

WHOLE COMMUNITIES WHOLE HEALTH



Fiscal Years 2022 and 2023 Biennial Report



The University of Texas at Austin
Research Development
Vice President for Research, Scholarship
and Creative Endeavors

Table of Contents

Changing the way science helps society thrive is our grand challenge.....2

Whole Communities–Whole Health Highlights in Numbers.....3

Program Achievements4

 Including the Whole Community4

 Looking at the Whole Picture5

 Hornsense Smartphone App.....5

 The “Sniffer” Van6

 Air Quality and Natural Disasters.....7

 Bringing Science Home.....7

 Whole Communities–Whole Health Headlines8

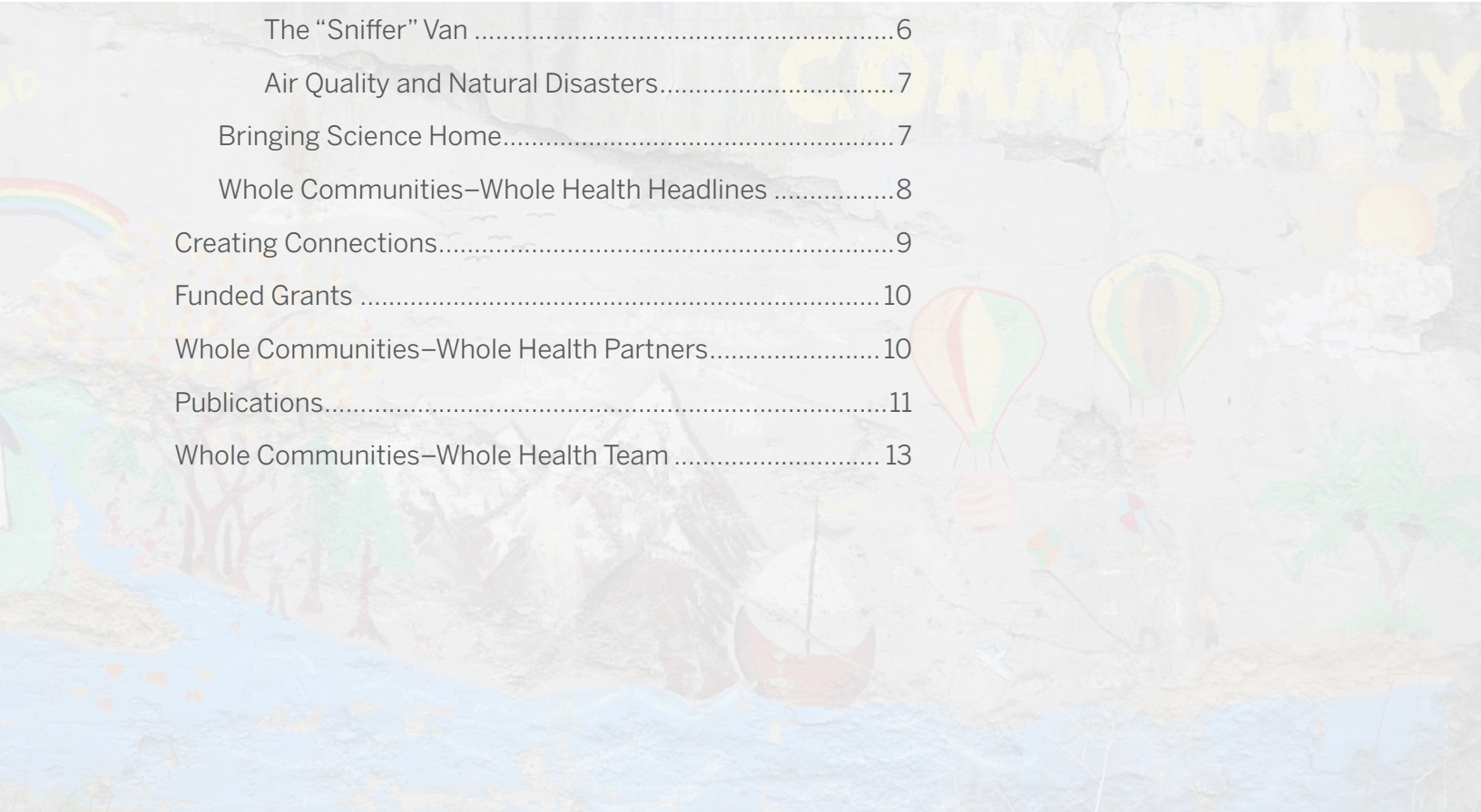
Creating Connections.....9

Funded Grants10

Whole Communities–Whole Health Partners.....10

Publications.....11

Whole Communities–Whole Health Team 13



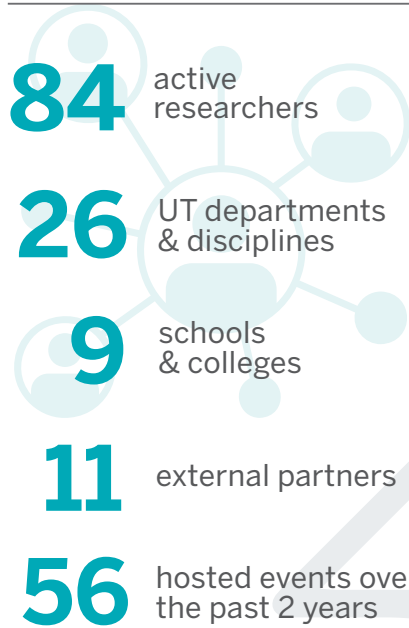
Changing the way science helps society thrive is our grand challenge.

Whole Communities–Whole Health (WCWH) is a community-centered cohort study that seeks to better understand how physical and emotional factors, biology, and the environment affect the overall health of children and their families. The project is designed with the individual health and well-being needs and concerns of the local community as central points of interest for study—from air and water quality to sleep and behavioral patterns.

WCWH researchers partner with families and community organizations in the Del Valle neighborhood, southeast of Austin. These family and community partners play an active role in guiding the research process. For example, local residents complained about air pollution and odors in the area, so the team investigated and discovered previously undetected pollutants in the air. The team accelerates the impact of its research by returning the data, sometimes in near-real time, to study participants and the community. Sharing information back to the community in this way is a core value of WCWH researchers.

Whole Communities–Whole Health Highlights in Numbers

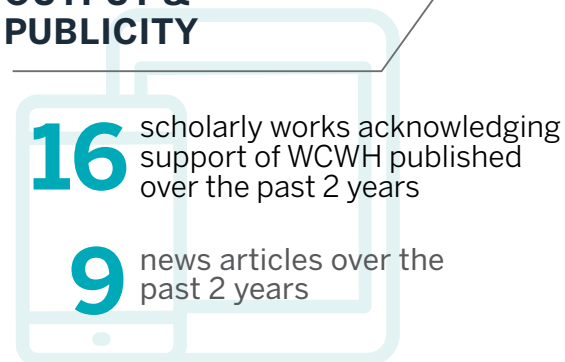
EXPANDING NETWORKS



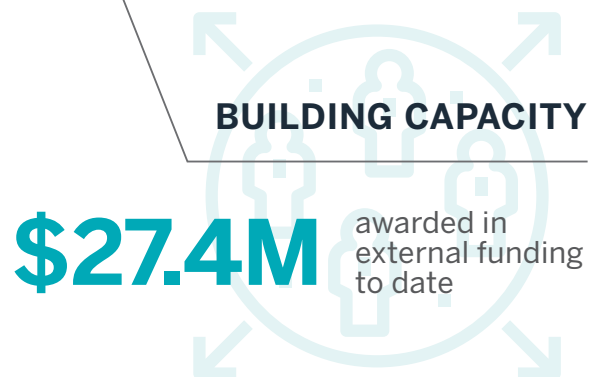
ENGAGING STUDENTS



SCHOLARLY OUTPUT & PUBLICITY



BUILDING CAPACITY



Program Achievements

Whole Communities–Whole Health is guided by three overarching research aims:

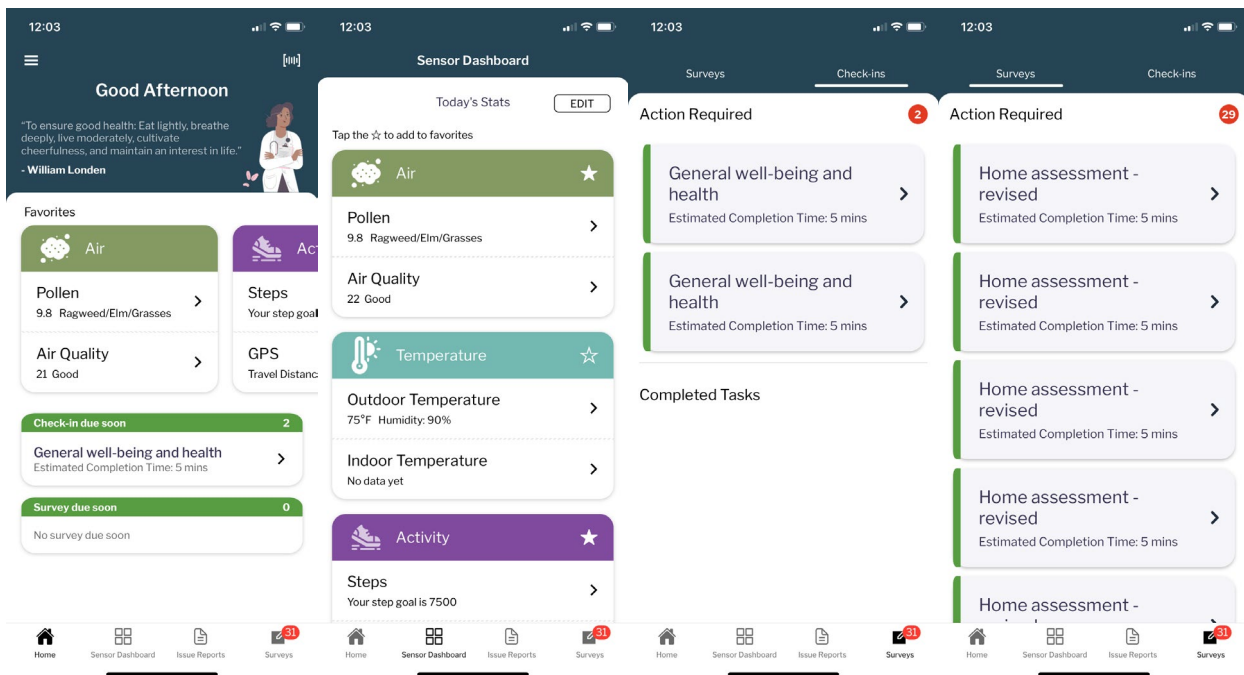
1. Including the whole community
2. Looking at the whole picture
3. Bringing science home

Including the Whole Community

Researchers are experts in their own specific fields, but families facing unique challenges are experts in their own experiences. The research program, therefore, is committed to producing results borne out of academics working with study participants in a holistic way.

In order to gather physical and mental health-related data on family households in communities frequently underrepresented by existing health-related datasets, researchers had to gain the trust of potential participants who may have been hesitant to engage. With the support of a Community Strategy Team—a group composed of local community leaders with first-hand knowledge of the challenges facing the participants—WCWH Senior Outreach Program Coordinator Shirene Garcia, Research Study Coordinator Sarah Smith, and the rest of the WCWH team have enrolled over 100 households thus far.





Looking at the Whole Picture

Hornsense Smartphone App

As a grand challenge reliant on health data through community engagement, WCWH researchers **designed and developed a user-friendly tool** that is both intuitive and engaging. The Whole Communities–Whole Health app, called Hornsense, is a smartphone-based application that serves as the primary portal for study participants. Translated into both Spanish and English, Hornsense allows participants to track the materials they receive, like sample collection kits, in-home environmental beacons, and wearable devices. The app also serves as a platform where participants can complete periodic surveys about their health and well-being or their environment. The results are submitted directly into the WCWH study database.

One critical function of the app is its role as a central dashboard for participants to view data they have already contributed to the study—from data sensed on their smartphones to survey responses and sample collection results. Participants can view their data and compare it to aggregated, anonymized information from across the participating community. The shared aggregate information is a summary about the community (i.e., an average), rather than individualized data tied to any single person.



Pawel Misztal (center) is opening up the “Sniffer Van” for community members to explore at the Del Valle Day celebration in June 2023.

The “Sniffer Van”

The “Sniffer Van” is a **mobile air quality testing vehicle** developed by Assistant Professor **Pawel K. Misztal** (pictured above) from the **Maseeh Department of Civil, Architectural & Environmental Engineering** and his team. Misztal uses a Vocus proton transfer reaction time-of-flight mass spectrometer, rigged into a car, to collect real-time GPS-linked VOC measurements that he can later analyze in his lab on campus.

A thousand times more sensitive than other devices in use, it can detect volatile organic compounds that may go unnoticed or unidentified but have been linked to adverse health effects, including cancer. While many of the researchers in WCWH are focused on indoor air quality, Misztal is providing vital data on the hyper-localized outdoor air quality in various neighborhoods. This is especially important in southeastern Travis County due to its proximity to major manufacturing and industrial plants.

Researchers travel around East Austin, recording detailed data on air quality in areas where odors were reported by residents. After developing this technology in WCWH-related work, Misztal has extended his sniffer van technologies to assist in additional research, reaching more areas of Texas.



The WCWH air quality team provided demonstrations of their technologies and presented results to community members at Del Valle Day at the Circuit of the Americas in June 2023. Rear (L – R): Andrea Hernandez, Sarah Smith, Kerry Kinney, Pawel Misztal, Sam Lin, Sarah Chambliss, David Jarma Front (L – R): Melody Millage, Sergio Castellanos, Shirene Garcia

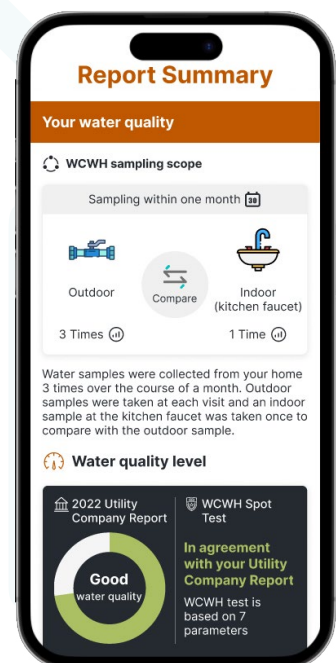
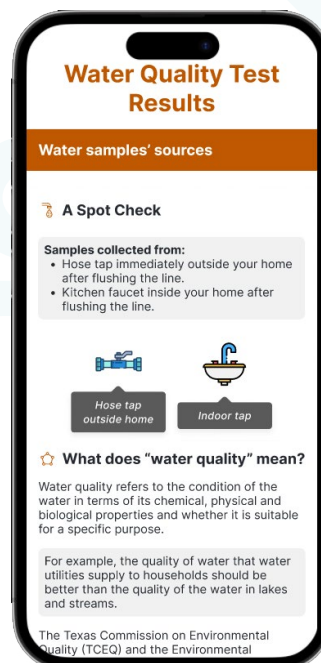
Air Quality and Natural Disasters

Members of the Whole Communities–Whole Health indoor and outdoor air quality research team—including the aforementioned Pawel Misztal and environmental engineering professor **Kerry Kinney**— are collaborating with faculty from one of UT's other Grand Challenges, Planet Texas 2050, on a Department of Energy-funded study in the Beaumont-Port Arthur region of Southeast Texas. **The Southeast Texas Urban Integrated Field Lab (SETx-IFL)** includes four other universities and is focused on the interactions between flooding and air pollution in southeastern Texas, particularly in the aftermath of extreme climate scenarios.

Bringing Science Home

WCWH is sharing vital information with study participants, backed up by rigorous data collection and analysis of health determinants. **Water quality** and **sleep/mood** reports have been completed and sent to individual households. Several more reports are close to completion.

The user experience design team within the School of Information has been working with content experts to **display reports within the study's mobile application**. To the right are some example reports that participants will be able to access within the same Hornsense app that they use to submit data—e.g., surveys—and view their own study data and aggregate community comparisons.

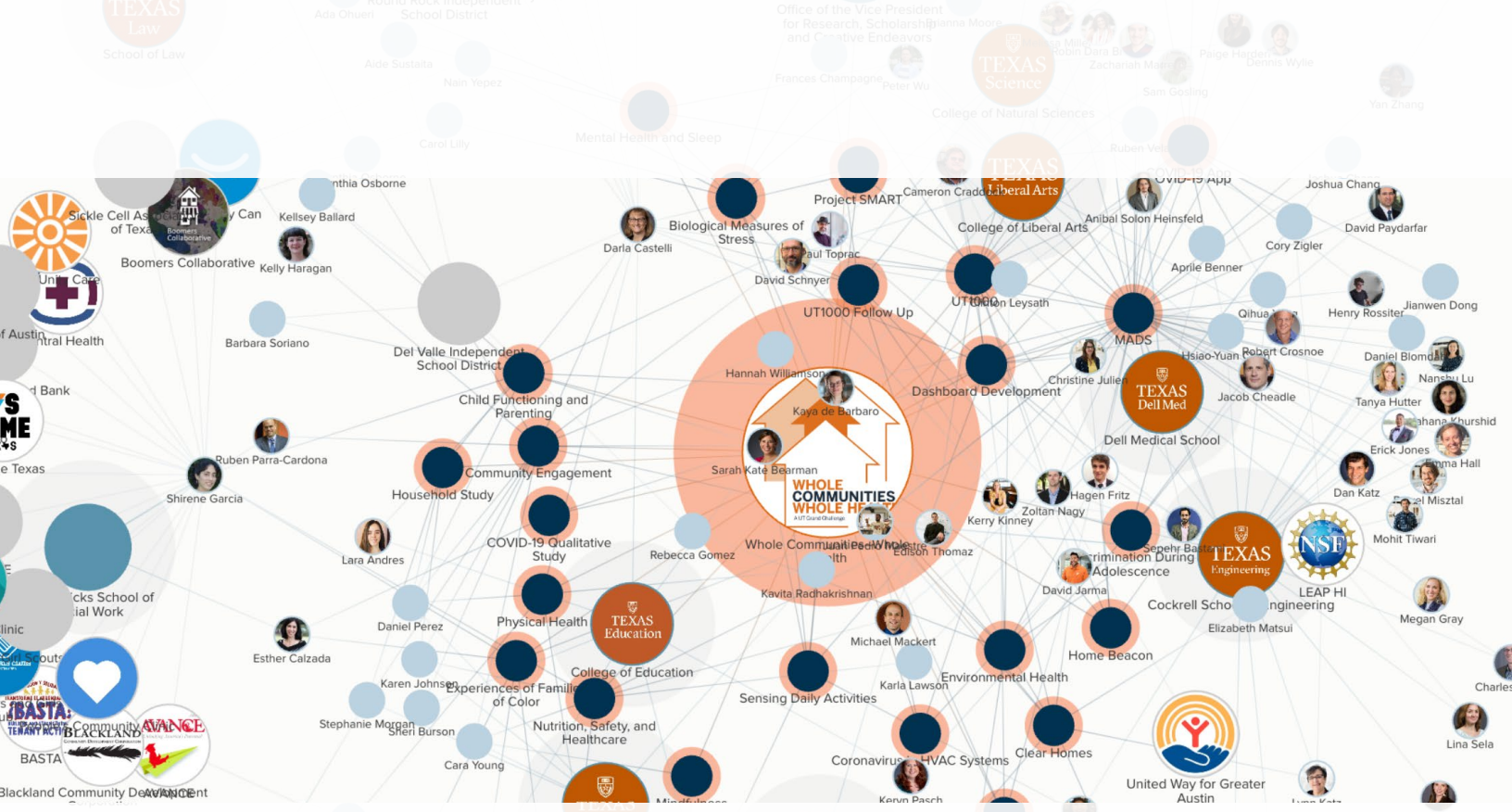


Whole Communities–Whole Health Headlines

UT OVPR Communications

- 7/26/2023 [Whole Communities–Whole Health Takes ‘Giving Back’ to a New Level](#)
- 5/30/2023 [How to Create an Oasis in a Food Desert](#)
- 4/20/2023 [All Public Health Campaigns Are \(Not\) Created Equal](#)
- 4/17/2023 [Embodying Interdisciplinary – A Profile of Dr. Jacquelyn Taylor](#)
- 9/15/2022 [Del Valle ISD’s Back to School Bash Sponsored by Whole Communities – Whole Health](#)
- 5/23/2022 [Interdisciplinary Research Opportunity Leads to Former Student’s Role at NASA](#)
- 12/2/2021 [Whole Communities–Whole Health Study Goes Mobile](#)
- 11/1/2021 [We Talk a lot About Cohort Studies, but What Are They?](#)
- 8/9/2021 [Ensuring Privacy, One Data Point at a Time](#)





Creating Connections

Finding solutions to the most pressing societal grand challenges cannot be done in an intellectual vacuum; fostering an open forum for ideas and interdisciplinary collaboration provides opportunities for new perspectives to emerge. WCWH is an initiative composed of researchers from multiple schools and departments across campus.

Explore the [interactive network map](#) to see how different researchers, schools, and organizations are connected to WCWH. Search by name, College/School/Unit, or project, or click any node on the map and pause to see its connections appear. You can magnify or expand the view, and you can click on any individual to see which projects or people they are affiliated with.

Funded Grants

Through FY23, WCWH researchers have received \$27.4 million in external grants, gifts, and awards that directly enable the grand challenge's work. External awards from the past two fiscal years are listed below. Many of these grant proposals were developed with the support of OVPR's Research Development team.

Texas Health and Human Services

Development of Interactive Resources to Promote Coping and Reduce Substance Use Disorders among Texas Families
\$6,000,000
Michael Mackert, Moody College of Communication

National Institutes of Health

FEASible: Sensing Factors of Environment, Activity, and Sleep Among Predominantly Latinx Women
\$3,716,804
Darla Castelli, College of Education

U.S. Department of Education

Training in Comprehensive, Culturally Affirming Services (TRACCS) in School Psychology: Increasing School Mental Health Service Capacity in High Need Schools
\$3,194,657
Sarah Kate Bearman, College of Education

National Institutes of Health

Urban planning, siting of air pollution sources, and asthma disparities
\$3,088,414
Elizabeth Matsui, Dell Medical School

National Institutes of Health

Digital Biomarker and Analytics for Cognitive Impairment with Mobile and Wearable Sensing
\$1,144,065
Edison Thomaz, Cockrell School of Engineering

National Science Foundation

SPatiotemporal INvestigation of Urban Pollution and Air Quality (SPIN-UP-AQ)
\$1,000,000
Pawel Misztal, Cockrell School of Engineering

National Institutes of Health

Neural, dyadic, and cultural influences on risk for anxiety in young Latinx children
\$899,049
Laura Quiñones Camacho, College of Education

National Institutes of Health

Asma Guardián!
\$713,240
Elizabeth Matsui, Dell Medical School

National Science Foundation

Interactive Dietary Monitoring
\$567,308
Edison Thomaz, Cockrell School of Engineering

National Alliance for Mental Illness

Development and Testing of a Mental Health Literacy Program for Public Schools
\$397,953
Sarah Kate Bearman, College of Education

Whole Communities–Whole Health Partners

Austin Public Health/Del Valle WIC Clinic
Avance
Central Health
CommUnity Care
Community Coalition for Health
Del Valle Community Coalition
Del Valle Independent School District
Measure
Saffron Trust
Superior Healthplan
Travis County EMS

Publications & Presentations

Research is ongoing for WCWH, but researchers have reported significant findings in peer-reviewed articles in academic journals and at national and international conferences. Publications and presentations from the past two fiscal years are listed below; nearly all are available online.

- Barbaro, Kaya de, Megan Micheletti, Xuewen Yao, Priyanka Khante, Mckensey Johnson, and Sherryl Goodman. 2023. "Infant Crying Predicts Real-Time Fluctuations in Maternal Mental Health in Ecologically Valid Home Settings." *Developmental Psychology* 59 (4): 733–44.*
- Fritz, Connor, Sheri Burson, Grace Lee, Christine Julien, Darla Castelli, Jamie Payton, and Carol Ramsey. 2021. "Project MoveSMART: Integrating Physical Activity and Computer Science Learning in Elementary School Classrooms." In *Proceedings of ACM Conference*. New York, NY, USA.
- Fritz, Hagen, Congyu Wu, Kerry Kinney, and Zoltan Nagy. 2021. "Comparison of Machine Learning Methods to Predict Sleep Quality from Daytime Activity and Nightly Bedroom Environmental Conditions." In *Proceedings of the 8th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation*, 222–23. BuildSys '21. New York, NY, USA: Association for Computing Machinery.
- Fritz, Hagen, Kerry A. Kinney, Congyu Wu, David M. Schnyer, and Zoltan Nagy. 2022. "Data Fusion of Mobile and Environmental Sensing Devices to Understand the Effect of the Indoor Environment on Measured and Self-Reported Sleep Quality." *Building and Environment* 214 (April): 108835.
- Fritz, Hagen, Kerry Kinney, David Schnyer, and Zoltan Nagy. 2021. "Indoor Environmental Quality and Its Effects on Sleep Quality." Oral presentation presented at the ASHRAE IAQ 2020, Athens, Greece, September.
- Fritz, Hagen, Mengjia Tang, Kerry Kinney, and Zoltan Nagy. 2022. "Evaluating Machine Learning Models to Classify Occupants' Perceptions of Their Indoor Environment and Sleep Quality from Indoor Air Quality." *Journal of the Air & Waste Management Association* 0 (ja): null.
- Fritz, Hagen, Sepehr Bastami, Calvin Lin, Kingsley Nweye, Tung To, Lauren Chen, Dung Le, et al. 2022. "Design, Fabrication, and Calibration of the Building EnVironment and Occupancy (BEVO) Beacon: A Rapidly-Deployable and Affordable Indoor Environmental Quality Monitor." *Building and Environment* 222 (August): 109432.
- Fritz, Hagen. 2021. "Data Fusion of Mobile and Environmental Monitoring Devices to Understand the Effects of the Indoor Environment on Sleep Quality." Oral presentation presented at the EWRE Seminar, September.
- Fritz, Hagen. 2022a. "Data Fusion of Consumer-Grade Sensors to Answer Indoor Air Quality Research Questions." Oral presentation presented at the UT Graduate and Industry Networking (GAIN) event, Austin, TX, February.
- Jarma, David. 2023b. "Exploring Effects of Environmental Factors on Pollutant Exposures via PM Monitoring and Microbial Analysis of Home Dust." Oral presentation presented at the Healthy Buildings Europe 2023 Conference, Aachen, Germany, June 12.*
- Johnson, Karen E., Li-Chen Lin, Shalonda Estelle Brazzell Horton, Ana Todd, Nancy Guillet, and Stephanie Morgan. 2022. "VAMOS-VaxNOW: A Nurse-Led Interdisciplinary Disaster Response to Address Vaccine Equity in Central Texas during the COVID-19 Pandemic." *Health Emergency and Disaster Nursing* 9 (1): 23–30.
- Kinney, Kerry. 2022. "Bridging the Gaps between the Built Environment, Human Health & Communities." Oral presentation presented at the National Strategy for Improving Indoor Air Quality, Washington, DC, September 8.
- Margolis, Amy E., Ran Liu, Vasco A. Conceição, Bruce Ramphal, David Pagliaccio, Mariah L. DeSerisy, Emily Koe, et al. 2022. "Convergent Neural Correlates of Prenatal Exposure to Air Pollution and Behavioral Phenotypes of Risk for Internalizing and Externalizing Problems: Potential Biological and Cognitive Pathways." *Neuroscience & Biobehavioral Reviews* 137 (June): 104645.
- McMahon, Megan, Isabella McConley, Chand Hashim, and David M. Schnyer. 2023. "Fitbit Validation for Rest-Activity Rhythm Assessment in Young and Older Adults." *Smart Health*, July, 100418.*

- Micheletti, Megan, Xuewen Yao, Mckensey Johnson, and Kaya de Barbaro. 2022. "Validating a Model to Detect Infant Crying from Naturalistic Audio." *Behavior Research Methods*, September.*
- Misztal, Pawel. 2022a. "Novel Mobile Air Quality Measurements in Texas Communities." Poster presentation presented at the Texas Academy of Medicine, Engineering, Science & Technology 2022 Annual Conference, San Antonio, TX, June 21.*
- Misztal, Pawel. 2022b. "Health Impacts of Indoor Air Quality." Oral presentation presented at the Texas Academy of Medicine, Engineering, Science & Technology 2022 Annual Conference, San Antonio, TX, June 22.*
- Palmer, Emma J., Juan P. Maestre, David Jarma, Alisa Lu, Elisabeth Willmann, Kerry A. Kinney, and Mary Jo Kirisits. 2021. "Development of a Reproducible Method for Monitoring SARS-CoV-2 in Wastewater." *Science of The Total Environment* 799 (December): 149405.
- Wu, Congyu, Aaron Fisher, and David Schnyer. 2022. "Gaussian Latent Dirichlet Allocation for Discrete Human State Discovery." arXiv.
- Wu, Congyu, Hagen Fritz, Melissa Miller, Cameron Craddock, Kerry Kinney, Darla Castelli, and David Schnyer. 2021. "Exploring Post COVID-19 Outbreak Intradaily Mobility Pattern Change in College Students: A GPS-Focused Smartphone Sensing Study." *Frontiers in Digital Health* 3: 169.
- Wu, Congyu, Megan McMahon, Hagen Fritz, and David M. Schnyer. 2022. "Circadian Rhythms Are Not Captured Equal: Exploring Circadian Metrics Extracted by Different computational Methods from Smartphone Accelerometer and GPS Sensors in Daily Life Tracking." *DIGITAL HEALTH* 8 (January): 20552076221114200.
- Yao, Xuewen, Megan Micheletti, Mckensey Johnson, Edison Thomaz, and Kaya de Barbaro. 2022a. "Infant Crying Detection in Real-World Environments." ArXiv:2005.07036 [Cs, Eess, Stat], February.*
- Yao, Xuewen, Megan Micheletti, Mckensey Johnson, Edison Thomaz, and Kaya de Barbaro. 2022b. "Infant Crying Detection In Real-World Environments." In *ICASSP 2022 - 2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 131–35.*
- Yao, Xuewen, Miriam Mikhelson, Megan Micheletti, Eunsol Choi, S. Craig Watkins, Edison Thomaz, and Kaya de Barbaro. 2023. "Understanding Postpartum Parents' Experiences via Two Digital Platforms." *Proceedings of the ACM on Human-Computer Interaction* 7 (CSCW1): 107:1-107:23.

* Indicated publications do not directly acknowledge Whole Communities–Whole Health support but are verified Whole Communities–Whole Health research project outputs.

Whole Communities–Whole Health Team

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