/west-ag-safety-conf, and
Journal of Agromedicine on the Western Ag Safety & Health Conference - Cultivating Collaborations.

Agricultural Safety and Health Council of America (ASHCA) and Summit

2020's ASHCA Summit was moved to an online series due to COVID. PNASH-related presentations included:

- Elena Austin. Dairy Safety Kit: An Innovative Online Training and Outreach Solution
- Kit Galvin. Pesticide Label Safety Info in Spanish and English: In Hand, Anytime & Anywhere
- Karen Lewis, PNASH Advisor, WSU Extension. Automation and Mechanization in Tree Fruit Production

In addition, our partnership work with the WA Dairy Safety Network was recognized in 2020 with an Agricultural Safety Council of America achievement award to PNASH's partner, Washington State Dairy Federation.

New Awards

Each year, thanks to the nucleus of research expertise and support formed by the Center, our faculty and staff researchers successfully procure additional project grants to help advance the goals and priorities of the PNASH Center. New project awards granted in Year 4 include:

Nancy Simcox, Assistant Teaching Professor, University of Washington
Experiential Safety Training: Virtual Reality for Multilingual Forest Workers
175,000, Washington State Dept. of Labor and Industries Safety and Health Improvement Program (SHIP), 2020-2022
A new project to protect the health and safety of forestry services workers through research-based training using virtual reality. This project extends PNASH's previous project work and our Forest Worker Safety Talks.

June Spector, Associate Professor, University of Washington
Wildfires and Human Health
$96,567, Science for Nature and People Partnership, 2020 - 2021
The purpose of this partnership project is to develop a consensus-driven, evidence-based approach to identify and communicate the human health and health equity implications of wildfires.

Eddie Kasner, Assistant Clinical Professor, University of Washington
COVID-19 Response: Co-developing Culturally Relevant Messages for Farmworkers
$20,000, UW Population Health Initiative, 2020
With a team of Washington state service leaders, this project assists in developing farmworker COVID-19 communications, and surveys agricultural stakeholders to assess needs and concerns in response to the Pandemic.

The following small grants and donations fulfilled a challenge funding gap and extended PNASH's work in **Sexual Harassment in Agriculture,** also supported as PNASH Pilot Projects, in 2016 and our current pilot (See page 52-53):

Jody Early, Associate Professor, University of Washington - Bothell
Improving Health Literacy about Sexual Violence in Agriculture: Developing and Evaluating ¡Basta! Preventing Sexual Harassment in Agriculture Training Videos.
$40,345 Donations: Over 60 Washington and Oregon growers and organizations donated small gifts to complete production of the video and education toolkit.

Spanish Graphic Novella for and with Farmworkers in Washington State
$5,000, 2020, UW Center for Communications, Diversity, and Equity, Collaborative Research This small project is modifying the Basta! video into a Spanish language comic, or graphic novella. The graphic novella will be developed in collaboration with the Farmworker Advisory Group comprised of Latina Farmworkers from Washington State.

Victoria Breckwich Vasquez, Affiliate Associate Professor, University of Washington
Training Community Health and Social Service Providers to Deliver Training Using the ¡Basta! Toolkit $10,000, 2020, Washington State Coalition Against Domestic Violence
In collaboration with the PNASH Center, WA Coalition to Eliminate Farmworker Sexual Harassment, and El Proyecto Bienestar, Dr. Breckwich Vasquez has been leading an effort to train community health and social providers to use the ¡Basta! toolkit.

Evaluation Program

PNASH's evaluation program ensures that our efforts are relevant, feasible, and sustainable; that they reflect the best science and practice; and that they are consistent with our ultimate goal of reducing exposures, injuries, and illness.

AIM 1: Regional Needs Assessment. To assess PNASH's responsiveness to regional needs and inform Center and project planning, three approaches will be taken: routine interviewing and surveying of Stakeholder Advisories and annual monitoring of Northwest Ag Health Indicators. This year our planned focus was on assessing PNASH's reach through direct contact and dissemination partners. This was initiated with a geographic analysis of contacts, but further work was postponed due to COVID-19 and will be followed through in Year 5.

With the onset of the COVID-19 pandemic, our focus turned to assess information needs and the experience of those in northwest farming, fishing, and forestry, starting with interviews with key stakeholder advisors. Forty-two interviews were completed over April – May by a member of Center leadership and members of the Internal Advisory Committee (IAC). Questions included COVID-19 experience and needs and general questions on their program/work progress and needs they see for their membership/community in safety and health. Results were shared and discussed among the IAC and integrated into our Center response to COVID and new project directions in wildfire and smoke, logging, and fishing. Our COVID-19 stakeholder assessments focused on the farmworker community, the priority need. See the Outreach Core's Needs

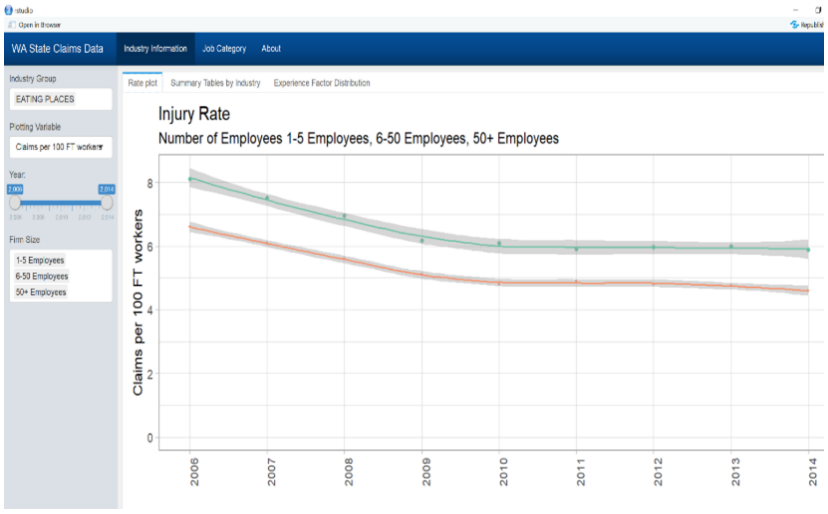
Assessment section, page 18, for descriptions of our COVID stakeholder needs assessments for:

- Farmworkers (phone interview - completed)
- Extension professionals (online survey - completed)
- Dairy management (phone interview - completed)
- Producers (online survey - in progress)

Ag Health Indicators. In April, Elena Austin and Edward Kasner hosted an internal data workshop, *Estimating Burden: Agricultural Health Indicators & Data Visualization*, for our investigators and student researchers.

The workshop introduced:
1) The utility of R and R-Studio for data analysis and visualization, including engagement with partners and stakeholders with this data, and
2) Our newly compiled morbidity, mortality, and demographic data sources on a GitHub shared platform.

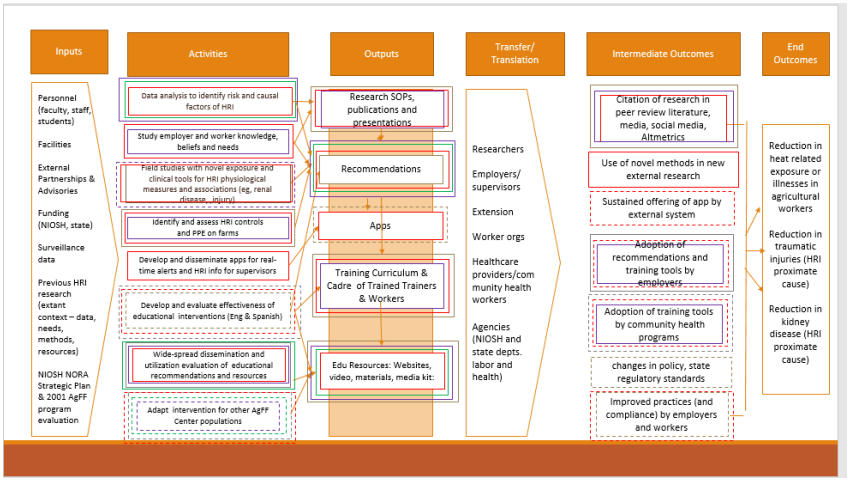
This workshop demonstrated an interest in regular investigator training, Open Data Kit (ODK) systems, and a need for student mentorship. Our overarching PNASH goal is to modernize our data management system to support replication and transparency. Preparation began for a second workshop in October 2020 and regular training will be supported by PNASH annual and through our Department R Working Group, including to our research co-investigators external to the University of Washington.



R-Studio graph of Washington State workers' compensation claims

AIM 2: Performance, Developmental, and Outcome Evaluation. In Year 4, Marcy Harrington and Doug Brock led an April workshop for PNASH Investigators on NIOSH's two new evaluation initiatives, *Burden, Need, Impact framework, and Contribution Analysis*. The PNASH Evaluation Team is integrating these approaches into our practices. Our primary work this year, was a collaborative pilot with NIOSH Evaluators, of the Contribution Analysis retrospective approach on three topics that have strong cross-center reach: Heat-Related Illness, ROPs, and Animal Handling. Marcy Harrington joined a NIOSH and Ag Center workgroup to plan the NIOSH Ag Centers' Evaluation Workshop, March 18, 2020. Due to COVID, this event was modified to a shorter, online format. Ms. Harrington chaired the contribution analysis pilot on the topic of Heat-related Illness. Overall, the workshop's objectives were to:

- Inform participants about NIOSH's evaluation capacity building, including its use of contribution analysis
- Facilitate relationship building between Ag Health and Safety Center Evaluation teams
- Identify future opportunities for cross-center collaboration and facilitate on-going evaluation efforts and strategies



Pilot Heat-related Illness Contribution Analysis Logic Model

PNASH, in the process of working on this NIOSH pilot on contribution analysis, was able to mentor and support our current Heat-illness team in compiling outcome evidence and completing planning for outcome evaluation for the remainder of the project period.

AIM 3: NIOSH AgFF Initiative and Multi-Site Evaluation. The PNASH Evaluation team collaborates regularly with NIOSH and the ten other NIOSH-funded Agricultural Centers through the Agricultural Center Evaluation, Communication, and Outreach (ECO) group. In Year 4, PNASH's significant multi-site collaboration activities:

Contribution Analysis Capacity Building & Pilot of Heat-related Illness Multi-site Analysis. Marcy Harrington advised, at the request of NIOSH Evaluators, on their engagement and capacity building of Ag Center Evaluators. Ms. Harrington also coordinated a multi-center evaluation team in contribution analysis of their center's Heat-related Illness research and education. This group included the Western Center, High Plains Center, Southeastern Center, and Southwestern Center. Our resulting analysis, including the logic model and evidence table, was used by NIOSH Evaluators as examples in their training and to inform NIOSH's development of future guidance and common tools.

COVID-19 needs assessment activities for farmworkers (COFS study with Western Ag Center) and for extension professional (Southeastern Center led). In addition, Edward Kasner contributed to the development of the national CVOID-19 guidelines for agriculture, an initiative lead by Jennifer Lincoln, NIOSH AFF Program Director.

Ag Center Surveillance Working Group. PNASH investigators Viktor Brovberg and Edward Kasner continued their active involvement in this workgroup organized by Erica Scott of the Northeast Center.

RESOURCES

- 2019 Year End Report. Pacific Northwest Agricultural Safety and Health Center
- Evaluation Tool: Harvest Program Monitoring Database, v. 3.0 (available on request)
- GitHub Data Repository: Northwest Agricultural Health Indicators
- Website: Western Ag Safety & Health Conference - Cultivating Collaborations

PILOT PROJECT PROGRAM AND EMERGING ISSUES FUND

PNASH administers an annual Pilot Project Program and Emerging Issues Fund, allowing us to award Northwest investigators small projects in research, intervention, and education projects.

Pilot Project Program – Year 4

The PNASH Pilot Program offers small grant opportunities to both new and experienced investigators who are seeking to explore new directions, test novel methods or develop preliminary data for occupational safety and health research in farming, fishing, and forestry. A call for pre-proposals are released annually to investigators throughout the Northwest using our contacts and through collaborations with public health programs in regional universities. The practice of submitting pre-proposals and direct consultation with applicants ensures that the final proposals submitted align with the mission and goals of the Center and the Pilot Project Program. Final proposals undergo an internal and external review process where they are scored based on the criteria outlined by the Pilot Program Application Guidelines, including:

- **Significance:** the project's responsiveness to regional and national priorities, focus on hazards that are serious and/or have high rates of exposure and the probability that research will make a difference
- **Investigator qualifications:** qualifications of PI and/or mentor; early career investigators are encouraged
- **Innovation:** new and novel methods; interdisciplinary and community-engaged research
- **Approach:** study design; population size and access; evaluation; research-to-practice
- **Future Funding Potential:** likelihood this project will lead to future studies and programs

In 2018, PNASH's Internal Advisory Committee reviewed program objectives, processes, and guidelines for applicants and reviewers. Changes resulting from this review included the addition of the Education/Research Translation Track. The Pilot Program now has two application tracks:

1) Feasibility Research Track: for pilot research studies seeking to gather preliminary data or explore new directions to help inform future research, and

2) Education/Research Translation Track: for translation studies seeking to move research into practice through the development and evaluation of training, education, and outreach materials and activities.

Year 5 of PNASH's cycle does fund a Pilot Project Program, with the intention that our final year should be focused on the dissemination and evaluation of our final findings and products.

Pilot Project Awarded for Year 4:

See progress on these projects reported under the section, PNASH Pilot Projects starting on page 45-43.

Kevin Lyons, Associate Professor, Oregon State University, $25,000.
Use of Unexpected Events and Management Requiring Conditions in the Training and Management of Workers

Edward Kasner, PNASH Outreach Director, and Research Scientist, $25,000
Smoke Monitoring for Agricultural Safety and Health (SMASH)

Jay Kim, Assistant Professor, Oregon State University, $5,000
Systematic Evaluation of Exoskeletons in Reducing Musculoskeletal Disorders in Manual Timber Felling

Jody Early, Associate Professor, University of Washington Bothell, $5,000
Sexual Harassment Prevention in Agriculture: Evaluating a Training Video and Curriculum

Emerging Issues Fund – Year 4

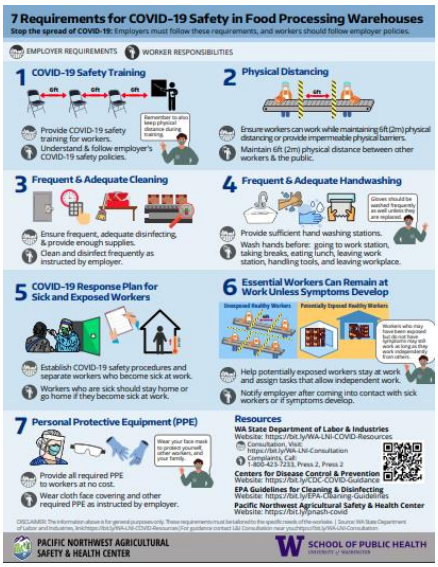
Through PNASH's Emerging Issues Fund we can take rapid action to address an emergent issue or cultivate a developing partnership. The Fund allocates up to $50,000 direct costs per year with awards as small as $2,000. Awards are available to active investigators within PNASH's Northwest network.

PNASH's Emerging Issues Fund prioritizes partnership building activities. The fund is used to address issues and priorities raised through project advisory committees, solicitation from Center stakeholder meetings, and input from ad hoc advisors. Activities should fall outside of the scope of currently funded PNASH work. Distinguishing criteria for this fund are:

- New effort to cultivate a developing partnership
- Address issues and priorities raised by stakeholders
- High impact opportunity in preventing injury and illness
- Immediacy/timeliness of the need
- Not a fit for other funding streams
- Opportunity to extend our research into practice

Emerging Issues Projects and Accomplishments

COVID-19 Rapid Response. 25,000 direct costs.
This summer, PNASH partnered with WA Department of Labor and Industries Multicultural Safety and Health Outreach Program to develop resources to develop COVID-19 resources for agricultural employers, workers, and supervisors. The goal was to communicate the WA State workplace requirements for agriculture in an accessible and visual format in English and Spanish. The effort was led by Edward Kasner, Idanis Cruz, Dennise Drury, Sarah Fish, and Elizabeth Torres of the Northwest Communities Education Center.



To date, the team has produced 6 social media card sets (90 cards total) and 7 fliers on the WA workplace requirements. Through dissemination on Facebook, these resources reached 18,505 people. To see the resources developed, visit the PNASH's Responding to COVID-19 webpage.

For the forestry sector, Marcy Harrington coordinated with the Association of Oregon Loggers and American Loggers Council in the preparation of a factsheet and article that was sent to all US state loggers associations. And Dr. Kasner reviewed guidance for forestry services disseminated by the Northwest forest Worker Center in English and Spanish.

Product	Description
6 Steps to Slow the Spread of COVID-19	*Guidance on cleaning & disinfecting at work & home*
If you touch it, disinfect it	*Flier with pictures of frequently touched items*
Tips to clean your home during COVID-19	*Guidance selecting products for cleaning & disinfecting*
Minimizing the Spread COVID-19 brochure	*Cleaning & disinfecting tips to prevent COVID-19 spread*
Safer Cleaning & Disinfection Recommendations	*Tips for reading the cleaning & disinfecting product label*
¡Ayúdanos a protegernos y ponte tu mascarilla!	*Guidance on masks work and when they should be used*
Help us Protect Each Other: Wear your mask!	*Tips practice for mask use and care*

Como Lavar y Usar Su Mascarilla de Tela	*Tips for washing your cloth face covering*
Cuando debo usar una mascarilla de tela?	*Tips on when a face mask should be used*
When using your mask, be sure to flier	*Tips for using face masks correctly*
Tips for wearing masks in the heat flier	*Guidance for using face masks in the heat*
Tips for wearing masks in the heat (*shown left*)	*Slide show w/ tips for using masks in the heat*
Safer glove use during COVID-19 flier	*Best practices for selecting & gloves during COVID-19*
Agricultural Employer's COVID-19 Checklist	*Developed from CDC/NIOSH guidance for COVID-19*
5 Requirements for COVID-19 in Ag cardset	*WA requirements for COVID-19 safety in agriculture*
Social Distancing Req. for Ag (*shown left*)	*WA requirements for COVID-19 distancing in ag*
Handwashing Requirements for Ag cardset	*WA requirements for COVID-19 handwashing in ag*
Cleaning & Disinfecting Req. for Ag cardset	*WA requirements for COVID-19 cleaning in agriculture*
Staying Home & Isolating Req. for Ag cardset	*WA req. for COVID-19 sick workers in agriculture*
COVID-19 Safety Training Req for Ag cardset	*WA requirements for COVID-19 safety training ag*
7 Requirements for COVID-19 Safety in Ag flier	*WA requirements for COVID-19 safety in agriculture*
7 Req. for COVID-19 Safety in Food Processing	*WA requirements for food processing in agriculture*
COVID-19 Req. for Temporary Worker Housing	*WA req.for COVID-19 safety in ag for worker housing*
Which Mask for Which Task? for Ag cardset	*WA requirements for COVID-19 safety in ag for mask use*
Requirement #1 for Ag: COVID-19 Training flier	*WA requirements for COVID-19 safety in ag for cleaning*
Requirement #2 for Ag: Physical Distancing flier	*WA req. for COVID-19 safety in agriculture for distancing*
Requirement #3 for Ag: Cleaning flier	*WA requirements for COVID-19 safety in ag for cleaning*
Coronavirus Basic Prevention Measures flier	*Developed with Assoc of Oregon Loggers*
COVID-19 for Logging – Practical Advice article	*Article for the American Loggers Council*

Delivering ¡Basta! Sexual Harassment in Agriculture Training. $2,000.
In response to overwhelming requests for training from WA and OR growers, the PNASH Center contracted Israel Gonzalez and Elizabeth Torres to deliver ¡Basta! training. The team had a total of six trainings requested from the agricultural industry including WA Grower's League, Washington Wine Industry Foundation, Kraemer's Nursery, and Superfresh Growers. During the six training sessions, the team trained a total of 320 workers, supervisors, growers, and human resource managers. See more information on how this emerging issue allocation supplements the small project, ¡Basta! Sexual Harassment in Agriculture, on page 52-53.

Tania Busch Isaksen. Knowledge transference effect on N95 mask fit, by communication medium. $9,000 direct costs.
The frequency of wildfires is increasing in Washington State, as well as the impact of transboundary smoke originating from distant wildfires. In October 2018, the PI's research group hosted a wildfire smoke risk stakeholder symposium that brought together 90 practitioners, researchers, and students, representing 35 organizations across Washington State, to develop a practice-based wildfire smoke research agenda. The symposium participants called for a better understanding of the physical and mental health impacts of wildfire smoke, evidence-based intervention strategies (specifically N95 mask efficacy research), and risk communication strategies to protect health during prolonged and extreme smoke events.

To reduce personal exposure to wildfire smoke and resulting adverse health effects, N95 respirators are increasingly used by the general public to filter out fine particles (PM2.5) present in smoke. When mandated in an occupational setting, the use of N95 masks requires a medical clearance, proper training, and fit testing. This rigorous attention to training and proper respirator fit is generally neither required nor practiced by the lay public. Here, we assessed the impact training has on N95 respirator fit in a convenience sample of forty individuals with no formal respirator training. To this end, we administered a Knowledge, Attitude, and Practices (KAP) survey to identify baseline knowledge and training retention; conducted a quantitative respirator fit test before, and after, each participant received their randomly assigned training material; and observed and analyzed the actions taken by participants during the donning process that affect fit. Educational intervention materials tested include: "Smoke From Fires: N95 Respirator Masks" video, DOH Wildfire Smoke and Face Masks factsheet, and the manufacturer's instructions. We found that the selected factsheet and manufacturer instructions improved the fit factor of participants' best, though the improvement did not achieve the passing fit factor of 100 for required use in an occupational setting. Pre-training fit testing found that most individuals achieved a fit factor of 2, a 50% decrease in particulate exposure. Post-training fit testing found most individuals reached a fit factor of at least 10, an expected 90% reduction in exposure. In comparing participants' pre-intervention KAP survey results with initial fit factors, participants tended to overestimate their knowledge on proper fit. In the absence of fit testing, effective training and risk communication are necessary for the use of N95 respirators by the general public. With training, N95 respirators can protect the general public during wildfire smoke events, but without proper use, N95 respirators may not reduce PM2.5 exposure to levels considered safe for public health. The results of this study will provide evidence on the efficacy of N95 respirators and training for proper fit as a personal intervention to reduce exposure to wildfire smoke.

Edward Kasner. Emerging Issues funding to new Pilot Projects: Pilot: Smoke Monitoring for Agricultural Safety and Health (SMASH). $8,000 direct costs faculty cost-sharing.
This pilot seeks to develop wildfire decision aid tools driven by data collected from a high-density network of air quality monitoring sensors. During the 2020 wildfire season, smoke sensors will be added to an existing network of weather stations in agriculturally productive regions to explore applications such as worker safety and health, crop protection, and plume tracking. If successful, this pilot study will demonstrate proof-of-concept for air quality monitoring based on the AgWeatherNet platform. See Pilot Project report on page 50.

June Spector. Addressing Health Disparities Faced by Rural Underserved Agricultural Communities.
$10,000 direct costs. This project stems from concerns expressed by farmworker participants in our summer 2018 farmworker survey and by our community partner, Community-to-Community. This project was originally supported by the UW Population Health Initiative.

To further characterize social and environmental climate-related concerns that impact farmworkers' health, this project proposed to collect participant-created digital stories. Digital stories are first-person narrative stories that combine photographs, video, animation, sound, music, text, and narrative voice. Through the community-academic partnership with Community to Community Development, this project was able to conduct three farmworker digital story workshops and collect 18 farmworker created digital stories in Skagit and Whatcom Counties. These workshops allowed us to pilot and adopt the digital story-making process. We are working to finalize a bilingual digital story workshop facilitator's guide.

Photos of Digital Story Workshop Participants

The preliminary themes that have emerged from these digital stories include social, environmental, and personal experiences. Community to Community (C2C) was able to screen six of these the Farmworker created digital stories during the 2020 Latino Legislative Day- Farmworker Tribunal. We are continuing to work alongside C2C to finalize a plan to further explore emerging hazards, immigration-related factors, and potential solutions and/or adaptation strategies of farmworkers.

Table 1: Digital Story Workshop Summary

WORKSHOP 1: YOUNG ADULT FARMWORKERS	WORKSHOP 2: RURAL AGX SURVEY PARTICIPANTS	WORKSHOP 3: FARMWORKER WOMEN	WORKSHOP 3: FARMWORKER AND ENVIRONMENTAL IMPACT (CANCELED DUE TO COVID-19)
Languages: Spanish and English **Story Themes:** Farmworker family experience, working in ag as a child/teen, and education	**Languages:** Spanish, Trique, and Mixteco **Story Themes:** Farmworker family experience, immigration, workplace injuries, wage, pesticide exposure	**Languages:** Spanish, Trique, and Mixteco **Story Themes:** farmworker family experience, immigration, workplace injuries, wage, pesticide exposure, pregnancy while working in agriculture	**Languages:** Spanish, Trique, and Mixteco **Proposed Story Themes/ prompts** included wildfire exposure, heat, workplace training and access to community resources

OUTREACH AND EDUCATION CORE

The Outreach and Education Core forges and sustains partnerships with agricultural stakeholders through engagement at the interpersonal, organizational, community, and policy levels. To help meet our goals, the Core is organized into four committees that correspond to the specific aims below.

Aim 1. Collaborate with stakeholders to identify the key issues and problems in agriculture that the Center can address through research, intervention, or educational activities *(Administrative Committee).*

Aim 2. Develop a research-to-practice plan for each of the Center's projects to ensure results of our research, interventions, and education are put back into the hands of agricultural workers and producers, health and safety professionals, health care providers, public agencies, and academic institutions *(Translation Committee).*

Aim 3. Implement outreach strategies that are specific to the needs and preferences of each stakeholder group *(Needs Assessment Committee).*

Aim 4. Provide regular communications between the Center and agricultural community and serve as a forum for stakeholders to discuss issues and resolve emerging problems *(Communications Committee).*

PNASH Response to COVID-19

In Year 4, the Core collaborated with state, regional, and national partners to develop guidance, assess regional needs, compile and develop resources, and disseminate key information to our stakeholders. See Emerging Issues section on page 12-13 for a listing of the products developed.

National NIOSH Ag Center Collaboration to Address COVID-19. The Ag Centers collaborated with NIOSH, CDC, OSHA, FDA, USDA, EPA, and other agricultural industry stakeholders over several months to develop interim guidance for farmworkers and agricultural employers. The guidance is a technical document that has been used by owners/operators of production ag facilities, safety and health professionals, and state and local health departments. All centers worked to create new materials and pair existing materials to the guidance for use with workers.

Regional Efforts to Address COVID-19. In response to the need for COVID-19 safety information, the Center launched the Responding to COVID-19 webpage to compile the best resources and guidance from health experts and authorities in WA, OR, ID, and AK. This webpage features subpages to curate resources for each industry and for employer and worker audiences. The Core also collaborated with rural organizations, health districts, state agencies, and UW researchers to develop communications and resources to increase awareness of the COVID-19 safety requirements and create resources with accessible vocabulary, a visual format, and Spanish language. These efforts targeted two different audiences: 1) agricultural workers, supervisors, and employers, and 2) agricultural communities and their families (see New Awards Section, Co Developing Culturally Relevant Messages for Farmworkers during the COVID-19 Pandemic (Kasner P.I.).

PNASH Returning Results Workshop

This March, the Core hosted the Returning Results Workshop to reflect on approaches for engaging and sharing study results with primary agricultural audiences. The goals were to 1) review and update plans to return results from the current cycle, and 2) reconsider the best ways to engage our agriculture, forestry, and fishing partners in future work. To accomplish this, we invited researchers who work with similar communities to show case examples, strategies, and best practices for returning results. An outcome of the workshop was the decision to launch a Returning Results Report annually for our research partners and participants. This resource will draw from the PNASH YER, to highlight our

progress, impact, and accomplishments but with a stronger emphasis on the use of photos and graphics instead of text and feature publicly accessible language and Spanish content.

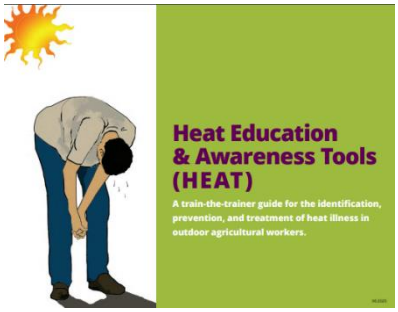
Translation of Research

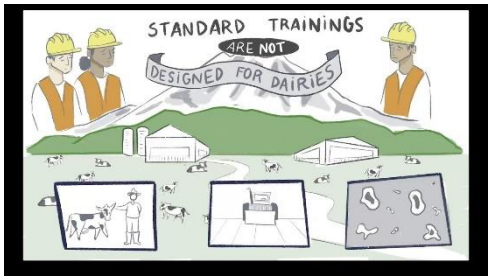
Our Translation Committee makes PNASH research accessible to agricultural communities by ensuring content is linguistically, culturally, and technically appropriate. This summer, the Committee revised their internal review process and review guidelines, expanded their team, and held bi-weekly meetings to ensure newly developed COVID-19 resources met PNASH standards.

This fall, the Committee will develop a glossary of Spanish terms to establish accuracy and consistency of language use. In addition, the Committee has been working to establish a set of guidelines using Creative Commons licensing for the PNASH Center. This guidance includes the difference in licensing types, which content or resources are applicable, and how to navigate the licensing process.

New Education Resources

COVID-19 Resources are reported under Emerging Issues section, page 12-13 and are available on our new webpage [Responding to COVID-19, with resources segmented by farming, fishing, and forestry.]





Product	Description
¡Basta! Prevent Sexual Harassment Toolkit	*Comprehensive guide for sexual harassment prevention*
¡Basta! comic (coming winter 2020)	*An educational graphic resource for farmworkers*
Dairy Partnership Video (*shown above*)	*Describes NW partnership for injury & illness prevention*
Dairy Safety Toolkit	*Online training course for supervisors with modules*
Heat Education & Awareness Tools (*shown above*)	*Training guide & resource for health & safety educators*
HEAT Worksite Posters	*Six worksite posters for heat-related illness prevention*
Heat Awareness App (WSU AgWeatherNet)	*Monitor temperature, wind, & humidity conditions in WA*
Practical Solutions for Handheld Equipment	*Online pesticide solutions developed by growers*
Pesticide Labels Now! App *(shown above)*	*Pesticides safety label info for apple & pear crops in WA*
Logger Poll Results and Safety Leadership	*Article in Idaho Logging Safety News*

Assessing Stakeholder Needs

The Needs Assessment Committee administers needs assessments to evaluate regional needs and progress to help the Center prioritize issues, identify opportunities for collaboration, and develop achievable action plans with research teams.

In Year 4, a new assessment our on PNASH contact reach was conducted using geographical mapping. This mapped segmented constituency group layers for flexible visual analysis by Producers, Industry, Agency, Academics, Extension, Service. The analysis demonstrated the utility of mapping for internal planning and showed a needs for farming outreach in Oregon and Idaho generally, and more specifically for extension and community service organizations.

Farming

In Year 4, this Committee initiated and participated in four surveys to assess the impact of COVID-19 on agricultural employers, workers, and communities. These COVID-19 survey results are currently being assessed and will be shared publicly as a report and in a public webinar. Surveys were approved by Human Subject IRB, yet each had unique partnerships and approaches. The farmworker and grower surveys employed some common questions to allow for a comparison of perspectives.

COVID-19 Farmworker Study (COFS). This study aims to provide critical missing information on farmworkers' abilities to protect themselves and their families during the COVID-19 pandemic. It brings together a collective of community-based organizations, researchers and, advocates in CA, OR, and WA to reveal information that can only be gathered directly from farmworkers who have been working during the COVID-19 pandemic. The effort has been coordinated by the California Institute for Rural Studies. PNASH has played a role in data analysis efforts in OR and WA. The preliminary findings highlight how the COVID-19 pandemic created challenges that negatively impacted farmworkers' workplace health and safety, access to healthcare, and financial security.

COVID-19 Impacts on Extension Professionals. The Southeastern Coastal Center for Agricultural Health & Safety (SCCAHS) developed and coordinated an online survey to identify the impacts that COVID-19 has had on the lives, health, and work of Extension agents. We coordinated with several ag centers to assess perceptions of Extension professionals across the country with the following objectives: identify sources of information used to inform their work related to COVID-19 and assess levels of trust they place in these sources; identify methods used to reach Extension audiences with COVID-19-related information and ways to build capacity for sharing information in a virtual environment; and assess Extension professionals' management of their health, time, and roles, especially regarding stress and the emotional impacts COVID-19 is having in their lives.

Dairy Management Practices During COVID-19. The Dairy Safety research team (P.I. Yost) and the Dairy Health research team (P.I. Rabinowitz) partnered to develop and administer a small survey to assess the impacts of COVID-19 on dairy practices and production. Through that process, we learned about a national effort led by investigators in Idaho and California to survey producers, managers, and workers as part of a large USDA grant. We will be assessing these results along with our own interviews

COVID-19 Survey for General Agricultural Producers. This online survey is in the development stage and in preparation for dissemination at the close of harvest in November 2020. The current survey instrument is developed for farming and we are assessing with our fishing and forestry advisors if there is interest in their industries as well.

Fishing

The major effort to engage fishermen has been through the OSU Fishermen Led Injury Prevention Program (FLIPP), which helps fishermen to understand high-risk tasks, safety perceptions, and injury prevention opportunities. Injury surveys and conversations with West Coast fishermen provided researchers with tangible safety solutions and outreach to implement that would be directly beneficial to commercial fishermen. This led to conversations with over 50 captains and deckhands about what makes a good crew and a poster summarizing the responses. Fishermen also indicated that the current available first aid and CPR training, which are required by USCG, don't apply to their experiences out at sea.

In response, FLIPP created a highly tailored two-day first aid and CPR training that directly applied to fishermen working conditions, which are oftentimes many hours if not days away from care. This training, Fishermen First Aid and Safety Training (FFAST) is based on PNW injury data collected by the research team with support from NIOSH and PNASH, making it specific to PNW commercial fishermen. These are just two of many examples of how engaging fishermen in the research process as much as possible allows researchers to be responsive to the needs of the industry.

Forestry/Logging

At the Associated Logging Contractors (ALC) of Idaho's first annual safety meeting, PNASH was invited to present. At this event, we provided an interactive presentation and survey of the audience (120 poll participants) using @TurningPoint's audience polling system. We assessed membership's safety and health experience and their top safety priorities. The results from the poll are shown below in ranked order:

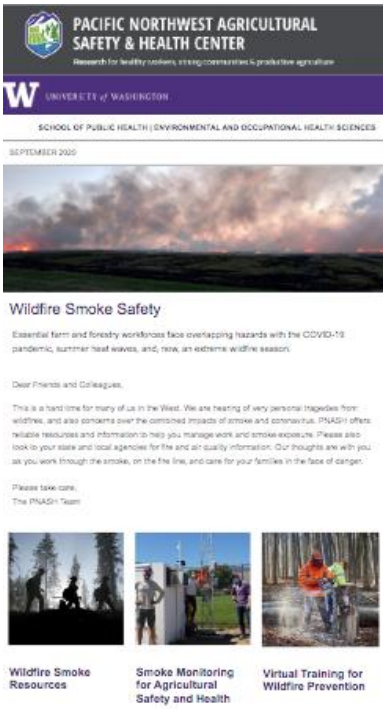
- Safety Needs: Training of New Workers, Room on Landing Zone and Roads, Mechanized Logging, Location Awareness, and Use of Guarding
- Hazards: Difficult Terrain, Woods Roads, Cutting, and Fatigue
- Health Issues: Chronic Back Pain, Chronic Muscle or Joint Pain, Poor Sleep, and Hearing Loss
- Training Interests: Fatigue & Stress, Safety Leadership, Danger Trees, and Fitness & Health

In addition, for COVID-19, informational interviews with logging stakeholders demonstrated an early need for guidance. Ms. Harrington collaborated with the Association of Oregon Loggers and the American Loggers Counsel to release a factsheet and article with practical advice for COVID-19 safety for logging. In addition, Dr. Kasner reviewed COVID-19 guidance for forestry services, developed and released through the Northwest Forest Worker Center.

Communications

This Committee develops content to promote and disseminate the Center's research and programs on social media, e-news, and our website. In Year 4, priorities included increasing the Center's social media presence, improving website navigation and visual design, establishing a database with AgFF resources and tools, and developing e-news blasts to share timely updates and information.

Website. In Year 4, website revisions were focused on increasing the visibility of PNASH research and resources by improving navigation and implementing a system to tag and curate content. This year, a new format was adopted for web pages which featured research and resource cards with pictures and descriptions. Webpages with this design include Responding to COVID-19, Heat-Illness Prevention, Dairy Safety, Pesticide Safety, and Fishing Injury Prevention. The Responding to COVID webpage has been one of our top visited webpages with a total of 2,773 visits and 505 resource downloads since March. Additionally, employer checklists developed from CDC/NIOSH guidance had 1,524 copies saved, 1,760 pdf downloads, and 3,694 total views. Visit Responding to COVID-19 webpage.



Blog. Last year, the Center launched a blog to create a permanent home on the website for our stakeholders to see PNASH updates, news, and events. This year the PNASH Center published eight blogs with stories on COVID-19 impact and resources, Pesticide Labels Now! mobile app, Heat-illness study, Fishing Safety Outreach, and more. To see our blog, visit: https://deohs.washington.edu/pnash/blog

E-news. PNASH e-news provides updates and shares the latest news monthly with our 717 subscribers. This past year, the e-news announced the release of the new tools for the agricultural industry including ¡Basta! Prevent Sexual Harassment, Dairy Safety Toolkit, Heat Education and Awareness Tools, and the ¡Etiquetas de pesticidas,ahora!™/ Pesticide Labels, Now!™. In addition, a series of e-news blasts were sent to provide stakeholders with timely updates on important issues such as COVID-19 and wildfires.

Social Media. Over the last year, the Center has experimented with social media as an engagement tool to build our following, promote news and resources, highlight stories of PNASH faculty, staff, and students, and draw traffic to the PNASH website. A key strategy to expand our following has included tagging and promoting our resources and those developed by partners. Another key strategy is to use paid promotion (boosts) to connect with new target audience segments (eg, women in agriculture) and agricultural counties.

In 2020, PNASH showed continued steady growth across our social media channels, including in our followers and our engagement rate. Facebook saw a 35% increase from 264 to 360 followers, Twitter 34% increase from 195 to 270. Note that we launched an Instagram page in August 2019 that now has 108 followers as of the end of September 2020. We also launched a LinkedIn page during the summer of 2019 that has gained followers over the year, to 73 followers.

Our reach also showed marked improvement, October 2019 to September 2020:
Twitter, 2.18% to 2.87% (32% increase)
Facebook, 9.16% to 10.09% (10.15% increase)

REACH/ IMPRESSIONS	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
Facebook	6655	5190	23171	19528
Twitter	13161	14300	15700	24900

COVID-19 Social Media Campaign. This March, a social media campaign was launched to share new COVID-19 resources and continue to raise awareness on the importance of COVID-19 safety. The posts promoted new resources, important news, changes in requirements, and webinars/events. From March to the present date, the campaign has published 77 posts and reached 29,724 people on Facebook alone.

Heat-Illness Awareness Campaign. The HEAT training and resources were disseminated in a pilot social media campaign over July – Sept 15, 2020. The pilot focused on Washington state and agricultural counties and posted in English and Spanish. Targeted audiences included employers, community health workers, and women in farming, with select messages promoted to these audiences through paid boosts. See more results in the Heat project report on page 36 .

2020 National Farm Safety and Health Week.
For NFSHW this year, the U.S. Ag Centers coordinated a social media campaign and hosted daily webinars in collaboration with AgriSafe. Jody Early and Dennise Drury were invited to co-present a session called Safety in the Field: Addressing Workplace Harassment for Farmworkers to raise awareness on the issue and promote the ¡Basta! Toolkit. The PNASH Center's contribution included 22 posts and reached 2,561 people.

Design and Video Task Force

This task force supports development, design, and production of multimedia graphics, infographics, and videos to share with stakeholders. This year, the taskforce led the development and production of an illustrative video to highlight the partnership among the research teams and industry partners for preventing dairy worker injury and illness. See Partnership for Dairy Safety & Health video.

Anti-Racism Equity & Action (AREA) Taskforce

The Core established the AREA taskforce this year to identify opportunities to integrate issues of race and equity into the PNASH Center efforts. During the first meeting, the taskforce identified mental health and work life balance as a key priority. In response, the team is currently working to compile a list of resources and guidance to help PNASHers engage in conversations about stress, work-life balance, and mental health with their teams. In the future, the taskforce hopes to develop additional proposal criteria the Center can use to review research proposals to assess community engagement and impact.

EVENTS & ADVISORIES

El Proyecto Bienestar – Farmworker Community Engagement, Yakima, WA. PNASH continued our engagement with El Proyecto Bienestar (the Well Being Project) - a long-standing community-based partnership between the UW PNASH Center, Northwest Communities Education Center/Radio Cadena, Heritage University, and the Yakima Valley Farm Workers Clinic. This past year, EPB played a key role in the PNASH Center's participation in the COFS study by recruiting farmworkers to participate in the survey and conducting farmworker interviews. In addition, EPB disseminated 500 COVID-19 safety resources to promote mask use in the agricultural community.

Ag Health and Safety Information Sources Voting Booth. To engage workers at Ag Safety Day this year, Sarah Fish, Maria Blancas, and Idanis Cruz led the development of an interactive voting booth. The purpose of the booth was to determine where workers go to obtain health and safety information. The preliminary results from the Kennewick, WA event on February 5th show the preferred source is the internet, the most useful format is a training guide, and the top platform to access online resources is YouTube.

¡Basta! Video Launch Party. PNASH co-hosted a community event with the WA Coalition to Eliminate Farmworker Sexual Harassment and the WA Grower's League to celebrate the release of the ¡Basta! Prevent Sexual Harassment in Agriculture toolkit. The event convened 79 stakeholders that supported the development of the ¡Basta! toolkit, representing agricultural producers and workers, commodity organizations, legal experts, state agency representatives, community service providers, and researchers.

Washington Dairy Conference. Each year the WA Dairy Federation hosts the annual WA Dairy Conference to share updates about crucial issues facing the dairy community and provide training. During this year's conference, PNASH met with dairy leaders and workers to present the train-the-trainer LEADS program led by Dr. Amber Progar and Dr. Elena Austin. The LEADS program is an online platform featuring dairy training resources for supervisors. During this year's training, nine participants completed the training and are prepared to train their co-workers using the training resources.

WA State Tree Fruit Association Meeting. The WA State Tree Fruit Association (WSTFA) Meeting is the largest tree fruit gathering in the country and draws agricultural stakeholders from around the nation and the world. At this year's event, the PNASH Center hosted an exhibit and delivered presentations. Edward Kasner delivered a presentation to highlight current PNASH research and share the goals of the SMASH Project (Smoke Monitoring for Agricultural Safety and Health, 2019 PNASH Pilot, P.I. Edward Kasner). The Bilingual Pesticide App and the ¡Basta! Toolkit was showcased at the PNASH exhibit.

Cascadia Conference. Cascadia is an annual joint meeting of faculty, staff, and students from the University of British Columbia, Simon Fraser University, Boise State University, Oregon State University, and the University of Washington. This year the ¡Basta! training video was screened during the evening ceremony. Erica Chavez-Santos, a Ph.D. student gave a presentation on the Multi-Level Heat-Related Illness Intervention study and Dennise Drury, MPH student, gave a presentation on evaluating the ¡Basta! Prevent Sexual Harassment in Agriculture training video and curriculum.

WA Governor's Ag Safety and Health Conferences. The Ag Safety Days are the largest training event in Washington State, bringing together a total of 600 agricultural employers, supervisors, and workers. Dennise Drury served on L&I's Ag Safety Day Planning Committee, which serves to organize the training sessions. This year PNASH hosted workshops on dairy safety tools for supervisors (English), fluorescent tracer train-the-trainer (English and Spanish), how to read pesticide labels, and use the Bilingual Pesticide App (English and Spanish), and ¡Basta! Prevent Sexual Harassment in Agriculture (English and Spanish).

Washington Grower's League Annual Meeting. The WA Grower's League (WGL) hosts the conference annually to share key updates in the industry and provide training. This year, Dr. Jody Early, Dennise Drury, and Elizabeth Torres were invited to give a presentation using the toolkit to 110 growers, supervisors, and resource managers.

First Annual A.L.C. Logging Safety Conference. Approximately 200 people attended this first safety conference for Idaho loggers. Dr. John Garland gave an overview of the statistics and his observations from the industry over the years, and gave a presentation on winch-assisted logging developments that generated a lot of questions. Marcy Harrington conducted a TurningPoint audience poll conducted last year at WA and OR meetings and had active participation in the poll by 120 attendees.

2nd Annual Logging Safety Summit. The annual Logging Safety Summit, started in 2019, had to postpone plans fora March 31 2020 Summit due to COVID-19 safety concerns. A program was developed by a planning committee of seven Northwest safety leaders and co-sponsored by PNASH, Associated Logging Contractors of Idaho, and the Association Oregon Loggers. The event convenes Northwest area logging safety educators, researchers and consultants in a one-day collaborative forum to cross-train and discuss issues in logging safety education. In-person networking and discussion is key to this meeting. The group has served as a network and advisory, with remote sharing of news and information. The planning committee will reconvene in winter 2020 to access how we can continue this collaboration remotely.

Additional Activities

September 6-December 19. Washington State Aerial Application of Herbicides in Forestry Working Group, PNASH Participation: Edward Kasner.

October. Washington State Department of Labor & Industries Division of Occupational Safety & Health Ag Safety and Health Forum, PNASH Participation: Amber Adams-Progar, Elena Austin, Kit Galvin, and Pablo Palmandez.

October 24-December 17. Pesticide Application Safety Committee, PNASH Participation: Edward Kasner.

October 30. Visit to University of Idaho Experimental Forest. PNASH Participation: Marcy Harrington, Edward Kasner, and Mike Yost.

November 7-8. Washington State Department of Labor & Industries WISHA 10 for Agriculture training, PNASH Participation: Jose Carmona, Idanis Cruz, Dennise Drury, Edward Kasner, Jen Krenz, and Elizabeth Torres.

November 21. Pacific Marine Expo, PNASH Participation: Marcy Harrington and Edward Kasner.

December 9-13. Washington State Department of Labor & Industries WISHA 10 for Agriculture Training of Trainers Certification, PNASH Participation: Dennise Drury and Elizabeth Torres.

December-February. Washington State University Pesticide Safety Education Program, Heat-related Illness Presentations, PNASH Participation: Jose Carmona, Dennise Drury, Edward Kasner, Jen Krenz, and Pablo Palmandez.

August 12. Agricultural Safety & Health Council of America Annual Conference. PNASH Participation: Elena Austin, Scott Dilley, Kit Galvin, and Karen Lewis.

September 21. Governor's Industrial Safety & Health Conference. PNASH Participation: Elena Austin & June Spector.

September 25. AgriSafe Webinar: National Farm Safety & Health Week. Safety in the Field: Address Workplace Harassment for Farmworkers. PNASH Participation: Jody Early and Dennise Drury.

PNASH YEAR 4 PEER REVIEWED PUBLICATIONS

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EXTERNALLY SPONSORED PNASH PROJECTS

EXTERNALLY SPONSORED PNASH PROJECTS

The Pacific Northwest Agricultural Safety and Health (PNASH) Center's foundational award is through NIOSH/CDC and establishes a base for other projects to fulfill PNASH's mission: Research for healthy workers, strong communities, and productive agriculture. In FY2019, the following projects and awards enhanced PNASH's innovative research and service in the Northwest.

COVID-19 Response: Co-developing Culturally Relevant Messages for Farmworkers

UW Population Health Initiative 2018-2019
PI: Edward Kasner, University of Washington

This pilot research study surveyed agricultural stakeholders to assess communications needs and concerns in response to the COVID-19 Pandemic. It brought in researchers from the UW Department of Communications (Dr. Carmen Gonzalez) and UW Department of Health Services (Dr. Gino Aisenberg) and PNASHers including Edward Kasner, Maria Blancas, Idanis Cruz, and Elizabeth Torres. They partnered with the Washington State Department of Health, Yakima Health District, and community health districts throughout Yakima County to develop and disseminate resources to communicate the latest COVID-19 safety requirements. Topics included masks, physical distancing, cleaning and disinfecting, and proper glove use. The team developed 14 resources, and printed and disseminated these 500 fliers throughout the Yakima Valley in collaboration with El Proyecto Bienestar. On Facebook, these fliers reached a total of 6,761 people.

PNASH COVID-19 Resources page: https://deohs.washington.edu/pnash/covid19-downloads

Wildfires and Human Health

Sponsor: Science for Nature and People Partnership, 2020 - 2021
PI: June Spector

This working group is led by a core team of researchers at the University of Washington and The Nature Conservancy. The purpose of the group is to develop a consensus-driven, evidence-based approach to identify and communicate the human health and health equity implications of wildfires versus ecological restoration-focused forest management, including managed and prescribed burns in the Western U.S. With support from SNAPP, the core team assembled a working group that brings together dozens of diverse perspectives on the issue, including foresters, ecologists, public health researchers and representatives from organizations such as the Tribal Healthy Homes Network, the California Environmental Protection Agency and Department of Forestry and Fire Protection, the Washington State Departments of Ecology, Health, Labor & Industries, and Natural Resources, Oregon State University, and the US Forest Service, US Geological Survey, and US EPA. Sub-teams of working group members are working on the following efforts:

Policy and stakeholder analysis. The purpose of this analysis is to better understand potential policy leverage points for integrating public health and ecological restoration-based forest planning practices, notably prescribed burning, for California, Oregon, and Washington. A review of scientific literature and state and federal policies were conducted, and barriers and facilitators for prescribed burning in each of the three states were identified. A collaborative approach with key stakeholders is recommended to effectively integrate human health and equity concerns when planning for prescribed burns.

"Active land management can help with the severity and spread of wildfires, but we still don't know the full extent of the health tradeoffs."

- Dr. June Spector

Health impact assessment. The health impacts assessment will describe tradeoffs in ecological forestry management and wildfires for human health. We are currently preparing model inputs to simulate future fire activities/behaviors for seven different forest management plans up to the year 2100 in the Tahoe Central Sierra region in California. Here, the work

stream will integrate land use modeling for fire emissions using the LANDIS II model with the HYSPLIT model for estimating dispersion of emissions under different land-use scenarios.

Learn more about this project through
Article: https://deohs.washington.edu/hsm-blog/living-fire
Partnership webpage: https://snappartnership.net/teams/wildfires-and-human-health/

The Etiquetas Bilingües de Pesticidas/Bilingual Pesticide Safety Project

Sponsors: Washington Labor and Industries Safety and Health Investment Projects Grant Program, Washington State Department of Agriculture Specialty Crop Block Grant Program, University of Washington CoMotion and Population Health Initiatives, and NIOSH Cooperative Agreement 2011 - 2016. 2014-2022.
PI: Kit Galvin
This project is developing mobile device apps with health, safety, and environment information from EPA agricultural pesticide labels in English with contextual Spanish translations. Pesticide handlers, farm managers, and growers can have this critical safety information in hand anytime, even in rural areas without connectivity. The project received new funding this year through UW awards for business development in marketing and financial sustainability, and the Social Entrepreneurship Fellows Program for Francis Abugbilla, Ph.D. Student.

Managers, pesticide handlers, and growers, as well as agricultural pesticide safety educators planted the seeds for this project during 2005 expert interviews about farm pesticide safety needs. “We need the labels in Spanish, especially the health and safety information like PPE, re-entry intervals, and decontamination and storage.” In 2015, the advent of cell phones fortuitously enabled us to pivot away from a desktop computer approach and provide the information directly to pesticide handlers and others while on the farm. Since then we have tested a pilot and ß-version (X pesticide handlers, managers, and educators). Some responses include, “When can I get this?,” “It’s easy to use,” and “The translations are excellent.” We also heard, “I am learning the English now that I have the Spanish” and “Having the Spanish builds trust. We know we are receiving the right information.” Educators want the app as a teaching tool.

Commercial agricultural pesticide labels come in booklets that can be many pages long. Traditionally, farm managers or coworkers often provided on-the-spot translations that may not be inaccurate or are unavailable when needed. This project addresses the inherent language disparity that can compromise farmworker health and safety and is central to our work developing safety solutions designed for a predominantly Spanish-speaking audience. With these apps, agricultural workers, managers, and companies can have the confidence that they are taking the appropriate measures to minimize ag worker, family, and community exposure to pesticides, as well as protect their crops and the environment. Proactively, growers and owners also view these apps as a risk management tool.

In Year 4, a free app ¡Etiquetas de Pesticidas, ahora!™ Pesticide Labels, Now!™was released for the apple and pear industries in Washington State. It is now available on the Apple App and Google Stores. It contains 40 pesticide labels in English and Spanish for products commonly used on these crops. With wifi or data one can also search the state database of approved labels and use the links to Worker Protection Standard training and information. The app is now being developed into a premium subscription service and will be available for most Washington State specialty crops.

Learn more about this project through PNASH’s Pesticide Safety webpage.

“We need pesticide safety information from the label in Spanish. I am bilingual, but the English is technical and I don’t understand it. How can I explain it to my workers?”

- WA Pesticide Applicator

Dairy Safety Network & Toolkit

Sponsors: Washington Labor and Industries Safety and Health Investment Projects Grant Program, flowed through the Washington State Dairy Federation, 2019-2021
PI: Elena Austin
The Dairy Safety Network project began in February 2019 with the aim to bring bilingual and bicultural safety materials and training opportunities to dairy owners and managers. Through the Network, the online Dairy Safety Toolkit (DST) provides curated training materials and tools to be used for on-site training of dairy workers. This portal also provides moderated discussion forums where users can share success stories and have questions answered by moderators. The online portal is also used to quickly disseminate emerging issues and changes in regulations. In addition, an in-person train-the-trainer animal handling program developed by Amber Adams-Progar at Washington State University is now being promoted and offered free of charge across Washington to dairy owners and managers. This program provides preventive strategies that target commonly reported animal-related injuries.

Home Air in Agriculture Pediatric Intervention (HAPI)

NIEHS, 2015-2021
PI: Catherine Karr, University of Washington
The HAPI project, made possible through our community partnership with El Proyecto Bienestar, aims to reduce exposure to inflammatory agents and allergens in the homes of asthmatic Latino children residing in an area of intense dairy and crop-based industrial agricultural production. Community-based participatory activities in the Yakima Valley of Washington State have identified pediatric asthma as a priority health concern. This study addresses three highly underdeveloped components of asthma and environment research: the health of children with asthma living in communities with industrial-scale agricultural operations, asthma in a particularly vulnerable subpopulation (Latino farmworker children), and evidence-based intervention strategies in these populations. Children with poorly controlled asthma aged six through twelve years, recruited through the Yakima Valley Farmworker Clinic, were randomized to the clinic's usual asthma educational program or an enhanced program, which includes two portable high-efficiency particulate air (HEPA/NH3) cleaners located in the child's sleeping area and living room. Children in the usual program group received HEPA/NH3 units after their study year. This study sought to characterize key indoor pollutant exposures for children with asthma who reside within 800 meters of crop production or dairy operations.

The study completed recruitment with 80 total enrolled families; 71 of these completed all phases of the study. In the past year, the team returned results to community participants and implemented a comprehensive dissemination and outreach plan. The project work in Yakima is now complete and two related scientific publications have been published. Additional scientific papers are underway.

Learn more about this project through these Yakima Herald articles from 2017 and 2018. Publications are listed below.

Masterson EE, Younglove LB, Perez A, Torres E, Krenz JE, Tchong French MI, Riederer AM, Sampson PD, Metwali N, Min E, Jansen KL, Aisenberg G, Babadi RS, Farquhar SA, Thorne PS, Karr CJ. The home air in agriculture pediatric intervention (HAPI) trial: Rationale and methods. Contemp Clin Trials. 2020 Sep;96:106085. doi: 10.1016/j.cct.2020.106085. Epub 2020 Jul 25. PMID: 32721578; PMCID: PMC7494646.

Riederer AM, Krenz JE, Tchong-French MI, Torres E, Perez A, Younglove LR, Jansen KL, Hardie DC, Farquhar SA, Sampson PD, Karr CJ. Effectiveness of portable HEPA air cleaners on reducing indoor PM2.5 and NH3 in an agricultural cohort of children with asthma: A randomized intervention trial. Indoor Air. 2020 Sep 29. doi: 10.1111/ina.12753. Epub ahead of print. PMID: 32996146.

NIOSH SPONSORED RESEARCH CORE PROJECTS

The RISC project is demonstrating the value of surveillance with targeted injury prevention strategies.

PREVENTION OF OCCUPATIONAL EXPOSURE TO PESTICIDE DRIFT

YEAR 4 of 6 (2016-2022)

PI: Edward Kasner, PhD
Clinical Assistant Professor
University of Washington

This project aims to understand the mechanisms of pesticide drift exposure among agricultural workers and prevent such exposures in the future. To accomplish this, we are working with the Washington State Department of Health (DOH) and Washington State University (WSU) to determine the probability of drift events due to environmental conditions during spraying, develop a predictive model, and conduct field studies to validate our model. Our drift determinants model will assist orchardists in assessing risks for drift-prone conditions. Findings from our field studies and model will be incorporated into farmworker pesticide safety training.

YEAR 4 ACCOMPLISHMENTS

- Analyzed WA DOH data to identify 252 drift events that included 690 confirmed cases of illness from 2000 to 2015 and received conditional acceptance on a peer-reviewed publication.
- Addressed a research method question on the compatibility of different tracer methods in terms of sample integrity and plant phytotoxicity. Kasner collaborated with Dr. Rathnayake-Mudiyanselage from WSU to develop a new manuscript related to airborne drift sampling within the Application Exclusion Zone.
- Informed the WA Pesticide Application Safety Committee in their recommendation to compile industry best practices and explore grower incentives to use new technology.

Please see our Year 4 progress toward our project aims to:
Aim 1. Determine the probability of drift events due to changing environmental conditions during spraying: we will estimate weather conditions during documented drift events in Washington State from 2000 to 2015 and build a 'drift determinants' model by conducting a case-crossover study of changing wind conditions on drift event days vs. non-drift event days. This aim was completed in 2017 and disseminated to WA DOH partners. A manuscript based on this study has been conditionally accepted as a peer-reviewed publication: "Occupational and Bystander Illness from Pesticide Drift in Washington State, 2000-2015." To characterize wind speed and direction at the time of the events, we linked illness data to meteorological data from a network of 171 state weather stations. Most drift events occurred in tree fruit (151/252 = 60%). Ground spraying and aerial applications accounted for 68% and 23% of events, respectively; 69% of confirmed cases were workers, and 31% were bystanders. Complete applicator spray records were available for 57 drift events (23%). Average applicator-reported wind speeds were about 2 miles/hour lower than corresponding speeds from the nearest weather station values.

Aim 2. Explore wind ramping as a determinant of drift: we will investigate the impact of distance and terrain on AgWeatherNet-based meteorological measurements at representative sites in the Yakima Valley and model wind ramping during field sampling of pesticide drift. For this aim, we collaborated with WSU scientists, who conducted orchard spray trials in the Yakima Valley with funding from the U.S. Forest Service, U.S. Department of Agriculture, and the Washington State Tree Fruit Research Commission. Their project, "Data to Model Apple Airblast Spraying Drift Exposure Levels" has generated data to validate a drift model for estimating human exposure from airblast spraying during dormant and full-canopy tree growth stages. We have finished data collection for this aim and are moving into data cleaning and analysis phases. Our interdisciplinary team drafted a manuscript,

"The tree fruit industry is migrating to low-drift technology. The benefit to growers is better crop protection, less culls, [and]...different regulations that recognize better practices."

- Gwen Hoheisel, WSU Partner
WSU Research & Extension

"Comparing Tracers: Concurrent Applications of Micronutrient and Fluorescent Dyes in Airborne Drift of Orchard Airblast Spray Trials."

Aim 3. Translate study findings into exposure prevention tools for agricultural producers and workers: we will produce new training modules for regional 'Drift Management Best Practices' courses, provide a user-friendly method for WA DOH investigators to integrate weather conditions into drift event documentation, and develop a system to alert pesticide applicators about drift-prone weather conditions. We anticipate the incorporation of a novel metric known as wind ramping – or the magnitude, duration, and intensity of wind changes – into decision making around pesticide application and as a training tool using by pesticide safety trainers in the Pacific Northwest. We will also search for ways to include our study findings in WSDA courses named "WPS - Train the Trainer", "Alternative Sprayers - New Technology", and "Sprayer Application Equipment & Best Management Practices." Aerial UAV footage was captured of our November and December 2018 spray trials, which could also be used in these trainings. See our planned Aim 3 translation activities also under "What's Next."

Related to this project, Dr. Edward Kasner, served on two different pesticide application workgroups established by the Washington State Legislature. The first workgroup was the Aerial Application of Herbicides in Forestry Working Group, which met on six different occasions (Sept-Dec 2019) throughout Washington to review best practices of aerial application of herbicides on forestland across the state. That workgroup finalized its commitments and submitted a report to the Governor's office at the end of 2019 (see report). The second workgroup, the Pesticide Application Safety Committee, met on two occasions (Oct & March 2020) in Olympia to develop recommendations for improving the safety of pesticide application over a five-year period (see report).

Water-sensitive paper (left) placed above real-time drift monitors (right) used in the orchard filed studies.

YEAR 4 RESOURCES

For a listing of all products, see our project website.

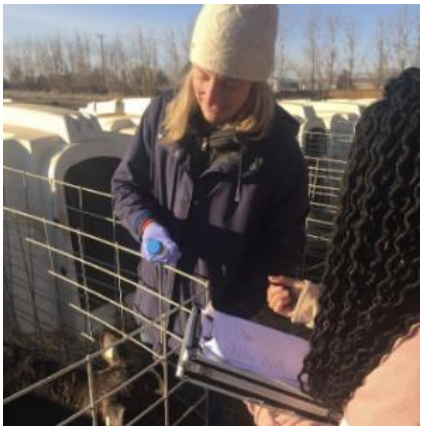
Kasner EJ, Prado J, Fenske RA, Yost MG. Occupational and Bystander Illness from Pesticide Drift in Washington State, 2000-2015. *Conditionally Accepted in Environmental Health.*

WHAT IS NEXT?

In the coming year, our efforts will shift to submitting manuscripts and research translation. A new graduate student has been recruited and will begin analyzing the data during winter 2021 to explore wind ramping. We have three planned translational activities in Year 5. The first activity will be a video tutorial for WA DOH investigators to link weather data to pesticide illness data and also integrated spatial features from GoogleEarthPro, which is now being used at WA DOH. The second activity will demonstrate the utility of installing a low-cost, on-site meteorological station for applicators to monitor wind conditions throughout a spray period, instead of using a hand-held anemometer only at the beginning of a spray period, as is currently required, or the nearest AgWeatherNet (AWN) station, as we did in Aim 1. And third, we are coordinating with the Practical Solutions for Pesticide Safety project to develop infographic communications on our results, and dissemination through the project website, and PNASH's pesticide safety partnerships and media outlets.

THE HEALTHY DAIRY WORKER STUDY

YEAR 4 of 6 (2016-2022)



PI: Peter Rabinowitz, MD, MPH
Associate Professor
University of Washington

The Healthy Dairy Worker Study is led by the UW Center for One Health Research, and partners at the Allen School for Global Animal Health at Washington State University (WSU), and is endorsed by the Washington State Dairy Federation.

We are characterizing the microbiome of workers on dairy farms compared to control individuals in nearby communities. This will provide a better understanding of whether dairy workers have a distinct gut and nasal microbiome communities that could affect their risk of gastrointestinal infection or allergic respiratory disease. In this way, we are exploring the "hygiene hypothesis": the concept that exposure to farm environments could have beneficial effects on immune function and allergy. Understanding of microbiome adaptation to dairy environments could lead to improved detection of individuals at risk, as well as targeted solutions, including dietary interventions, to promote a "healthy" microbiome.

YEAR 4 ACCOMPLISHMENTS

- Returned individual results of respiratory testing to participants, and, if needed, provided a medical referral.
- Marine de Marcken's MPH degree project on the effect of dairy farm work and allergy status showed preliminary results that dairy workers may be at higher risk for sensitization to bovine aeroallergens and subsequent airway inflammation.
- We have successfully sequenced several hundred samples and are performing microbiome analysis. This work is headed by a Ph.D. candidate student and will be the focus of her thesis.

Due to the outbreak of COVID-19, our team ceased field sampling activities in early February 2020. We were unable to conduct study visits due to the high-risk component of the study. Beginning fall 2020, we will resume the study activities which can be done safely with proper PPE (survey by phone and fecal and blood sampling). This pause in the study has slowed down the study completion process for study subjects.

Please see our Year 4 progress toward our project aims to:
Aim 1. Compare reported health status, gut and nasal microbiome, and respiratory function in a cohort of newly hired dairy workers, as well as comparison groups of community controls and experienced workers. As of February 2020, twelve participants had completed the two-year study. This equates to 100 fecal samples, 100 exhaled nitric oxide measures and spirometry samples, and 60 blood samples. Additionally, we have environmental samples taken in the milk parlors, calving areas, and in the lunch/break rooms, as well as fecal samples from cows and calves. To date, we have sent 621 extracted DNA samples to Washington State University (WSU)'s Call Laboratory. We currently have enrolled 85 people in the study: 38 dairy workers, 43 community members, and four new dairy workers (anticipated recruitment was 30 of each type of participant). The lack of enrolled new dairy workers is due to 1) a lack of recent industry growth, 2) an older, experienced workforce in the dairy industry with less of a turnover on the dairy farms, and 3) new dairy workers often left the job after only a couple days. A total of 17 participants have dropped out of the study due to moves or lack of interest.

MPH recipient Marine de Marcken's thesis evaluated the prevalence of allergic sensitization in dairy farm workers as compared to community controls. Total and cow epithelium-specific IgE levels were measured from the serum of 41 dairy farm workers and 36 community controls. Relevant information regarding occupation, demographics, and allergy symptoms was obtained via a questionnaire. Results of the analysis showed no significant evidence for the association between dairy farm exposure and total IgE, but sensitization to bovine allergen was higher in dairy workers as compared

to controls. Dairy workers may be at higher risk for sensitization to bovine aeroallergens and subsequent airway inflammation, so suggesting no evidence for a protective effect of farm exposure analysis is being replicated now to confirm findings.

Aim 2. Over a two-year follow-up period, compare gut and nasal microbiome changes between new workers and controls.
Based on preliminary results from 13 bovine fecal, 38 human fecal, and 22 environmental samples at baseline, we see that humans and bovine fecal microbiomes are more similar to each other than environmental microbiomes. Environmental samples from the feeding barriers, calf hutches, and calving floor clustered similarly to human and bovine fecal samples. Looking at alpha diversity metrics such as Shannon and Simpson indices, we see similar alpha diversities across bovine, environmental, and human samples. No particular environment appears to be more diverse than another. A comparison of alpha diversity between dairy workers and community controls shows no appreciable differences in diversity indices either.

Este studio me ha dado la oportunidad de placticar con me hija y esposa sobre como puedo mejorar mi salud cuando trabajo con las vacas."

"This study has given me the opportunity to talk with my daughter and wife about how I can improve my health when I work with cows."

- WA Dairy Worker

Through PNASH Emerging Issues funding in Year 3, we were able to expand Aim 2 to include blood sample collection and analysis for a subset of participants to study IgE levels and bovine specific antigen sensitization. MPH student Marine de Marcken has written her thesis on biomarkers in the blood samples for allergens, and we expect publication in a peer-reviewed article within the year.

Aim 3. Determine whether microbiome components are associated with health status or early work cessation.
Ph.D. student Pauline Trinh's degree study focuses on Aim 3's analysis and confirmatory analysis of the epidemiological metadata. We are now addressing whether the microbiome community structure is related to asthma risk as measured by eNO. While our control numbers are low, we will determine whether there are any differences between the microbiome of workers who left work on farms and those who remain.

YEAR 4 RESOURCES

For a listing of all resources see our project website.
Marine de Marcken 2020 MPH. Background on Laboratory Animal Allergy & Recommendations for Management of LAA Patient Care at HAWC.
E-Learning Course: Infection Prevention & Control on Farms.

WHAT IS NEXT?

We have completed the bulk of our participant recruitment and will be continuing our follow-up on these participants using new COVID-19 safety measures through a new award. Manuscripts are in preparation for the respiratory function and allergic sensitization aims. Our analysis has begun on the comparative samples for existing and new dairy workers. A major need remains the lack of new dairy workers in our cohort. We are in discussions with several large dairies about how to address this need. We expect additional funding from Quest Diagnostics to carry out a study of the COVID-19 status of our study volunteers. We have a unique opportunity to explore whether respiratory status is related to differences in COVID-19 infection outcome since we have pulmonary function testing results on our subjects prior to the COVID-19 pandemic. We hope to initiate this new study beginning in Winter 2021. A future need we are exploring is to test the hypothesis that exposure to bovine coronaviruses could affect the risk of COVID-19 infection.

A MULTI-LEVEL APPROACH TO HEAT-RELATED ILLNESS PREVENTION FOR AGRICULTURAL WORKERS

YEAR 4 of 6 (2016-2022)

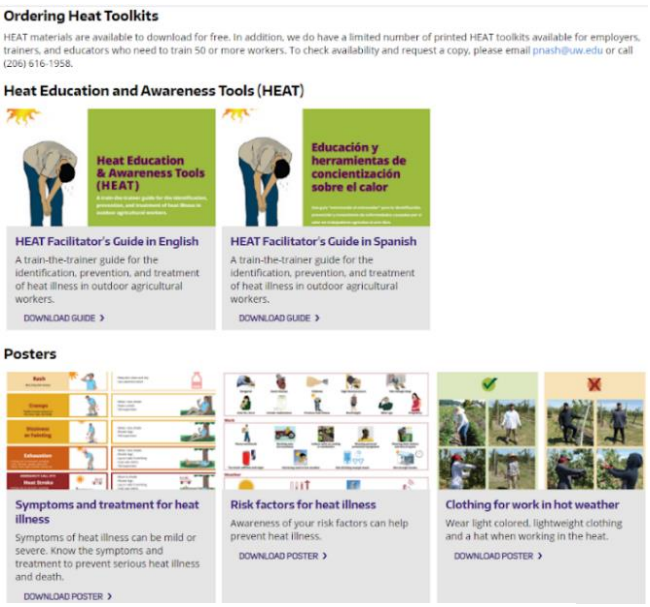
PI: June Spector, MD, MPH
Associate Professor
University of Washington

This study works in collaboration with growers and workers, safety educators, and Washington State University's (WSU) AgWeatherNet. This participatory intervention project is developing and evaluating a Heat Education & Awareness Tools (HEAT) program that addresses risk factors for agricultural workers at the individual, workplace, and community levels. The HEAT approach includes a heat awareness mobile application for supervisors and participatory educational materials for workers.

YEAR 4 ACCOMPLISHMENTS

- Released English and Spanish versions of the HEAT participatory educational materials to Washington project partners and online at https://deohs.washington.edu/pnash/heat-toolkit through direct mail and social media, resulting in over 22,000 online engagements with the material.
- Shared study progress and returned individual results with study participants, in English and Spanish, through personal meetings and visual materials.
- Completed Diana Marquez's internship project, Evaluating the Effect of Heat Stress Prevention Education on Agricultural Worker Knowledge. Results showed that HEAT training improved worker knowledge scores at the end compared to the beginning of the season.
- Presented preliminary results and heat prevention training through WSU Pesticide Recertification Courses (approx. 1000 people reached over 6 trainings), Washington Governor's Industrial Safety and Health Conference (29), and through UC Davis' Webinar (94).

Aim 1. Develop an adverse heat health effect prevention intervention approach that addresses individual, workplace, and community factors, using an established Expert Working Group model. In Year 4, the English and Spanish versions of the participatory educational materials were disseminated back to project partners to provide feedback and pilot the program. Nine employer partners received HEAT hardcopy packages, including train-the-trainer manuals and posters. In addition, we presented materials to two key educator partners: 1) health educators (promotores) at Quincy Community Health Center, and 2) WA L&I Education and Outreach program for use in the WISHA10 for Ag program. Each group was provided with training and piloted evaluation questions in preparation for a larger implementation and evaluation effort that will take place in the spring and summer of 2021. Groups we met with were positive in their initial reactions and provided ideas on how they intended to use the materials. For example, companies discussed how they would display posters in high visibility areas. Promotores described having posters available for workers to see as they waited at the clinic to get tested for COVID-19.



HEAT webpage and resources

For the heat awareness mobile application with WSU AgWeatherNet, we completed the integration of the heat module and we anticipate that it will be released next spring. Including heat awareness as a module within the AgWeatherNet's suite of tools is anticipated to increase our reach to WA growers, versus as a stand-alone application. We conducted follow-up interviews with managers who used the app in 2019 and this user feedback has informed improvements to our 2.0 version.

The HEAT resources were disseminated in a pilot social media campaign over July–Sept 15, 2020. The pilot messages, in English and Spanish, targeted WA audiences in agricultural counties, including employers, community health workers, and women in farming. Select messages were promoted to these audiences through paid boosts. The campaign launched with an e-news release to PNASH's farm contact list resulting in 162 opens (23%). Custom social media posts were released through @PNASHCenter on Facebook (25 posts), Twitter (21 posts), Instagram (23 posts). These resulted in 14,550 impressions (times content viewed) and a reach to 10,340 people through Facebook, 6,136 impressions through Twitter, and 1,893 impressions and a reach to 1,489 people through Instagram. Engagement rates were high during heat waves and concerning the topics of 'Síntomas y tratamientos,' 'masks and heat,' 'heat cramps', and 'what clothing to wear.' The pilot demonstrated the utility of social media for reaching and directing audiences to our online resources. As a result, the HEAT webpage saw increased activity with 204 downloads. The top resources downloaded were: Heat Training Book-English, Symptoms Treatments Poster, Heat Training Book-Spanish, Staying Hydrated Poster, and Risk Factors Poster.

July e-news launching HEAT campaign.

Aim 2. Assess the effectiveness of the intervention on occupational heat strain and heat-related symptoms in a parallel, comparison, group intervention study in WA summer tree fruit workers. In fall 2019 we provided a summary of project progress and selected preliminary results to workplaces that participated in our summer 2019 field study. We also returned summaries of individual measurements to worker participants, including heart rate and activity levels. The project team met with workplace managers and with 49 of the 78 worker participants. Participants were interested in their own health measures and in learning how to interpret them. Many showed an interest in learning how they could track these measures on their own and improve their health. For the participants we were unable to meet in-person, we mailed their results in personalized handouts. Only six participants were not reachable.

Due to the onset of the Coronavirus pandemic, we were unable to conduct our planned fieldwork during the summer of 2020, which had aimed to recruit a similar number of participants as 2019. After a reassessment of our current data, we concluded we had sufficient power to test our original hypotheses with the data collected in 2019.

We have completed a secondary analysis, evaluating scores from a knowledge assessment in comparison versus intervention groups from 2019, and are finalizing the analyses and report. Preliminary results indicate that improvement in knowledge scores at the end compared to the beginning of the season was greater in the intervention group than the comparison group (Mann Whitney U: V= 277; P-value= 0.025). Scores in the intervention group improved by an average of 1.6 (SD=2.0) points compared to an improvement of 0.4 (SD=1.7) points in the comparison group from the beginning to end of the season. We are now conducting the analysis of the 2019 field study data including baseline characteristics, demographic data, and heart rate data that have been cleaned and prepared for analysis. Weekly symptoms questions, weather station data, activity monitor data, and personal ambient temperature data are also being cleaned. Statistical analysis plans were further developed for primary outcomes (intervention effect on physiological strain index (PSI) and reported weekly symptoms).

YEAR 4 RESOURCES

For a listing of all the products see project webpage.

Tigchelaar M, Battisti DS, Spector JT. Work Adaptations Insufficient to Address Growing Heat Risk for U.S. Agricultural Workers. Environ Res Lett. 2020 Sep;15(9):094035. doi: 10.1088/1748-9326/ab86f4. Epub 2020 Aug 25. PMCID: PMC7594196.

Mobile App Version 2.0: Heat Awareness Module in AWNFarm mobile application, available for both Android and IOS operating systems. [in beta testing mode]

Heat Education & Awareness Tools (HEAT) in English and Spanish

Presentation: (English and Spanish)

WHAT IS NEXT?

Our next steps for research include finalizing the statistical analysis, compiling a master dataset with documentation, and publication of our methods and results. We are aiming to have additional preliminary results this coming year, to inform our dissemination efforts. We will use information from the evaluations this year to provide practical recommendations on how to use materials in our broader HEAT training dissemination and evaluation efforts.

2021 will begin a HEAT national dissemination campaign, including 1) Train-the-trainer sessions (in-person and remote webinars), with user evaluations; 2) AgWeatherNet on the new mobile apps' release and user experience outcomes; and, 3) Launch a summer 2021 national media campaign in English and Spanish, disseminated through traditional farm media outlets (trade magazines), our partner's networks, and an extensive summer social media campaign.

Heat posters at partner worksite in WA.

INJURY AND ILLNESS PREVENTION FOR THE PACIFIC NW DAIRY INDUSTRY

YEAR 4 of 6 (2016-2022)

PI: Michael Yost, Ph.D., MPH
Professor
University of Washington

We seek to reduce serious dairy worker injuries by tracking injuries and developing train-the-trainer programs and workplace practices that address high-risk work. Washington claims data shows that dairy workers in the state have a higher than average rate of injury than other industries. Dairy specific risks include animal assaults, slips and falls on wet surfaces and chronic injuries from repetitive stress. This project combines expertise from Washington State University (WSU)'s Department of Animal Sciences, Washington State Department of Labor and Injuries (LNI) Safety and Health Assessment and Research for Prevention (SHARP) Program, Washington State Fatality Assessment (FACE) Program, and the Washington State Dairy Federation.

YEAR 4 ACCOMPLISHMENTS

- Dairy Practice Survey of 34 dairies supported the feasibility of a train-the-trainer model to improve safety on dairy farms, with 85% of respondents identifying a need for an online collection of materials and 94% responding they would conduct worker safety training every month with an effective training program.
- Established Washington Dairy Partnership and launched new WA State-funded project with online Dairy Safety Toolkit (See page 30).
- The Washington Dairy Federation has now partnered with the Washington Governor's Safety Conference focused on agriculture, Ag Safety Day. This event is the first of its kind for our state, offering safety training for the state's hired dairy workforce (English and Spanish sessions). They plan to continue the safety training event annually.

Please see our Year 4 progress toward our project aims to:

Aim 1. Identify common tasks and circumstances associated with acute injury risk in Washington Dairies. In fall 2019, we offered a train-the-trainer animal handling program for WA State dairy farmers. The program was developed to address and target specific injuries identified through this aim's analysis in Years 1-3. The project identified that animal handling injuries account for more than ¼ of accepted injury claims in state-based data. This information and potential solutions were communicated back to our stakeholders through a presentation at the WA State Dairy Federation conference as well as through our Dairy Safety Toolkit online training tool.

Aim 2. Survey current safety training and animal handling practices in Washington Dairies. This aim was completed in Year 3. Our findings support the feasibility of a train-the-trainer model to improve safety on dairy farms.

Aim 3. Establish an Expert Working Group (EWG) comprised of managers and workers involved in day-to-day activities in the dairy industry. An EWG was established in Year 3. Ten members are dairy safety professionals, including safety managers, herdsmen, and dairy farm owners. In Year 4, the EWG conducted a formative review of the new online training tool for managers and safety specialists, the new Dairy Safety Toolkit (see Aim 6).

Aim 4. Implement and evaluate selected training interventions with a study population. In February 2020, 37 workers were trained on-farm using a video-based intervention targeting animal handling. Results from a six-month follow-up will be contrasted to workers who received interactive training previously developed and offered. Follow-up conducted using a text-message-based questionnaire three months after the intervention elicited in a response rate of 50%. Participant retention in the follow-up survey has always been challenging, and our text-message follow-up has proven highly successful. On-farm training was planned to continue in spring and summer 2020 but was halted due to COVID-19 restrictions. The research team spent the summer months transitioning in-person training content to an online format, expanding the future role of the Dairy Safety Toolkit in future training interventions.

Aim 5. Develop a methodology for and conduct a dairy injury surveillance program. In Year 3, we completed this aim. We now have established a data-sharing agreement with WA LNI allowing for access to case level de-identified injury data from the dairy industry. This data has been redesigned into an interactive, online dashboard that we share annually with our dairy stakeholders and partners.

Aim 6. Translate results in a Best Practice Guide for minimizing injuries in Washington dairies. To translate results and share our training modules, we obtained funding from the State of Washington's Safety and Health Improvement Program to develop an online training toolkit that includes materials developed throughout this project partnership. The Toolkit is in part a clearinghouse of training materials with an interactive forum allowing the discussion to provide insight and feedback from workers on the day-to-day experiences and challenges they face using the training materials and evidence-based practices.

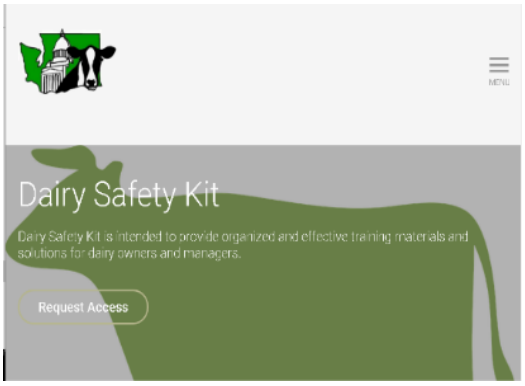
The Dairy Safety Toolkit now includes eleven completed modules and users are beginning to register. Toolkit modules topics include:

- Accident Prevention Program (APP)
- Safety Meetings
- Slips Trips and Falls (STF)
- Animal Handling
- Farm Program
- Hazard Walkthrough
- Preventing Sexual Harassment in Agriculture
- COVID-19
- Chemical Hazards
- Confined Spaces
- HEAT Tool Kit

In fall 2020, registered users were individually contacted to obtain usability data for the existing format. Contacted participants provided feedback such as "[we] like what is there regarding preparedness with identifying hazards and having a safety meeting." Users also made recommendations for further improvements including, "Farmers would likely also look for information on what to do in the case of a safety incident." This feedback will be used to improve current offerings and align content with existing training needs. Toolkit promotion, evaluation, and improvements will take place over the final two years of this project.

YEAR 4 RESOURCES

For a listing of all products see our project website
Fact Sheet: Mapping Activity: Identifying Hazards
Fact Sheet: Conducting a Safety Meeting
Online Learning: Dairy Safety Toolkit
Website and Video: Washington Partnership for Dairy Safety and Health



WHAT IS NEXT?

In the coming year, we will continue transitioning training materials to an online format. We plan to enroll additional managers into the LEADS train-the-trainer program where they will be provided with the Dairy Safety Toolkit to guide safety training at their worksite and contribute through online feedback and discussion. The effectiveness of this training intervention will be assessed through follow-up text message questionnaires over six-months and through the online feedback in the Dairy Safety Toolkit.

SAFETY SURVEILLANCE FOR PACIFIC NORTHWEST COMMERCIAL FISHING: Risk Information System for Commercial (RISC) Fishing

YEAR 4 of 6 (2016-2022)

Laurel Kincl, PhD, CSP
Associate Professor
Oregon State University

Viktor Bovbjerg, PhD, MPH
Professor
Oregon State University

Commercial fishing is vital to the Pacific Northwest (PNW), yet it has some of the highest rates of serious injuries and deaths. This comprehensive data project, RISC Fishing, uses multiple datasets to estimate injury risk and risk factors in commercial fishing in the Pacific Northwest. Our goal is to work in partnership with fisheries to pinpoint and address hazards. This project partners with the CDC/NIOSH Commercial Fishing Safety Program and is guided by a Technical Advisory Board composed of stakeholders from commercial fishing safety: related organizations, including the United States Coast Guard, Washington and Oregon fisheries management professionals, the Oregon Health Authority, the National Oceanic and Atmospheric Association, the Alaska Marine Safety Education Association (AMSEA), health and safety professionals who have worked or worked in commercial fishing safety, and Sea Grant commercial fishing extension agents.

YEAR 4 ACCOMPLISHMENTS

- The Commercial Fishing Incident Database (CFID 2.0) is now managed by the NIOSH Western States Division.
- Review of state and national American Community Surveys showed a high prevalence of non-standard work (independent contractor), night shifts and shift work, musculoskeletal conditions, smoking, and second-hand smoke exposure. About one-fifth of U.S. fishermen reported no health care coverage.
- Acquired additional data from the National Trauma Database and the National Emergency Medical Services Information System (NEMSIS) which holds promise for expanding case identification beyond the Pacific Northwest and for collaboration across Ag centers.

Please see our Year 4 progress toward our project aims to: **Aim 1. Create a practical, scalable commercial fishery surveillance system for the Pacific Northwest.** The CFID 2.0 is now managed by the NIOSH Western States Division (WSD). A version of the RISC Fishing (Risk Information System for Commercial Fishing) database is retained locally at Oregon State University for continued development. On an ongoing basis, our study team assists NIOSH/WSD with the commercial fishing fatality and non-fatal injury and vessel disaster and casualty data coding.

"The redesigned CFID has been instrumental in our ability to be responsive to stakeholders. Since its rollout, we have fulfilled numerous data requests from fishery managers, the US Coast Guard, marine safety trainers, and journalists."

– Samantha Case,

In Year 4 we added data to the current non-fatal injury module and continued to build additional modules as data sources were obtained. Data was received from the National Trauma Database and the National Emergency Medical Services Information System (NEMSIS), and state-level data for Oregon (OR-EMSIS) and Washington (WEMSIS). "Custom" databases from the National Trauma Database hold the promise not only of linking to existing cases but expanding case identification beyond the PNW and for collaboration across Ag centers. We experienced some delays due to COVID-19 since data acquisition comes

from public health departments or national registries where the staffs were responding to the COVID-19 pandemic. We anticipate that this will gradually ease during the coming months.

Aim 2. Assess the utility and accuracy of commercial fishing surveillance data. Commercial fishing incident data are collected by multiple organizations. We have applied statistical data linkage methods to our data sets to not only locate matches but also increase the linkage accuracy and confidence. In Year 4, after trialing three approaches to linking datasets it was determined that the Python Record Linkage was a better fit for use with the RISC system and our databases. Four commercial fishing datasets from Oregon and Washington were linked to match cases and expand our information on these cases: the Commercial Fishing Incident Database, the Vessel Casualty Database, the Nonfatal Injuries Database, and the Oregon Trauma Registry. The datasets each covered different date ranges from 2000-2017, containing 458, 524, 184, and 11 cases respectively. A total of 41 true matches and 8 close matches were identified, of which 29 were duplicates.

Our review of 2014 data from the American Community Survey for Oregon (n=39,336 people surveyed), Washington (n=70,600) and California (n=372,553), identified 156 potential commercial fishermen. Basic demographics, health status, and healthcare access were summarized. Graduate research assistant, Ph.D. student Solaiman Doza, summarized prevalence data from the Behavioral Risk Factor Surveillance System from 2013-2015 and the National Health Interview Survey's Occupational Health Supplement in 2015. From these, fishermen showed a high prevalence of non-standard work arrangements (independent contractor), night shifts and shift work, musculoskeletal conditions (one-third), smoking and second-hand smoke exposure. About one-fifth of the U.S. fishermen reported no health care coverage. Work is underway to highlight key findings for dissemination.

Aim 3. Develop evidence-based hazard assessments with commercial fishery safety stakeholders. In Year 4, our Technical Advisory Board convened in two meetings in December 2019 and July 2020 and both were virtual meetings. The December meeting focused on the development of a hazard assessment that was shared with commercial fishermen during trainings held this November and December 2019 in Oregon and Washington. The July 2020 meeting focused on the results of the data linking and prevalence information. We shared a draft of our idea for the RISC Fishing Findings, which is a way we intend to visualize a targeted message regarding health/exposure. We received positive feedback and several dissemination ideas. At the July meeting, many board members shared resources and experience related to the COVID-19.

YEAR 4 RESOURCES

Version 2.0: Commercial Fishing Incident Database (CFID)
RISC Webpage and Resources: https://health.oregonstate.edu/labs/osh/resources/risc
Infographics:

- RISC Fishing Findings
- Understanding Risk for Better Training
- Linking Data for Risk Information

Hazard Assessment Sheets:

- Hazard Sheet: Cleaning Buoys for the Crab Pot Line
- Hazard Sheet: Assessment form for use on vessels

WHAT IS NEXT?

In Year 5, we will continue to build modules with new data into our RISC Fish System. We will provide summary analysis and continue to explore data visualization for our stakeholders as well as develop additional Hazard Sheets and RISC Fish Findings for dissemination regionally at dockside exams, commodity meetings, first aid, and safety trainings, and through Sea Grant. After linking more data, we expect to be able to conduct detailed analyses of the utility and limitations of the data. We will continue to work on the documentation of the system and to collaborate with our surveillance partners at other Agricultural Safety and Health Centers.

PRACTICAL SOLUTIONS FOR PESTICIDE SAFETY: Handheld Application Equipment

YEAR 4 of 6 (2016-2022)

PI: Kit Galvin, MS, CIH
PNASH Senior Research Scientist
University of Washington

This education project identifies, evaluates, and adapts pesticide safety solutions that Northwest farmers developed for themselves. These practical solutions are then shared back to the industry through an online platform. This project focuses on handheld application equipment and builds upon our previous Practical Solutions for Pesticide Safety guide for broadcast spraying. This project is useful to nurseries, greenhouses, grass seed production, and reforestation industries with solutions that 1) reduce exposure; 2) are practical, compatible, convenient, adaptable, safe, novel, and meet regulations; and 3) support the requirements and training needs of the revised US EPA Worker Protection Standard. Visit https://deohs.washington.edu/pnash/handheld-psps to view these solutions in English and Spanish.

YEAR 4 ACCOMPLISHMENTS

- Modified the in-person on-site data collection protocols for remote site-visits to comply with the Washington State and University of Washington COVID-19 safety requirements. This approach for remote worksite visits offers new avenues for future projects and remote engagement with worksites.
- Documented nine new potential practical solutions through a remote site visit.
- Completed the development of the new practical solutions' online platform in both Spanish and English. This platform is now being used for PNASH's other website resources.

Please see our Year 4 progress toward our project aims to:

Aim 1. Establish advisory groups to inform the development and dissemination of new practical solutions for handheld pesticide application equipment.
In Year 4, we continued to work with our Expert Working Group (EWG) and build an Expert Review Group (ERG) of industry managers, supervisors, and pesticide handlers to review new solutions. Due to COVID-19 protections and resource demands on the essential agricultural industry, most activities with the ERG members were postponed. We have since developed COVID-19 precautions for safe remote work and we will be able to continue with our advisors.

Aim 2. Develop practical solutions for pesticide safety for handheld application equipment.
During 2020 we modified the in-person on-site data collection protocols for remote site-visits to comply with the Washington State and University of Washington COVID-19 safety requirements. Using iPads with data service, conferencing software, and other online tools, we successfully conducted a remote site visit and documented nine more potential solutions. In lieu of in-person site visits, we also developed four additional solutions from data collected previously. . The EWG and ERP evaluations of seven solutions were completed. The evaluations covered practicality, safety, efficacy, and adaptability to other locations. The Oregon State University Pesticide Education Resource Collaborative (PERC) team provided an expert technical review of these solutions, as well as the accompanying resource links for regulatory, training, and educational information and materials. All evaluation results were then incorporated into the solutions. Other COVID-19 impacts on the project included, growers who would normally be available for site visits were focused on their COVID-19 response and team members redirected to the Center's COVID-

19 activities. In addition, we have continued to develop relationships with other commodity groups and growers, such as cannabis, to expand our selection of solutions for handheld application equipment.

Aim 3. Disseminate Practical Solutions for the Pesticide Safety guide.
A new bilingual (Spanish and English) website platform integrates the finalized solutions. This platform and a content management system allows for rapid posting and modification along with a tested user interface in both English and Spanish. Before the release of each solution, the platform is used by testers and evaluators. Each solution includes a description, quotes, setup, and use, supplies, tips, photographs, and a downloadable PDF. Also included are links to supporting Worker Protection Standard information, educational materials, training tools, and relevant federal and regional regulation. This platform is now being used for other PNASH resources as well.

YEAR 4 RESOURCES

Webpage: Practical solutions for Pesticide Safety: Handheld Equipment / Soluciones prácticas para seguridad con pesticidas: equipo manual
Webpage (updated): Practical Solutions for Pesticide Safety

WHAT IS NEXT?

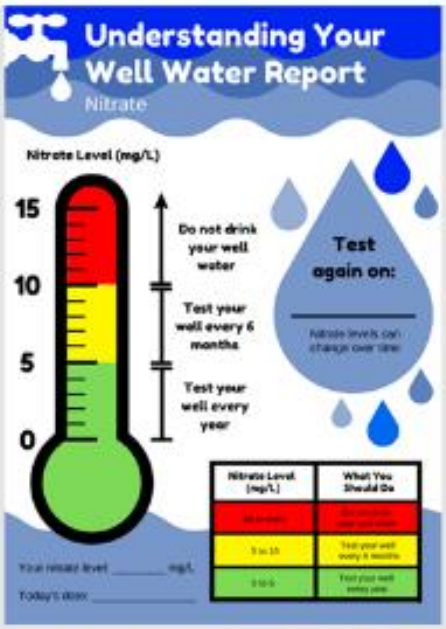
In Year 5 we will continue to conduct remote, and when possible, onsite data collection and to collaborate with the PERC and participating nurseries, greenhouses, and forest products industries on solution identification, development, and evaluation. We will complete the development, evaluation, translation, and posting of at least eight new practical solutions and complete two shop talks based on solutions. We will continue to develop relationships with other commodity groups and growers. Additionally, we plan to implement our regional dissemination and promotion plan which includes commodity conferences and meetings (remote or in-person), Ag Safety Days, websites, social media, and other e-media. We will also partner with the Oregon Pesticide Safety Education Program (PSEP) and PERC at OSU in regional and national dissemination and promotion.

PNASH PILOT PROJECTS

Testing Your Well Water

Who to call and how to collect a water sample

VIEW PDF



Understanding Your Well Water Report – Nitrate

Test results and potential solutions

VIEW PDF

A community-driven project to improve well water testing communications for stakeholders of the Lower Yakima Valley

PILOT: NITRATE WELL WATER TESTING IN AG COMMUNITIES: Improving environmental health communication with health behavior theory

YEAR 2 of 2 – FINAL REPORT (2018-2020)

PI: Elena Austin, ScD
Assistant Professor
University of Washington

The U.S. Safe Drinking Water Act does not regulate private wells, leaving over 42 million residents with little oversight of their water quality. Elevated levels of nitrate in groundwater are a significant public health concern for private well water users in the Lower Yakima Valley, which has a large Latino farmworker community.

This pilot project developed a process for tailoring communication materials that promote well water testing specifically for this population. Our project was guided by a committee of local stakeholders of the Lower Yakima Valley (LYV) in Washington State, including El Proyecto Bienestar and the Latino Community Fund.

ACCOMPLISHMENTS

- 37 private well users participated in four focus groups (20 Spanish and 17 English speakers)
- Project advisory committee included local community members, government agencies, and organizations.
- Educational materials, co-developed with the local health district, were developed around the identified needs and motivators for the community.

Please see our final results by project aims:

Aim 1. Conduct formative research on the determinants of selected health behavior (nitrate well water testing) within the target population.

An advisory group guided key educational messages and behaviors to consider during the focus group process. From this, we developed the focus group sessions, designed to identify barriers and motivators of well testing, as well as effective communication methods. In Year 1, El Proyecto Bienestar and the PNASH team conducted four focus groups (two in English, two in Spanish) with thirty-seven participants from Washington's LYV, a community with a large Latinx population and elevated nitrate concentrations in groundwater. Focus group questions were drawn from the RANAS model for water-related health behaviors. Our thematic analysis identified three common themes: 1) Suspicion of Water, 2) Major Barriers to Testing, and 3) Important Motivators. Important prevention topics included testing, well maintenance, and treatment, including water softeners, particle filters, and reverse osmosis systems.

Aim 2. Develop educational materials addressing determinants identified in Aim 1.

Participants in the focus groups indicated that they preferred visual and colorful materials and would be more likely to use them if they came from trusted sources in the community. Factsheets were designed around four important motivators identified in the focus groups:

- How to determine drinking water safety.
- Communication that "testing of well water is your responsibility," which was not commonly known.
- Procedural information: who to contact, how to collect a sample, what to test for, and when to test.
- The idea of 'let's learn together' as a community about well water safety.

"I am skeptical about the drinking water that we have. At our place, we have trucks that come in maybe two to three times a year and they're spraying, putting down the liquid nitrogen to fertilize their alfalfa fields."

- Focus group participant

Our results also point to the following communications strategies:

Standardize water quality reports: Well users need well water quality reports that are easy to understand and provide recommended actions, regardless of the laboratory they visit.

Partner with Radio KDNA for Spanish-language communications: Radio spots, radionovelas (radio dramas), or radio shows can be effective ways to provide actionable information.

Provide testing and treatment information online: An online list of frequently asked questions and guidance on who to call for well maintenance, testing, and treatment could support well users.

Develop tailored communications: LYV residents need communications that are tailored to their culture, language, and literacy level. Messages that emphasize the importance of family health and the role that the household handyman plays in protecting family may be effective in LYV. Information that follows the CDC's guidelines for literacy-appropriate communication may be useful for LYV residents.

Aim 3. Evaluate the impact of educational materials on health behavior and determinants of health behavior.
In fall 2019 the Technical Advisory Group (TAG) provided formative feedback on the content and format of the factsheets. The radio station KDNA was identified as a trusted source for environmental health-related information. Important modifications were incorporated, including providing a different style of faucet in one of the images and the addition of a direct phone number to the county health department. A final launch event and follow-up evaluation were held on January 16, 2020. Two local health officials were invited to participate and gave presentations. Of our participants, 17 completed a meeting evaluation form. Only four participants reported testing their water in the past year, however, 14 intended to use the free testing kits distributed at the meeting to conduct testing at their home. All participants expressed the intention to share the educational materials discussed at the meeting with other LYV residents.

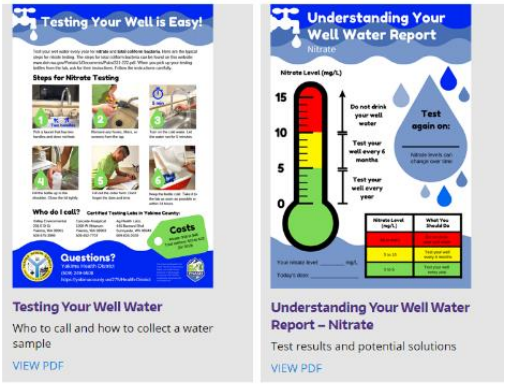
RESOURCES

Webpage: Nitrate Well Water Testing
Manual: Moderator Guide and Coding book. English and Spanish.
Factsheets:

- Is My Well Water Safe to Drink?
- Understanding Your Well Water Report: Nitrates
- Understanding Your Well Water Report: Total Coliform and E. Coli
- Private Wells and Community Needs: Voices from the Yakima Valley

VanderGeest K. 2019. We are all here to learn: A qualitative study on private well stewardship within a rural, agricultural Latino community. MS Thesis. University of Washington.
VanDerGeest K, Ko LK, Karr C, Torres E, Drury D, Austin E. Private well stewardship within a rural, agricultural Latino community: a qualitative study. BMC Public Health. 2020 Dec;20(1):1-1

PNASH Resources in English



PNASH Resources in Spanish

WHAT IS NEXT?

This pilot project is completed, but PNASH's partnership in El Projecto Bienestar and dissemination of results will continue. In addition, based on the results of this project, published in BMC Public Health, Dr. Elena Austin has been appointed as a member of the Reducing Health Impacts of Reactive Nitrogen in Ground and Surface Water from Agricultural Sources: An Environmental Health Matters Workshop to Identify Opportunities for Leadership Planning Committee of the National Academies of Sciences, Engineering, and Medicine. This committee guide policy, technology and communication strategies to address groundwater contamination from agricultural sources.

ACTIVITY RECOGNITION MODELING APPLICATION FOR LOGGING SAFETY

YEAR 2 of 3 (2018-2021)

PI: Robert Keefe, PhD, MS
Professor, University of Idaho

This pilot project is integrating geospatial technology and activity recognition modeling into a Garmin smartwatch and smartphone application for rigging crew workers in the logging industry. This application aims to prevent injuries by improving loggers' situational awareness by providing real-time updates of their coworkers' work activity status and location.

ACCOMPLISHMENTS

- Presented methodology of the study to 300 loggers and found widespread support for this system
- Completed analysis of field study data collected on active logging operations during the previous year
- Results suggest wearable, GNSS-enabled watch sensor data has a high potential for the development of smart alerts to inform co-workers of work-related incidents. Results have been submitted for peer review

Please see our final results by project aims:
Aim 1. Test the hypothesis that an activity recognition model based on wearable smart watch sensors can predict rigging crew work activities at least 80% of the time. The team completed the development of rigging crew activity recognition models. These models predict choker setter work activities with sensitivity values of 76.95–83.59% and chaser work activities with sensitivity values of 71.95–82.75%. The team has submitted a manuscript based on these results in PLOS ONE. Results indicate the feasibility of quantifying forestry work activities using smartwatch sensors, which is an important step in the development of real-time smart alerts.

Aim 2. Test the hypothesis that an activity recognition model using a combination of Global Navigation Satellite System (GNSS) and smartwatch sensor data can detect a lack of movement and fallen worker position status at least 80% of the time. Observational fall data were more limited than we anticipated during field sampling. Additionally, during the period of data collection, Garmin released a generic fall detection algorithm, making Aim 2 less relevant. Rather than developing an independent algorithm, we are working to integrate this new functionality with the results from Aim 1 above.

Aim 3. Code the two-activity recognition models into an existing smartphone application, Garmin Connect, so that a model that predicts the movements of rigging crew workers and detects lack of movement with 80% accuracy can be made publicly available. This is the primary focus of our Year 3 work. We are waiting for a peer review of the results underlying our activity recognition modeling. We will incorporate comments and feedback from the review process into translational work with app development and testing.

WHAT IS NEXT?

We have requested a project extension and anticipate focusing on implementing Aim 3. In particular, we are focusing on evaluating the viability of using our logging-specific activity recognition model when coupled with the existing Garmin fall detection algorithm in real-time. Additionally, we will continue to seek input and feedback on our study results and their application from logging and forestry professionals in 2021.

Pilot: Use of Unexpected Events and Management Requiring Conditions in the Training and Management of Workers

YEAR 1 of 2 (2019-2021)

PI: Kevin Lyons, PhD
Associate Professor
Oregon State University

This pilot project is developing a novel system, with a simulated environment, where workers identify potential safety concerns and assign a severity rating to the safety concerns. This system will uncover factors in risk decision making for new logging workers, informing future safety training programs.

YEAR 1 ACCOMPLISHMENTS

Due to COVID-19, we had to modify the project's approach to the simulated scenarios. This challenge led to a creative engagement format that now allows for broader participation.

Aim 1. Develop a system where a worker can identify potential safety concerns.
Existing safety incident data for cable logging rigging crews show that being struck by logs or debris is the most frequent cause of serious injuries. In the past year, we conducted interviews with experienced cable loggers to identify important safety incident scenarios useful for training and for understanding a worker's decision-making process. The level of control a worker has to implement a safety system was identified as a risk factor for injury. This project has begun to develop a set of event codes that can be used for reporting safety incidents present in a scenario. Preliminary results of this project have been presented to the Oregon-OSHA Forest Activities committee.

Six cable logging rigging crew scenarios have been simulated and can be shared through remote conferencing.

- Lateral yarding with two rigging slingers, one on each side of the skyline
- Log slides out of the landing when rigging crew access is restricted
- Commercial thinning: pulling the first logs in a turn over to remaining logs for the turn
- Commercial thinning: downhill yarding with a haul back
- Changing yarding roads when using a mobile tail spar
- Working on unstable logs

Aim 2. Evaluation of the incident scenarios
By using a simulated environment we were able to evaluate six very different scenarios. To date, five subjects have been assessed. All subjects stated the scenarios were clear and they felt they understood the necessary elements. The potential incidents reported were organized into five categories; 1) Logs or Debris, 2) Cables, 3) Supports, 4) Carriage or Grapple, and 5) Other. Subclasses were added as new possible incidents were identified. As we continue to add subjects we will look for a point where new subclasses are no longer being created.

Aim 3. Evaluate the variation in worker assessment of safety
We have begun to enroll subjects and collect data through remote sharing of the simulated incidents.

WHAT IS NEXT?

We will continue enrollment in the study, including new student loggers, as well as more experienced industrial logging crews and Oregon-OSHA field officers. Our final analysis and reporting will be completed this summer 2021 and help shape future logging training programs using simulated scenarios.

Pilot: Smoke Monitoring for Agricultural Safety and Health (SMASH)

YEAR 1 of 2 (2019-2021)

PI: Edward Kasner, PhD
Clinical Assistant Professor
University of Washington

The hazard of wildfire smoke exposure continues to increase in the Northwest and presents an important health risk to outdoor workers, including those in agriculture. This pilot seeks to develop wildfire decision aid tools driven by data from a high-density network of air quality monitoring sensors in Washington State. During the 2020 wildfire season, smoke sensors were tested in agricultural regions to assess needs for worker safety and health, crop protection, and plume tracking. If successful, this pilot study will demonstrate proof-of-concept for air quality monitoring based on Washington State University's AgWeatherNet platform.

YEAR 1 ACCOMPLISHMENTS

Aim 1: Identify use cases for data collected from a high-density, low-cost wildfire smoke sensor network in agricultural regions of Washington. Our multidisciplinary project team first explored the use cases for grower decisions related to smoke sensor data. Some questions raised were: 1) Is there potential to partner with AgWeatherNet to include PM1.0 monitors on existing weather stations, 2) Which is more damaging: high concentrations of smoke (e.g. AQI) or "freshness" of smoke?, and 3) Can sensor data help growers with crop insurance claims? We submitted proposals to state tree fruit and wine industry associations to present our findings from September 2020 and to administer a grower needs assessment survey at their annual meetings.

Aim 2: Deploy and evaluate low-cost wildfire smoke sensors that inform occupational health guidance related to exposure monitoring in agriculturally productive regions. Claire Schollaert, Ph.D. Student, led sensor field deployment, over August and September 2020. Six different air sampling devices were deployed simultaneously to develop an understanding of the low-cost monitor performance in rural environments. The following sensors were deployed: two Thingy: AQ sensors (CO, O3, CO2, and PM2.5), two cyclone-based gravimetric samplers (PM4.0; NIOSH Method 0600), one Aerotrak Handheld Optical Particle Counter (PM 0.3-10), one nephelometer (PM2.5), and one Beta-Attentuation Mass Monitor (PM2.5 and 10). The next phase will involve deployment of the low-cost monitors only on AgWeatherNet.' Co-location monitoring took place at the WA Department of Ecology air monitoring site in Wenatchee, WA.

Aim 3: Quantify relationships from the 2020 wildfire smoke season that expand decision aid tools for precision agriculture. A manuscript draft is in progress.

RESOURCES

Austin E, Kasner E, Seto E, Spector J. Combined Burden of Heat and Particulate Matter Air Quality in WA Agriculture. J Agromedicine. 2020 Jul 30;1-10.
Heat, fire, smoke and health in Washington's ag industry. 2020 Sep 3.

WHAT IS NEXT?

In the coming year, we will complete the grower needs assessment (Aim 1), additional sensor deployment (Aim 2), and submit a manuscript draft related to the September 2020 smoke events (Aim 3). Results will be shared with AgWeatherNet users and our tree fruit and wine grape industry colleagues. Members of the project team will be re-submitting an R21 spin-off proposal and are currently exploring other grant opportunities with the EPA and Washington State Department of Labor & Industries.

"We appreciate your approach to gathering wine grape grower feedback about use for high density, low-cost smoke monitoring and demonstrating how sensor data could be analyzed in a precision agriculture framework to support decisions related to worker and crop health."

– WA State Wine Commission

Pilot: Systematic Evaluation of Exoskeletons in Reducing Musculoskeletal Disorders in Manual Timber Felling

YEAR 1 of 2 (2019-2021)

PI: Jay Kim, PhD, MS
Assistant Professor
Oregon State University

This small pilot project is assessing logging stakeholders' interests in the use of exoskeletons to reduce musculoskeletal injuries. Identifying potential barriers and risks for manual timber felling through personal interviews and questionnaires with workers, safety managers, and educators.

YEAR 1 ACCOMPLISHMENTS

Specific Aim. To evaluate stakeholders' awareness and acceptance of exoskeletons, and identify potential barriers/risks to implementation of exoskeletons in forestry In the past year, a semi-structured interview form was developed to evaluate exoskeletons for use among agricultural and construction workers. The questionnaire integrated feedback from our forestry industry partners. Due to COVID-19, we were unable to conduct the in-person semi-structured interview and exoskeleton demonstration. However, the online survey was administered as an alternative tool. We conducted 19 surveys of professional logging workers including timber fellers, safety managers, logging company owners, forestry educators, and logging workers who are familiar with timber felling processes.

Our preliminary data analysis demonstrates that the NW forestry industry is generally very interested in exoskeleton technologies and is willing to adopt exoskeletons should it be proven to be effective and safe in various logging environments.

RESOURCES

For listing of all resources, please see OSU Forestry and Ergonmics website.

WHAT IS NEXT?

The collected survey results will be summarized and shared back to our study partners, and with NW forestry stakeholders through PNASH's logging safety network, and the regional logging association safety meetings. Additional feedback will be sought at these meetings to understand the barriers and opportunities for the adoption of exoskeletons and injury reduction potential for timber fallers.

Based on the findings and instrument (i.e., survey) developed from this pilot study, we plan to conduct a laboratory pilot study to evaluate the biomechanical benefits and risks of exoskeleton use during simulated logging tasks (e.g., tree felling and choker setting, etc.). In addition, our research team will seek to expand this project to other agricultural industries including nursery and vineyard workers.

"This must work in all weathers, snow, ice, rain, heat, etc. It must be balanced so as not to overstress any part of the body even on steep ground with poor footing in slick conditions. It also needs quick breakaway capability in case the worker needs to move quickly out of the way."

- Study participant, Oregon

Education Small Grant: Sexual Harassment Prevention in Agriculture: Evaluating a Training Video and Curriculum

YEAR 1 of 2 (2019-2021)

PI: Jody Early, PhD, MS, MCHES
Associate Professor
University of Washington – Bothell Campus

Previous PNASH engagement with Washington farmworker communities revealed a need to address sexual harassment for women farmworkers. Studies estimate female farmworkers face sexual harassment at a rate of 2-3 times higher than other work sectors. Many farms lack appropriate training and prevention programs to protect workers and are seeking assistance. The PNASH Center has been working with stakeholders throughout Washington State to develop a sexual harassment prevention program specific to the needs of this industry and culturally appropriate for Latino farmworkers.

YEAR 1 ACCOMPLISHMENTS

- Released the ¡Basta! Prevent Sexual Harassment in Agriculture toolkit and video
- 2020 Award Winner for American Public Health Assoc. Public Health Education & Health Promotion
- 129 training participants surveyed demonstrated improved knowledge and acceptance
- 174 print copies disseminated and 1,113 resources downloaded
- Trained 562 agricultural workers, supervisors, and growers during 13 training sessions. Six growers in Oregon and Washington invited us to deliver training or participate in training events.
- Received additional funding ($5,000) from the University of Washington's Center for Communication, Difference, & Equity to co-create a Spanish graphic novella for the ¡Basta! toolkit with farmworker women.
- ¡Basta! toolkit was adopted by the WA State Coalition Against Domestic Violence to use for peer advocate training.

Please see our Year 1 progress toward our project aims to:
Aim 1. Develop a pre/post-questionnaire to evaluate the effectiveness of the training video and curriculum on individual knowledge, attitudes, and beliefs (in both English and Spanish). The pre-test was designed to assess participants' sexual harassment attitudes and knowledge, and the post-test to assess attitudes, knowledge, workplace policies, training practices, and self-efficacy to intervene or report harassment. Building on these findings and expert review (Aim 2), we are now developing an additional survey with variables on sexual harassment experiences, behavioral intentions, perceived risk, and workplace climate.

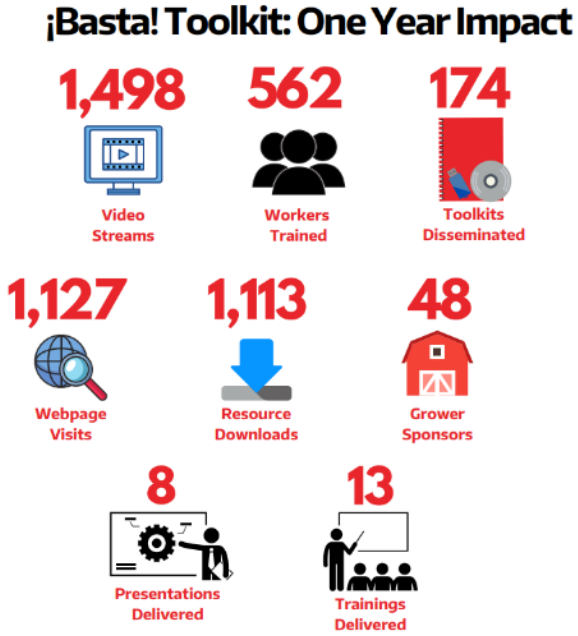
Aim 2. Engage subject matter experts and farmworkers to assess the face and content validity of the questionnaire to determine its appropriateness for the Latino farmworker population. The questionnaire was reviewed by an advisory team consisting of a trainer, a community health educator, two members of the Yakima Valley community, and two academic level health educators. The questionnaire has been pilot tested with 129 stakeholders, 103 Spanish and 26 English speaking workers, supervisors, HR personnel, and other agricultural stakeholders. Interviews with stakeholders to assess the qualitative and internal validity of the questionnaire were delayed as a result of COVID-19. For the development of the larger survey, the team has been conducting meetings with the Farmworker Advisory Group to determine how they interpret the questions and obtain their perception of the word choice and response options.

Aim 3. Evaluate the effectiveness of the training video and curriculum using the pre/post questionnaire developed in Aim 1 during five different training sessions. The survey was administered at Ag Safety Days in Kennewick and Wenatchee. There was an 80% response rate, with the respondents consisting of 74% female and 26% male

respondents, with 20% English and 80% Spanish-speaking. Our preliminary findings show participants' knowledge and attitudes scores significantly increased after the training ($P<0.05$). The final test scores for workers and supervisors were lower than other participants including growers, HR, and trainers. This finding was surprising because we expected the supervisors to have more knowledge than workers. The overall scores for workers and supervisors were the same, and there were no differences between male and female participants, or between English or Spanish speaking workers. We also found a few participants indicated they did not know their workplace harassment policy or how to help someone experiencing harassment, but all those that did were Spanish-speaking. Based on these preliminary findings, we identified employers may need more support to communicate workplace policies and provide training in Spanish. Additional analysis will be conducted by Dennise Drury for her MPH thesis to be released this winter/spring.

RESOURCES

Webpage with resources:
https://deohs.washington.edu/pnash/toolkit
Facilitator's Guide in English
Facilitator's Guide in Spanish
Training video without pauses
Training video w/ pauses for training
Growers as Allies training video
Video Interview: Mike Gempler, WGL
Video Interview: Jeff Perrault, Perrault Inc.



ARTICLES

September 2019, Claire Hutkins, Migrant Clinician's Network, #MeToo in the Fields: New Video and Curriculum to Eliminate Agricultural Worker Sexual Harassment
October 2019, Preventing sexual harassment in agriculture, University of Washington, Bothell News
November 2019, Sarah Stanley, UW DEOHS Blog
December 2019, Emily McCarthy, Crosscut News, 'We just want to work': Washington farmworkers say enough to sexual assault
December 2019, Madison Miller, Bothell-Kenmore Reporter
January 2020, Jackson Holtz, UW News, University of Washington selected for 2020 Carnegie Foundation Community Engagement Classification
October 2020, Doug Esser, University of Washington, Bothell News, Bothell's ¡Basta! program wins national award, *Article In-development*.

WHAT IS NEXT?

The findings from this pilot study are being used to develop a larger longer survey to assess additional factors such as sexual harassment experiences and workplace climate. This winter/spring, the team will be conducting validity and reliability testing for this new instrument. The findings from this pilot study will be leveraged to apply for a larger longitudinal study to assess the implementation and impacts of the ¡Basta! Toolkit in a workplace over 5 years. In addition, the team has received funding from the University of Washington Center for Communication, Difference & Equity (CCDE) to co-develop a graphic resource on sexual harassment prevention with and for Latino farmworkers. This resource will be released this November and will be another addition to the ¡Basta! toolkit.