IC²

Health AI for All

The IC² Institute
Annual Report
2023-2024

YEAR OF AI

IC² Institute
The University of Texas at Austin

Office of the Vice President for Research,
Scholarship and Creative Endeavors

IC²

Director's Welcome

Like the wider University community, this past year was the "Year of AI" at the IC² Institute. We launched exciting research initiatives, convened thought leaders around important conversations, and worked with partners to advance the responsible development of AI for health care.

The rapid acceleration of AI across society raises many compelling questions about the role AI will play in our lives. Not that long ago, technical experts like engineers and computer scientists would have been the ones to address these questions. With AI now deployed in domains like education, criminal justice, employment, finance, and health care, the stakes are higher and more of us must direct our talents to questions on the technical, social, and ethical implications of using machine intelligence in place of, or alongside, human intelligence. Our activities over the course of the past year highlight the diverse perspectives and expertise that are required in future applications of AI.

In partnership with Dell Medical School, the IC² Institute funded research projects that combine expertise in areas like oncology and pediatrics with expertise in computer science, epidemiology, and virtual production. These interdisciplinary projects offer an opportunity to drive both cutting-edge research in Health AI and innovations in real-world clinical applications.

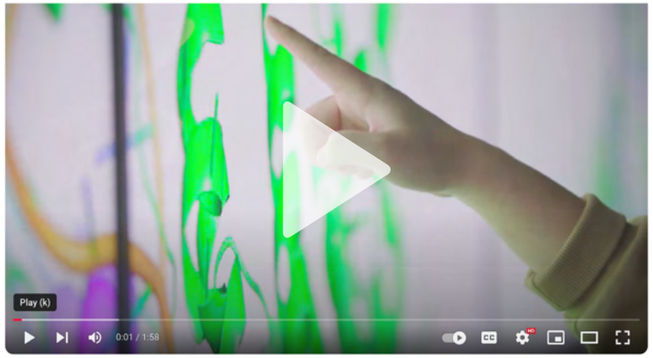
With funding from the Episcopal Health Foundation, IC² has engaged health care professionals across the diverse urban and rural regions of Texas to assess their views about the use of AI in health care. We've been able to highlight perspectives that are often overlooked in the design and deployment of Health AI — like why some populations either do not use or trust AI in health care. Our work with graduate students from UT Austin's Design in Health program proposes a human-centered approach that underscores the idea that health care is a domain where human intelligence and the human touch continue to matter.

Our team continued to collaborate with the Good Systems Grand Challenge at UT Austin. For example, we've worked with architectural engineers to use computational techniques to better understand disparities related to transportation and mobility experiences. And we've partnered with computational psychologists to probe disparities in maternal health outcomes. In a project funded by the National Institutes of Health, the IC² Institute has worked with researchers from UT's School of Information, Cornell University's Medical School, and Tuskegee Institute to use AI and machine learning to study the social risk factors impacting the rise of Black youth suicides.

So, as you read on, keep in mind why diverse perspectives and expertise must inform AI research and deployment. By broadening who participates in the development of AI, we can enrich future AI solutions and enhance the technology's ability to achieve more good than harm.

— S. Craig Watkins

Ernest A. Sharpe Centennial Professor,
Moody College of Communication
Executive Director, IC² Institute



2024 is the Year of AI at UT Austin

Year of AI at UT Austin

In the "Year of AI," The University of Texas at Austin spotlighted its commitment to advancing artificial intelligence research and innovation through interdisciplinary collaboration and cutting-edge projects, including targeted work by IC².

Leadership at the IC² Institute Conference, Spring 2023

Pictured at the IC² Institute Conference: Health AI for All, are (left to right) Dean Claudia Lucchinetti (Dell Medical School), President Jay Hartzell, Executive Director S. Craig Watkins, and Dean David Vanden Bout (College of Natural Sciences).

CONTENTS

IMPACT THROUGH AI

Health AI Strategy for Safety-Net Providers

With funding from the **Episcopal Health Foundation**, our researchers are seeking to understand how safety-net health care practitoners perceive, and use, Health AI in their delivery of health care to underserved populations. Existing AI research has yet to focus on safety-net providers and how they must consider both medical and non-medical drivers of health in their work.

This research includes extensive interviews, a literature review and a scenario-based survey; it will result in strategic findings and recommendations.

Learn more.

"Artificial Intelligence will dramatically impact the delivery of health care in the coming years. We believe that AI can play a critical role in addressing the needs of the safety-net population, increasing efficiency of care provision, and decreasing costs."

– **Gregory Pogue,**
Deputy Executive Director
and project researcher

Research Funding to Advance AI, Equity and Health Outcomes

The Institute, in collaboration with Dell Medical School, selected four faculty research awards to fund from a competitive field of proposals. The awarded projects cut across a variety of health domains and focus on AI development that is ethical, responsible and mitigates bias to drive targeted health outcomes. Learn more:

Enhancing Pediatric Health Equity Using Machine Learning

John Michael Virostko, MD, Oncology
Augusto Cesar Ferreira De Moraes, Epidemiology

Developing an AI-Based Diagnostic Tool for Epilepsy in Low-Resource Areas

Kristina Julich, MD, Neurology
Dan Freedman, MD, Neurology
Eunsol Choi, Computer Science

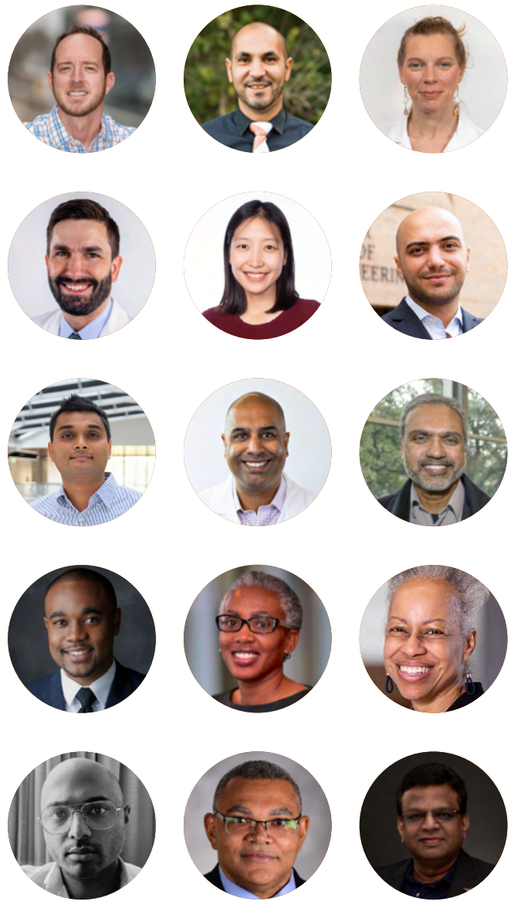
AI and Clinician Collaboration for Unbiased Colorectal Cancer Diagnosis

Farshid Alambeigi, Engineering
Sandeep Chinchali, Engineering
Joga Ivatury, MD, Surgery

Advancing Health AI for Diverse Populations

Ruben Rathnasingham, Medical Education
Adewole Adamson, MD, Internal Medicine
DeLawnia Comer-HaGans, Health Equity
Sharon Ricks, Health Equity
Deepak Chetty, Virtual Production
John-Paul Clarke, Engineering
Shiva Jaganathan, IRRIS

RESEARCH AWARD RECEPIENTS



Research Funding (cont.)

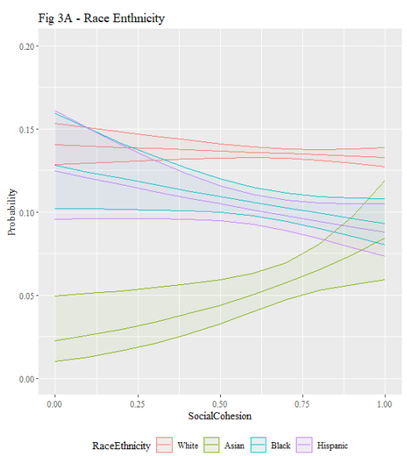
These projects address health disparities across rural and urban regions and different populations. The researchers are developing models and technologies to improve accuracy and fairness in the diagnosis and treatment of a variety of health conditions. Whereas most of the projects rely on existing datasets, one project explores the use of synthetic data. Importantly, the researchers leverage AI to support data analysis, model development and pilot implementation to assess or validate their approaches. All have a strong focus on health equity and responsible AI.

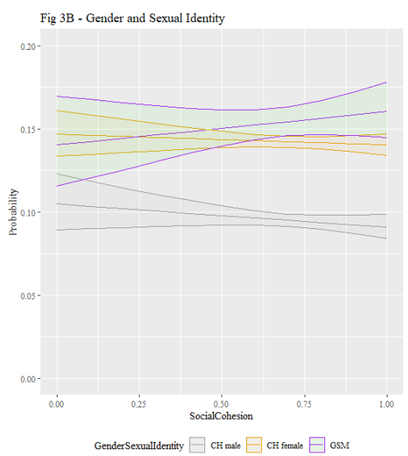
A Precise Methodology to Understand Social Determinants of Health

While it is becoming common knowledge that non-medical drivers of health – such as food security, education, transportation, safety and social relationships – impact health outcomes, there is more to learn about which of those social determinants have the strongest impact and how findings may vary across different groups of people.

IC² is exploring modeling techniques and refining a precision methodology to understand the distribution and impacts of non-medical drivers with more precision by working with large datasets (over 800,000 people) like the **All of Us** program managed by the National Institutes of Health.

To learn more, see **our news article** and our **publication in PLOS Mental Health**.





Impact of Social Cohesion on Depression Risk Across Race and Ethnicity

These figures illustrates the interaction between non-medical drivers of social cohesion and demographic factors related to race, ethnicity, gender, and sexuality. The vertical axis represents the predicted likelihood of an All of Us participant experiencing depression. The horizontal axis covers a range from 0 to 1 where higher values indicate greater social cohesion within a participant's neighborhood.

How Can AI Inform Suicide Interventions?

Suicide has persistently been a top cause of death among youth 10–24 years old and is receiving greater attention as the public becomes increasingly aware of the youth mental and behavioral health crisis. Since the mid-2010s, the suicide rate among Black youth has risen sharply. A grant from the National Institutes of Health this year has paved the way for a multidisciplinary research team from UT Austin, Cornell University, Prairie View A&M and Tuskegee University in Alabama to use AI and machine learning to understand the social risk factors that may predict Black youth suicide. A major project goal involves working with community stakeholders to design AI solutions that are aligned with community needs in order to develop more effective interventions. We are honored to have the Institute's S. Craig Watkins on this research team.

TEXAS The University of Texas at Austin

TUSKEGEE UNIVERSITY

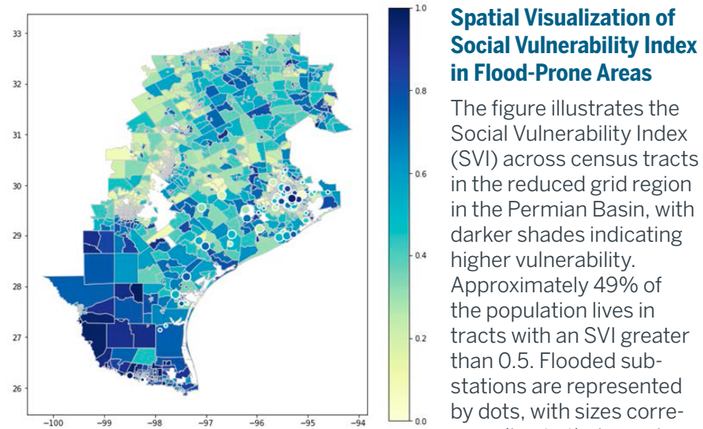
NIH National Institutes of Health

Weill Cornell Medicine

Addressing Social Equity in Grid Resilience

When there is a natural disaster, who loses power? What is the differential impact on communities?

Operations researchers released a report this year that aims to answer those questions and contribute to practical power grid solutions that address the disproportionate impact of natural disasters on vulnerable populations. The study was funded by IC². Using their own equity calculations and applying machine learning techniques, the team generated realistic flood scenarios and applied them to a large-scale synthetic power grid. The result is a grid management model that ensures both efficient resource allocation and equitable community impact.



Spatial Visualization of Social Vulnerability Index in Flood-Prone Areas

The figure illustrates the Social Vulnerability Index (SVI) across census tracts in the reduced grid region in the Permian Basin, with darker shades indicating higher vulnerability. Approximately 49% of the population lives in tracts with an SVI greater than 0.5. Flooded substations are represented by dots, with sizes corresponding to their maximum flood levels.

Learn more and read their publication, which was featured in *Socio-Economic Planning Sciences*.

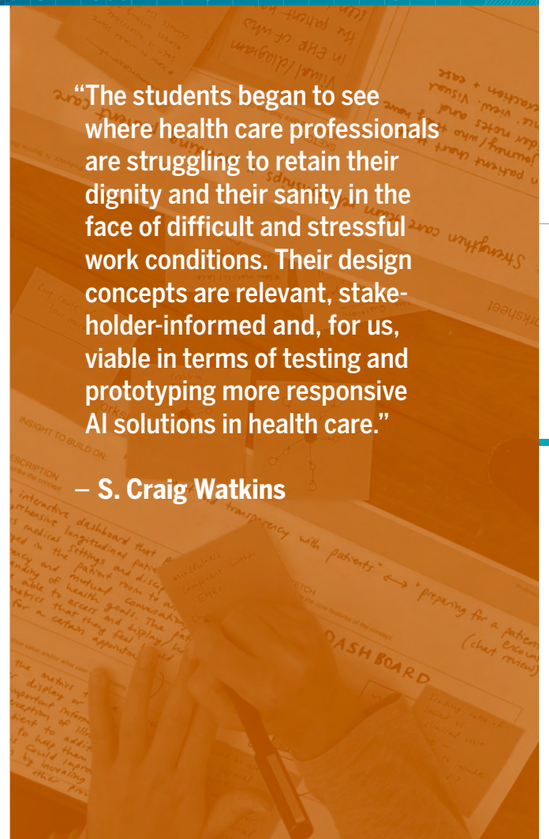
STUDENT ENGAGEMENT

Design in Health Capstone: Leveling the AI Playing Field for Social Services

In their capstone project for the IC² Institute, four graduate students – Isabel Alexander, Laura Long, Karl Sheeran and Tanya Sasnouskaya – interviewed health care workers in community settings to examine their daily realities and workflows and look for opportunities to integrate AI tools to address stressors and barriers to patient care.

Learn more.

Design in Health



"The students began to see where health care professionals are struggling to retain their dignity and their sanity in the face of difficult and stressful work conditions. Their design concepts are relevant, stakeholder-informed and, for us, viable in terms of testing and prototyping more responsive AI solutions in health care."

– **S. Craig Watkins**

"AI can gather all of the information and make it easier for clinicians to digest – so they can focus more on the person. Less time summarizing; more time analyzing."

– **Karl Sheeran**

Students in the 23–24 Academic Year

34
IC² Institute Research Students

22
Capstone Students

Perception of Artificial Intelligence Implementation by Mental Health Professionals

IC² sponsored a group of pharmacy doctoral students who conducted a project to explore mental health professionals' perceptions of AI implementation.

View poster.

Student Spotlight: Ishani Purohit

Ishani has worked as an IC² researcher for two years — first, on a team evaluating the **differential impacts of social determinants of health**, and more recently **exploring AI use in the delivery of health care in Texas**. She is pursuing a medical degree with ambitions of becoming a community-minded doctor, one who can connect the dots between the social, economic and environmental factors that affect a patient's health. Her experience and education spans public health, research and international relations.

Read more in our interview with Ishani.

"I love the work at IC² because it's very interdisciplinary and collaborative. Everyone has a unique perspective, and combining all of those perspectives enriches the project outcome."

— Ishani Purohit

Showcasing Student Impact

Sameen Rahman | Business

Coordinated a nationwide search for successful mentor-protégé programs for businesses and created recommendations for the City of Austin and Travis County.

Jasmine Wright | Latin American Studies

Met with community leaders on the Uvalde Community Asset Mapping and Economic Recommendation Report and on how to become a well-being hub.

James Lifton | Public Affairs

Interviewed health AI thought leaders to benefit rural safety-net service providers.

Irene Kim | Business

Developed resources and strategies for the Readiness Training Program for Historically Underutilized Businesses (HUBs).

Nayan Vashisht | Engineering

Focused on reinforcement learning for complex sociological systems, specifically wage theft and day laborers.

Daniela Lizarazo | Information Studies

Used statistical modeling, data science and deep learning for the I-Corps hub program.

AI-RELATED ENGAGEMENT

UT's Commitment to AI Excellence

As part of the Year of AI at UT Austin, the Institute's Director S. Craig Watkins engaged in key initiatives alongside UT President Jay Hartzell. Together, they traveled to Washington, D.C., to advocate for support of the university's artificial intelligence initiatives.

During their visit to Capitol Hill, they emphasized UT's leadership in AI workforce development and research, highlighting crucial contributions to national security and the economy. They addressed challenges such as competition with the private sector for top talent and announced 2024 as the "Year of AI" at UT, coinciding with the launch of a new Master of Science in Artificial Intelligence program. Key Texas congressional members expressed their support for UT's efforts.

Learn more.

Engaging Communities in Health AI

Craig also traveled to Atlanta to present at a special event: the AI for Health Equity Symposium, hosted by **The AIM-AHEAD Consortium** (Artificial Intelligence / Machine Learning Consortium to Advance Health Equity and Researcher Diversity), a program of the National Institutes of Health. Craig discussed how stakeholder engagement enhances and is critical to the development of health-oriented AI and machine learning systems.

Featured Guest: S. Craig Watkins on Smart, Ethical AI

Craig received numerous invitations—including two podcasts—to share his research, expertise and experience in the ethical and thoughtful development of AI – and the serious risks of designing AI and machine learing without incorporating varied forms of expertise.

Brené Brown: *Unlocking Us*

"We don't want to automate bias," Craig emphasized, as he and Brené discussed this very real risk. Craig highlighted the need for AI to be built with people rather than for people, and for us to consider how stories offer critical data that complement statistical data on specific human issues. Craig shared examples of how existing AI tools have unintentionally perpetuated bias – continuing to filter out women or people of color from job interviews, for instance, or predicting who is most likely to be arrested as a proxy for predicting who is most likely to commit a crime.

> **"Not even understanding or having the awareness to ask these questions [of how AI can perpetuate bias] can pose significant problems and challenges as we strive to develop systems that are high performing, systems that mitigate historical and legacy biases."**
>
> **– S. Craig Watkins**

Craig made the case for a more sophisticated and multidisciplinary approach to AI development so that AI tools consistently resist or remove biases. And he leads by example: IC² brings social scientists, designers and ethicists to the table in addition to computer scientists and engineers to consider AI's role in high-stakes problems, such as suicide among Black youth.

UT Austin's College of Natural Sciences and College of Liberal Arts: *AI for the Rest of Us*

On this podcast, Craig reiterated key points about responsible AI, including the need to integrate (1) a nuanced understanding of the different people a tool is designed to serve and (2) strategies to ensure AI can mitigate bias rather than sustain it.

He also discussed the fact that the real challenge is designing and deploying AI systems in ways that deepen rather than supplant human expertise, thus building an AI empowered society.

> "What we really should be building are systems that augment, support and enhance human intelligence and expertise – as opposed to building systems that automate, replace or substitute for human intelligence and expertise. That's going to be a really interesting challenge moving forward."

Guiding Nonprofits and Their Funders to Ethical AI

This year, IC² Director S. Craig Watkins and Board Member Jo Carcedo traveled to Los Angeles for the **Grantmakers for Effective Organizations** annual conference to present on The Future of Philanthropy in the Age of Artificial Intelligence and host a roundtable discussion about how nonprofits can begin to adopt AI in ethical and responsible ways. The larger event focused on sharing and developing community-driven grantmaking practices to support transformational change.

Read more in Jo's article.

Health Equity in AI Decision Residency

Matt Kammer-Kerwick of IC² joined the **Health Equity in AI Decision (HEAD) residency program** in England this summer. HEAD brings together early career and senior researchers from the US and UK to build a collaborative research community. Researchers incubate targeted projects on equity and universal accessibility in technology-driven health care, aiming for the root causes of disparities.

The impact of HEAD continued well beyond the residency week; Matt's project team has focused on equitable AI in decision support for underserved and isolated communities, including a project for the City of Austin examining energy and environmental sustainability decisions. The team includes Matt and:

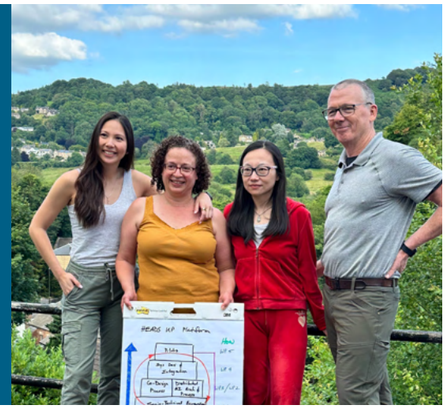
Pepita Barnard
Computer Science
University of Nottingham

Natalie Leesakul
Law
University of Nottingham

Yang Lu
Science, Technology and Health
York St John University

Mo Naiseh
Human-Centered AI
Bournemouth University

Arya Farahi
Data Science
UT Austin



Health AI for All Conference

How do we design and deploy Health AI to ensure that it benefits all segments of society?

Our April conference, Health AI for All, addressed this question by focusing on the social, clinical, ethical and economic implications of using AI in health care. Hosted in partnership with UT Austin's **Good Systems**, the event featured expert panels, on-the-ground insights and dynamic idea exchange.

Our 2024 Conference report and our highlights videos synthesize the event, and capture key ideas and plans to drive next steps by IC² and our partners. This year's event built directly on the collective learning from our 2023 conference.

VIEW OUR EVENT SYNTHESIS AND VIDEO

"Tools that we develop to serve the most vulnerable populations will make health care better for all of us. "

– **Kirsten Ostherr,**
Director, Medical Humanities Research Institute, Rice University

AWARDS, PUBLICATIONS, PRESENTATIONS

15 Publications

7 Reports

14 Presentations

2 Awards

PUBLICATIONS

We celebrated **22 publications and reports** this year, several of which are highlighted in this report.

See the full list.

Custom-Fit Community Development With the Permian Energy Development Lab

An inaugural report from the Permian Energy Development Lab provides a detailed snapshot of the diverse communities within the Permian Basin grounded in rigorous, county-level analysis. The Lab has 3 primary goals for its region of 50+ counties in 51,000 square miles:

- Catalyze advanced energy research.
- Prepare new energy professionals and entrepreneurs.
- Create value for energy communities.

The report offers direction for achieving these goals. Its authors used socioeconomic analysis to group the region's communities into seven distinct archetypes, which paves the way for customized research and workforce development initiatives that are responsive to the needs and nature of the Permian Basin's people.

Learn more: ***Community Archetypes in the Permian Basin and Their Relationship to Energy Resources*** by Elizabeth Ross and Jill Engel-Cox, National Renewable Energy Laboratory; Thushara Gunda, Sandia National Laboratories; & Gregory Pogue, IC² Institute

PERMIAN
Energy Development Lab

INSTITUTE PRESENTATION HIGHLIGHTS

We conducted **14 presentations** this year, showcasing our commitment to advancing health care solutions and community well-being. Notable presentations include:

College of Education and Health Professions, University of Arkansas
"Reaching All Community Members With Health Care: The Well-Being Hub Model"

Texas Health Catalyst, Dell Medical School, UT Austin
"Catalyzing Collaboration, Enhancing Innovation Outcomes: Lessons From Austin"

Healthier Texas Summit 2023
"Harnessing Health Data: New Approaches to Personalized Care"

Spotlight on Gregory Pogue: Fulbright Specialist

We are proud to highlight Gregory Pogue, who served as a **Fulbright Specialist** this year. He delivered a plenary lecture at the 1st Congress of Entrepreneurial Universities in São Paulo, Brazil, hosted by Universidade Federal do ABC. His presentation, Adding Healthcare Innovation to Austin's Entrepreneurial Culture, explored the evolution of the entrepreneurial ecosystem in Austin, Texas, and the significant impact that the introduction of Dell Medical School in the city had on life science and health care innovation.

The Fulbright Specialist Program coordinated this lecture and sends U.S. experts to consult on collaborative projects around the world.

Thank you, Greg, for your outstanding contributions and for representing our institute internationally!

AWARDS

This year, IC² was the proud recipient of **2 esteemed awards**:

Bold Inquiry Incubator

for Community-Engaged Research to Meet the Needs of Rural Communities After Mass Shootings

President's Award for Global Learning

for Leading With Peace - Lessons From Northern Ireland in partnership with nonprofit Corrymeela

The overlapping teams of scholars involved in these two initiatives:

Monica Muñoz Martinez, History
Noël Busch-Armendariz & **Caitlin Sulley**, Social Work
Gloria González-López, Sociology
Gregory Pogue, **Matt Kammer-Kerwick** & **Bruce Kellison**, Bureau of Business Research / IC² Institute

Students examine one of many "peace walls" scattered throughout Belfast as part of their global learning about peace and conflict in Northern Ireland.

ACKNOWLEDGMENTS

UT AUSTIN SPONSORED PARTNERSHIPS

Bold Inquiry Incubator
Center for Health Communication
Construction Industry Institute
Dell Medical School
Department of Civil Engineering
Department of Mechanical Engineering
Department of Statistics and Data Science
Energy Institute
Good Systems
Human Dimensions of Organizations
Moody College of Communications
School of Design and Creative Technologies
The UTeach Institute

SPONSORED PARTNERSHIPS

Austin Independent School District
Capital Metro
City of Austin:
- Austin Public Health
- Small and Minority Business Resources Department
- Office of Innovation
- Office of Sustainability

Episcopal Health Foundation
Hyvelocity Hydrogen Hub
LS Electric Co.
National Science Foundation
Permian Energy Development Lab
Public Utility Commission of Texas
Travis County Historically Underutilized Business (HUB) Division
U.S. Department of Defense

ENGAGED STAKEHOLDERS

Advanced Research Projects Agency for Health
AmeriCorps
Austin Community College
Austin Public Library
Black Men's Health Clinic
Center for Health Care Services
Central Health
Children's Medical Group
Deloitte
Episcopal Health Foundation
Form Communities
Good Systems
H-E-B Wellness
Impact Factory
JB-Advisory
Managed Health Connections, LLC
Measure
Medable
Medical Humanities Research Institute
Memorial Hermann Health System
MHMR of Tarrant County
Nexxus Project
Northwest Arkansas Association
Pediatrix
Precise Populations
Rice University
Sam Houston State University College of Medicine
Southwest Texas Regional Advisory Council
Spindletop
St. Luke Transplant Hospital
Stanford University
Stressie Inc.
Texas A&M:
- Digital Health
- Telehealth Institute

Texas Census Project
Texas Health and Human Services
Texas Suicide Prevention Collaborative
University of Arkansas
UT Austin:
- College of Natural Sciences
- College of Liberal Arts
- Department of Psychology
- Design in Health, College of Fine Arts
- Hogg Foundation for Mental Health
- LBJ School of Public Affairs
- School of Human Ecology
- School of Information
- School of Law
- School of Nursing
- Steve Hicks School of Social Work
- Texas Advanced Computing Center
- Texas Institute for Excellence in Mental Health
- Texas Technology Access Program

Vivent Health

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**New member for 2023–2024*

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IC²
Innovating Well-Being