WHOLE COMMUNITIES WHOLE HEALTH

Fiscal Year 2024 Annual Report

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

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

Whole Communities–Whole Health is now beginning year three of its five-year community-centered cohort study to understand how physical and emotional experiences, biology and the environment impact the overall health of children and families. The University of Texas at Austin Grand Challenge partners with families and community organizations in the Del Valle area, near Austin, to collect data on social determinants of health while listening to residents about their priorities for building a healthy future. It is this partnership between researchers and the community that drives Whole Communities–Whole Health.

This grand challenge accelerates its impact by returning data to study participants and the community. Sharing findings directly with participants remains a core objective of the program, and one in which progress was made in the past year. Through a smartphone app, study participants can access some personalized results based on measurements of air quality, sleep and physical activity levels. Meanwhile, Whole Communities–Whole Health researchers examine variables affecting health at individual and community-wide levels, combining environmental quality, medical markers, surveys and community-level data to form a holistic picture of health.

Beyond its immediate objectives, this study serves as a blueprint of a new framework for community-based cohort studies. By prioritizing community partnership and real-time data sharing, Whole Communities–Whole Health is developing a model for conducting cohort studies that can be adapted and implemented in diverse settings, potentially transforming how researchers engage with communities to improve public health.

Whole Communities–Whole Health Highlights in Numbers

EXPANDING NETWORKS

85 active researchers

22 UT departments & disciplines

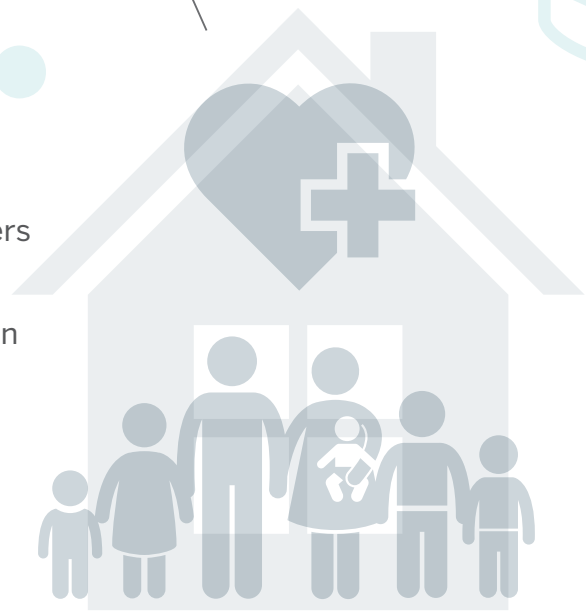
9 schools & colleges

19 external partners

14 hosted events in the past year

ENGAGING STUDENTS

36 undergraduate & graduate student researchers



SCHOLARLY OUTPUT & PUBLICITY

13 scholarly works acknowledging support of WCWH published in the past year

24 news articles in the past year

BUILDING CAPACITY

$35.8M awarded in external funding to date

Program Achievements

In Fiscal Year 2024, as the first participants enter their third year of the community cohort study, Whole Communities–Whole Health researchers have collected comprehensive data including water samples, naturalistic audio, physical activity metrics, biological samples, health measures, air quality readings, surveys and ecological momentary assessments. The data return team has been developing participant reports through user experience interviews and iterative design.

Whole Communities–Whole Health researchers have also made progress by building on awards granted in previous fiscal years. Assistant Professor **Laura Quiñones Camacho** (Educational Psychology, College of Education) is actively incorporating her NIH K01 award study on anxiety risk in young Latinx children into the cohort study. **Darla Castelli** (Kinesiology and Health Education, College of Education) and **Andreana Haley** (Psychology, College of Liberal Arts) are leveraging the initiative's environmental beacons and Amazon Web Services infrastructure to conduct research on health factors affecting Latina women. **Kaya de Barbaro** (Psychology, College of Liberal Arts) is applying her wearable sensor methodology to study maternal sensitivity in substance use disorder prevention. These ongoing projects showcase the broader impact and practical applications of the initiative's technologies and methodologies across diverse areas of health research.

Attendees at the 2024 Whole Communities–Whole Health Research Showcase, held in April 2024, survey the event's poster session where many of the previous year's program achievements were on display.

Research

FY24 proved to be a particularly successful year for Whole Communities–Whole Health research. The team completed templates for participant reports, with results for biological age, Fitbit and Language ENvironment Analysis (LENA). This will enable the return of five reports to participants in the cohort study, including the now-completed water quality and sleep/mood reports. Additionally, numerous peer-reviewed publications, including those highlighted below, utilized pilot study data collected over previous years.

Real-World Sleep Research

A team led by Research Assistant Professor **Benjamin Baird** (Psychology, College of Liberal Arts) and Psychology Professor **David M. Schnyer** used sleep and activity data collected as part of a Whole Communities–Whole Health pilot study to investigate the **connection between physical activity, sleep quality and psychological health.** The results, published in the *Nature* journal ***Scientific Reports***, showed that both low-intensity and moderate-to-vigorous physical activity was linked to deeper, more restorative sleep, and that better sleep was in turn associated with more energy and less stress the following morning.

There was already evidence to support this, but previous studies had been conducted in lab settings, with conclusions drawn from observing experiences after just one night's sleep. This time, thanks to wearable technology (a key feature of Whole Communities–Whole Health's data collection process), the researchers were able to continuously observe participants' behaviors at home instead of in the unnatural settings of a lab, providing a more accurate picture of how daily activities impact sleep and mood over multiple weeks, even months. "We've shown using a standard Fitbit that anyone could wear — not even an expensive scientific device — that it is actually sensitive to these sorts of sleep architecture measures, and in a way that's showing predictive results," Schnyer said. "The world is your oyster now. You can use this device to study all manner of different sleep architecture data related to lifestyle — related to mood and mood disorders — in the field, not in a lab, that people might have thought was not possible previously."

There was broad interest in the research, garnering media coverage from numerous news outlets worldwide including the Association of American Universities and HuffPost UK.

READ MORE

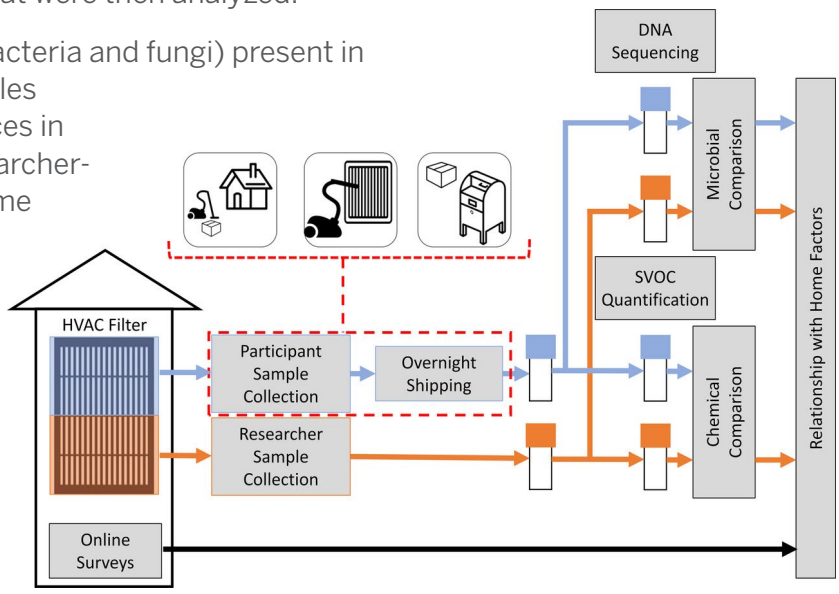
"The world is your oyster now. You can use this [FitBit] device to study all manner of different sleep architecture data related to lifestyle — related to mood and mood disorders — in the field, not in a lab, that people might have thought was not possible previously."

— Psychology Chair David M. Schnyer

Indoor Exposures Uncovered

Published studies demonstrate the interdisciplinary scope of the Whole Communities–Whole Health program. For example, a team led by engineering professor **Kerry Kinney** (Maseeh Department of Civil, Architectural and Environmental Engineering, Cockrell School of Engineering) **evaluated the feasibility** of using participant-collected household dust samples to assess indoor exposures to microorganisms and semi-volatile organic compounds. Dust was collected from heating, ventilation and air conditioning (HVAC) filters in 43 urban homes across Texas. In each home, both the resident participants and researchers independently collected filter dust samples that were then analyzed. In each home, both the resident participants and researchers independently collected filter dust samples that were then analyzed.

The microbial communities (bacteria and fungi) present in the participant-collected samples showed no significant differences in diversity compared to the researcher-collected samples from the same homes. This suggests that participant-collected HVAC dust can serve as a viable sample type for indoor microbiome studies in residences. Semi-volatile organic compounds of potential health concern, such as organophosphates, phthalates and brominated flame retardants, were commonly detected in both participant and researcher dust samples at levels consistent with prior indoor studies, though some compound concentrations varied between the two sample groups. While challenges remain, the study demonstrated the potential for participant-collected dust samples to be an alternative to researcher home visits for assessing indoor environmental exposures.



A graph from a Whole Communities–Whole Health research paper about self-reported indoor air quality results. The article, "Participant-collected household dust for assessing microorganisms and semi-volatile organic compounds in urban homes," published in Science of the Total Environment, demonstrated how switching from a process of researchers going directly into people's homes to collect samples to participants themselves collecting the data and returning it by mail proved to be very effective.

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Household Auditory Chaos

Whole Communities–Whole Health researchers **Kaya de Barbaro** (Psychology, College of Liberal Arts) and **Edison Thomaz** (Chandra Family Department of Electrical and Computer Engineering, Cockrell School of Engineering), with graduate student Priyanka Khante, published a study in ***Frontiers in Digital Health*** documenting their development of an auditory "chaos classifier." The chaos classifier is an algorithm that can reliably detect four levels of household chaos from audio recordings of real-world environments where children are present. Household chaos, characterized by high noise levels, crowding and lack of routines, is a known risk factor that can negatively impact child development and behavior. However, previous research has relied on subjective parent surveys to measure chaos levels.

The research team created a novel dataset by collecting and annotating over 400 hours of daylong audio recordings from infants wearing audio recorders in their homes. They trained machine-learning models on this data to classify four levels of auditory chaos. This automated chaos detection opens new possibilities for research into the dynamic effects of household chaos on child cognition, behavior and developmental outcomes. The team made a subset of their annotated dataset and their best-performing model publicly available to facilitate further work in this area.

Digital Distractions in Parenting

In a recent study published in ***Child Development,*** a research team led by **Kaya de Barbaro** (Psychology, College of Liberal Arts) provided the first objective evidence of how real-time phone use affects mothers' speech to infants in extended real-world interactions. The research, involving 16 mother-infant pairs, collected over 16,000 minutes of synchronized data on phone use and audio recordings in home settings over a week. Results showed that maternal phone use was associated with a significant decrease (16%) in maternal child-directed speech overall, with short periods of phone use (1 to 3 minutes) linked to an even greater decrease (27%). This highlighted the potential impact of everyday technology use on parent-child interactions and infant language environments.

The study's findings underscored the complex relationship between parental phone use and infant speech exposure. While short phone use events had the strongest impact, the effects varied depending on the time of day and duration of use. The researchers theorized that different types of phone activities (e.g., texting versus video calls) may have distinct effects on parent-child interactions. The study also demonstrated the value of using multimodal sensing technologies to capture detailed, real-world data on children's everyday experiences and developmental influences.

READ MORE

"A Day in Del Valle," May 2024. Whole Communities–Whole Health faculty, researchers and program coordinators visit local communities in Del Valle and connect with Community Strategy Team members and local law enforcement.

Community Partners & Engagement

A core value of Whole Communities–Whole Health is community-engaged research: both the researchers and members of the community bring their expertise to the project. The researchers are experts in their fields, and the community members involved, including families participating in the study, are experts in their own lives and communities. When these groups come together, the benefits are exponential. Community members not only share their data — without which the research would not be possible — they also help ensure that the science stays relevant to their community. Researchers offer scientific expertise and access to resources and technology that the community may not have had. Together, this partnership produces results with real-world applications that are meaningful to the community where the research is being conducted.

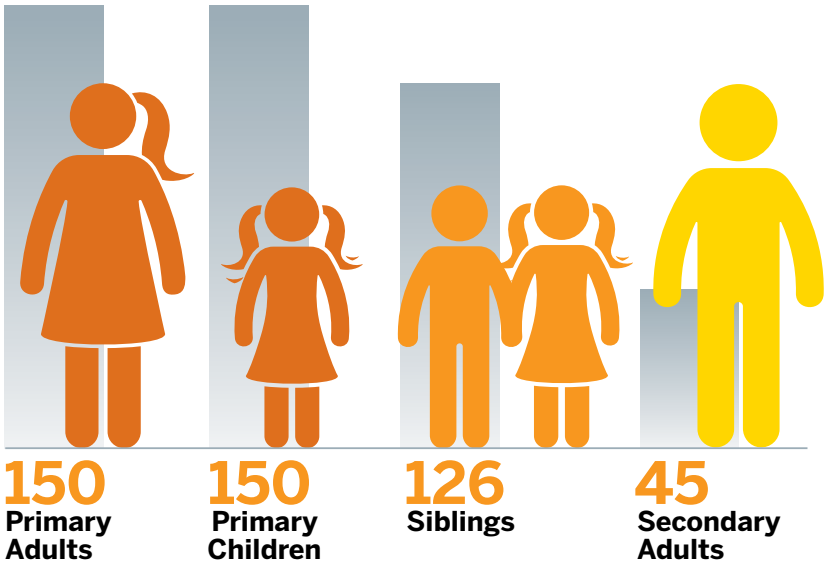
Historically, community members have had good reason to be wary of researchers. A history of abuse and coercion in research has left its scars, especially among marginalized communities. Researchers today must have patience and flexibility as they form authentic connections with participants in their studies. Led by Senior Outreach Program Coordinator Shirene Garcia (Steve Hicks School of Social Work) and Research Study Coordinator Sarah Smith, the Whole Communities–Whole Health team uses a relationship-focused approach to engage with participants in the cohort study.

The complexity of the cohort study presents unique challenges, as many participating families come from historically marginalized communities. Prioritizing these participants as people first is critical to building authentic, trusting relationships where families feel comfortable and stay engaged. Retention is a significant hurdle for any longitudinal study, especially when participants represent diverse backgrounds and circumstances, yet the cohort study has maintained steady retention rates despite these potential obstacles.

Del Valle Resource Day 2024

Community Strategy Team

The Community Strategy Team (CST) at Whole Communities–Whole Health is a group composed of local community leaders with first-hand knowledge of the unique challenges and strengths of the participants. It plays a key role in helping Whole Communities–Whole Health cultivate long-lasting relationships between people and organizational partners in the community. For example, at the CST's suggestion, three years ago Whole Communities–Whole Health began hosting classes as a way of giving back to the community. This year, the classes evolved into a one-day event, the Community Resource Day, where six classes were offered along with keynote speakers, a resource fair and family fun. Over 100 community members attended the event, with participation from 35 organizations and the support of 61 volunteers. Watch this **video** featuring CST member Ellena Gonzalez to learn more.



In FY24, Whole Communities–Whole Health enrolled 50 more households in the study. There are now 150 families and 471 participants.

Bringing Science Home

Whole Communities–Whole Health has made returning data to participants a central feature of its research approach, emphasizing transparency and providing an immediate benefit to participating families. This unique aspect of the study involves translating complex data into easily digestible information provided in periodic reports. These data return reports put information directly into the hands of participants, allowing them to take immediate action to improve their health.

The Whole Communities–Whole Health team has adopted a human-centered design approach to create useful and user-friendly reports. They conducted scenario-based, semi-structured interviews with participants to gather feedback on the reports' understandability, actionability, accessibility and content preferences. This iterative process, involving input from both participants and subject matter experts, has facilitated ongoing refinements to the reports. As of Fiscal Year 2024, the team has returned the first reports on sleep/mood and water quality to participants, with plans to incorporate Fitbit information in future sleep/mood reports.

Qualitative interviews with 20 cohort study participants revealed generally positive reactions to the reports. Participants found the reports mostly easy to understand and appreciated the visual elements, though they expressed a desire for more visuals to balance text-heavy content. The study also highlighted the trust participants placed in the Whole Communities–Whole Health team, with many mentioning specific team members they would contact regarding questions or concerns. These findings, along with a state-wide survey on Texans' willingness to participate in health research, are guiding the creation of future data return reports. The Whole Communities–Whole Health team's efforts in data return demonstrate a commitment to fostering trust, promoting data transparency and providing immediate health benefits to participants in community-engaged research.

"I did not expect this report to be so educational. Honestly, I had no idea what was coming. I really liked it, because it is something that is very useful to us as a community.... There are very few people who have this information."

— Cohort study participant

Data Return Workgroup

The data return workgroup, led by Senior Outreach Program Coordinator Shirene Garcia (Steve Hicks School of Social Work), plays the crucial role of synthesizing complex research data into accessible, actionable reports for study participants. This interdisciplinary team brings together expertise from UT Austin faculty members **Benjamin Baird** (Psychology, College of Liberal Arts), **Mike Mackert** (Center for Health Communication, Dell Medical School), **Sean Upshaw** (Stan Richards School of Advertising & Public Relations, Moody College of Communication) and **Yan Zhang** (School of Information), along with research study coordinator Sarah Smith and graduate research assistant Wei Rui. The workgroup's effectiveness is greatly enhanced by the active participation of community liaisons from local partner organizations such as Boomers Collaborative Foundation, Community Coalition for Health, Mama Sana Vibrant Woman, and the Community Advancement Network. These liaisons provide invaluable insights into community needs and preferences. Altogether, this collaborative approach ensures that the data return reports are not only scientifically accurate but also culturally relevant and easily understood.

Whole Communities–Whole Health Headlines

External News Features and Mentions

Feb 2024	**New APS Rising Stars** Association for Psychological Science
3/4/2024	**Scientists to Study Real-World Eating Behaviors Using Wearable Sensors and Artificial Intelligence** Rhody Today, University of Rhode Island
4/1/2024	**To Sleep Better, You Should Move More** Futurity
4/1/2024	**UT Austin Study Sprints Ahead With Findings Linking Exercise to Enhanced Sleep Quality** hoodline.com
4/1/2024	**Move More, Sleep Better: Study Finds Physical Activity Lengthens REM Latency** Medical Xpress
4/1/2024	**Move More, Sleep Better, UT Study Finds** Austin Journal
4/2/2024	**The 1 Daytime Activity That Ensures Better Sleep is Actually Very Simple** HuffPost UK
4/3/2024	**Fitbit Study Reveals That Regular Exercise Leads to Better Sleep** Gigazine
4/3/2024	**Study Using Wearable Tech Further Validates Exercise, Sleep and Mood Connection** Sleep Review
4/5/2024	**Very Simple Daily Habit Can Help You Fall Asleep Faster, According to New Study** Daily Mirror, UK
4/8/2024	**Exercising Regularly Will Enhance Better Sleep – Study** New Telegraph, Nigeria
6/26/2024	**Q&A: Researchers Discuss Study Showing Maternal Cell Phone Use May Negatively Impact Infant Language Development** MedicalXpress

6/26/2024	**Mom's Smartphone Use Might Affect Baby's Language Development**	UPI
6/26/2024	**Could Mom's Smartphone Use Affect Baby's Language Development?**	USNews.com
6/26/2024	**Mom's Smartphone Use Might Affect Baby's Language Development**	Yahoo
6/27/2024	**Mums who are Obsessed With Their Smartphone Talk to Their Children Less, Study Finds**	Daily Mail, UK
6/27/2024	**Phone-Obsessed Mums May Hamper Their Child's Development, Experts Warn**	msn.com
7/3/2024	**Parents' Phone Usage Could Impact Baby's Development**	thebump.com

UT Austin News Coverage

4/1/2024	**Move More, Sleep Better, UT Study Says**	UT News

UT Austin OVPR Communications

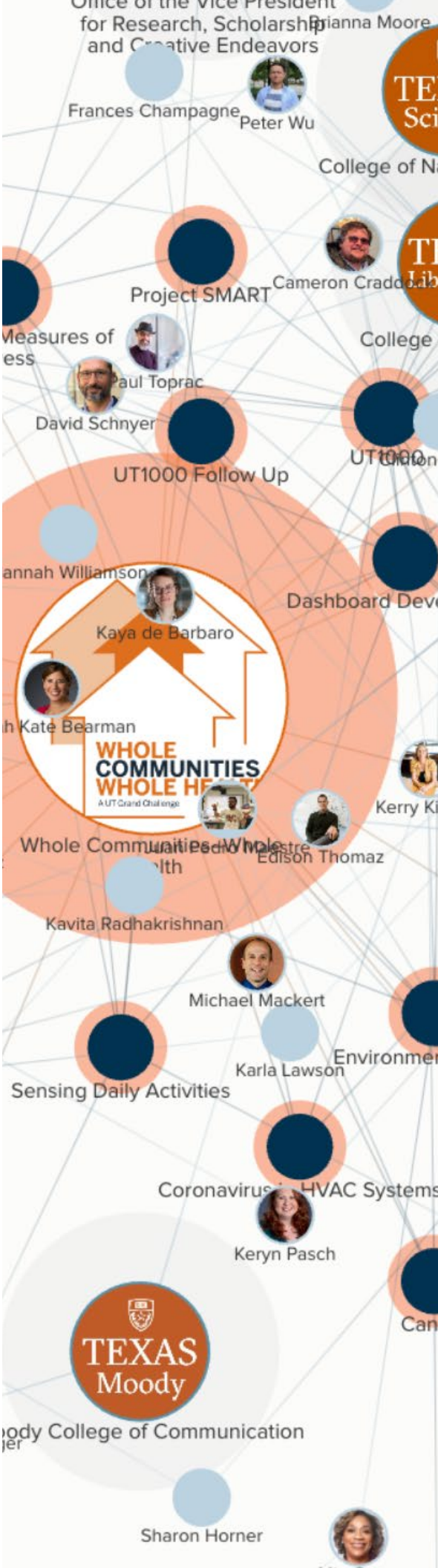
10/24/2023	**Health Kick: A Q&A With New Whole Communities–Whole Health Chair Mike Mackert**
3/29/2024	**SEEDing Hope: An Interview With WCWH Showcase Keynote Speaker Adam Grabell**
5/9/2024	**Fast-Track to Impact: WCWH's Flash Funding Competition Ignites Collaborative Research**
7/5/2024	**Cultivating Interdisciplinary Collaboration**
7/27/2024	**Ellena Gonzalez on Building Trust With Whole Communities-Whole Health**

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. Whole Communities–Whole Health is an initiative composed of researchers from multiple schools and departments across campus. The grand challenge is making strides to continue building its network of research and recently brought five new collaborators into its work through a call for proposals at its annual research showcase.

Explore the **interactive network map** to see how different researchers, schools and organizations are connected to Whole Communities–Whole Health. 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 they've been affiliated with.

Whole Communities–Whole Health chair Mike Mackert at the annual Research Showcase in April 2024



Funded Grants

Through FY24, Whole Communities-Whole Health researchers have received $35.8 million in external grants, gifts and awards that directly enable the grand challenge's work. External awards from the past fiscal year are listed below.

U.S. Environmental Protection Agency
Uncertainty Assessment Framework for Robust Product Category Rules of Salvaged and Remanufactured Construction Materials
$3,268,754
Christopher Rausch, Cockrell School of Engineering

National Institutes of Health
Making Genomic Prediction of Complex Disease Equitable
$1,981,250
Arbel Harpak, Dell Medical School

National Institutes of Health
Automated Assessment of Maternal Sensitivity to Infant Distress: Leveraging Wearable Sensors for Substance Use Disorder Prevention and Research
$1,973,422
Kaya de Barbaro, College of Liberal Arts

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

Air Quality Research Program
Novel Observations and Quantified Source Apportionment of Ozone, Particulate Matter, and Contributing Precursors in the El Paso Area
$280,810
Pawel Misztal, Cockrell School of Engineering

University of California San Diego
Non-Targeted Gas-Phase and Particle-Phase Mobile and Stationary Coastal Measurements to Characterize Chemical and Biological Sources: A Collaborative Case Study With UCSD Airborne Institute and UT Austin
$171,779
Pawel Misztal, Cockrell School of Engineering

Institute of Museum and Library Services
Public and Academic Libraries as Community Hubs to Promote Mental Health Help-seeking for Young Adults
$149,611
Yan Zhang, School of Information

Brain and Behavior Research Foundation
Parent-Child PFC Neural Synchronization During Fear-Inducing Events as a Predictor of Resting-State PFC Functional Connectivity and Anxiety Symptoms in Young Children
$70,000
Laura Quiñones Camacho, College of Education

Texas Air Research Center
Application of Novel Mobile Measurements for Chemical Speciation and Toxicity Weighting of Industrial and Biomass Burning Sources in Southeast Texas
$50,969
Pawel Misztal, Cockrell School of Engineering

National Institutes of Health
Neural, Dyadic, and Cultural Influences on Risk for Anxiety in Young Latinx Children - Administrative Supplement
$50,000
Laura Quiñones Camacho, College of Education

Whole Communities–Whole Health Partners

Any Baby Can
Austin Public Health
AVANCE
Central Health
Central Texas Food Bank
Children's Town Center
Children's Wellness Center
CommUnity Care
Community Coalition for Health
Del Valle Community Coalition
Del Valle Independent School District
Little Explorers Daycare
Lonestar Family Market
MEASURE
Superior Healthplan
Sweetpea Learning Center
The Joyful Child
Travis County Community Center
Travis County EMS

Publications & Presentations

Research is ongoing for Whole Communities–Whole Health, and researchers have reported significant findings in peer-reviewed articles in academic journals and at national and international conferences. Publications and presentations from the past fiscal year are listed below; most are available online.

Early, Ansel, Hagen Fritz, Zoltan Nagy, Atila Novoselac, and Kerry Kinney. "Classification of Cooking Events in Residential Kitchens in Austin, Texas Using PM 2.5 Time Series Data." Oral presentation presented at Indoor Air 2024, Honolulu, HI, July 8, 2024.

Early, Ansel, Hagen Fritz, Zoltan Nagy, Atila Novoselac, and Kerry Kinney. "Residential Heat Exposures in Lower Income Households: Data Collected in the UT Austin Whole Communities—Whole Health (WCWH) and FEASible Studies." Oral presentation presented at Indoor Air 2024, Honolulu, HI, July 9, 2024.

Early, Ansel, David Jarma, Atila Novoselac, and Kerry Kinney. "Preliminary Indoor PM2.5 Data from the Whole Communities—Whole Health Pilot Study." Poster presentation presented at the American Association for Aerosol Research 41st Annual Conference, Portland, OR, October 3, 2023.

Hsieh, Ju-Chun, Weilong He, Dhivya Venkatraghavan, Victoria B. Koptelova, Zoya J. Ahmad, Ilya Pyatnitskiy, Wenliang Wang, et al. "Design of an Injectable, Self-Adhesive, and Highly Stable Hydrogel Electrode for Sleep Recording." *Device* 0, no. 0 (December 5, 2023).

Hsieh, Ju-Chun, Mengmeng Yao, Benjamin Baird, and Huiliang Wang. "Protocol to Fabricate a Self-Adhesive and Long-Term Stable Hydrogel for Sleep EEG Recording." *STAR Protocols* 5, no. 2 (June 21, 2024): 103097.

Huglo, Elise. "Multi-Algorithm Calibration of Low-Cost Air Sensors to Measure Indoor Air Quality in Households within Vulnerable Communities." Poster presentation presented at Indoor Air 2024, Honolulu, HI, July 9, 2024.

Jarma, D., J. P. Maestre, J. Sanchez, S. Brodfuehrer, L. E. Katz, S. Horner, and K. A. Kinney. "Participant-Collected Household Dust for Assessing Microorganisms and Semi-Volatile Organic Compounds in Urban Homes." *Science of The Total Environment* 908 (January 15, 2024): 168230.

Jarma, David, Sam Lin, Evelyn Deveraux, Anna Neville, Pawel Misztal, and Kerry Kinney. "SVOC Quantification in Indoor Dust Collected from Residential Homes in Beaumont/Port Arthur, TX Using Thermal Desorption Vocus-PTR-TOF-MS." Oral presentation presented at Indoor Air 2024, Honolulu, HI, July 10, 2024.

* Jarma, David, Juan P. Maestre, Pawel K. Misztal, and Kerry Kinney. "Assessing Microbial and Chemical Exposures in Beaumont, Texas." Poster presentation presented at the American Association for Aerosol Research 41st Annual Conference, Portland, OR, October 5, 2023.

Khante, Priyanka, Edison Thomaz, and Kaya de Barbaro. "Auditory Chaos Classification in Real-World Environments." *Frontiers in Digital Health* 5 (2023).

* Lin, Chou-Hsien, Evelyn Deveraux, Daniel Blomdahl, David Jarma, Daniel Sung, Liv Haselbach, Sidney Lin, et al. "Air Pollutant Enhancements in Indoor Environment by Acute Outdoor Emission Events." Oral presentation presented at the Indoor Air 2024, Honolulu, HI, July 11, 2024.

Maestre, Juan, David Jarma, Evan Williams, Dennis Wylie, Sharon Horner, and Kerry Kinney. "Impacts of Outdoor Vegetation on Indoor Residential Microbiomes." Oral presentation presented at Indoor Air 2024, Honolulu, HI, July 9, 2024.

Maestre, Juan P. "Bevo Beacon, a Whole Communities-Whole Health Open Hardware Device for Air Quality." Oral presentation presented at the Latin American Sensors Network, Virtual, April 9, 2024.

* Maestre, Juan P., David Jarma, Evan Williams, Sharon Horner, and Kerry Kinney. "Indoor Microbial Exposure Differences between Urban and Rural Homes in Central Texas." Poster presentation presented at the American Association for Aerosol Research 41st Annual Conference, Portland, OR, October 3, 2023.

* Neville, Anna, David Jarma, Kerry Kinney, and Pawel Misztal. "Characterization of Human Exposure Sources in Human Hair and Indoor Dust Using a Thermal Desorption Vocus-PTR-TOF-MS (TD-Vocus)." Oral presentation presented at Indoor Air 2024, Honolulu, HI, July 8, 2024.

Tunis, Rachel, Tom Baranowski, Angelica Rangel, James Custer, Edison Thomaz, Paul Rathouz, Jay Bartroff, et al. "A Decentralized Clinical Trial of a Digital Intervention with Multiple Health Trackers for Heart Failure: Early Learnings and Practical Considerations." Oral presentation presented at the PervasiveHealth 2023, Malmo, Sweden, November 27, 2023.

Zapalac, Kennedy, Melissa Miller, Frances A. Champagne, David M. Schnyer, and Benjamin Baird. "The Effects of Physical Activity on Sleep Architecture and Mood in Naturalistic Environments." *Scientific Reports* 14, no. 1 (March 7, 2024): 5637.

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

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Rebecca Gomez
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Community Coalition for Health

Carl Hunter
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Zobeida Guerrero
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