Center for Outcomes Research
Houston Methodist Research Institute

“Leading Health Outcomes by Design”

2021 Annual Report

Director: Bita A. Kash, PhD, MBA, FACHE
Co-Director: Khurram Nasir, MD, MPH, MSc
Associate Director: Farhaan Vahidy, PhD, MBBS, MPH, FAHA

Research Administrator: Jennifer Taylor, MBA
Program Project Manager: Megan Taubert, MHA
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In the second year of the COVID-19 pandemic, the state of our nation may be summed up by pandemic fatigue, the “great resignation”, and staffing issues across most sectors. However, these trends did not hold true at the Center for Outcomes Research as our team continued to tirelessly pursue meaningful research, service and education activities to help advance knowledge and make a difference locally within our own institution. I am again impressed and most grateful for our team members’ resilience and commitment to our mission and for Houston Methodist leadership’s support for our projects and programs. In 2021 the Center for Outcomes Research secured $8,270,844 in external funding towards research, published 92 papers in peer-reviewed journals, supported over 50 COVID-19 projects via the newly established data registry (CURATOR), and supported over 20 dataset and data registry requests for the entire research enterprise at Houston Methodist. We feel a great sense of accomplishment in having provided value to the institution, which also included data analytics and statistical support services as part of the faculty development initiative at the COR.

HMRI leadership offered COR a substantial expansion budget beginning in 2020 to provide requisite funds to expand the center’s research activities and big data resources at Houston Methodist. These additional funds were used in 2021 to hire additional FTEs and to develop a robust data infrastructure capacity in collaboration with system IT leadership. As we expand our data platform capacity with key partners such as AWS and make substantial progress on big data and AI pilot studies, it has become very clear that our data and analytics platform will provide capacity to enrich insights beyond the electronic health record—targeting acquisition of genetic data; social determinants of health data; the microbiome; behaviors, motivations, patient-generated, and patient reported outcomes data—to develop novel approaches to identify effective ‘omic’ guided management. This powerful precision medicine ecosystem has already resulted in partnerships with industry and external collaborators to co-develop digital tools to track tailored therapies based on a more refined understanding of determinants of health that could translate into improved outcomes—necessary to fulfil the promise of precision medicine. Almost every type and clinical specialty will be using AI, particularly deep learning, in the future. FDA approvals of AI algorithms are accelerating, and Houston Methodist is going to be well positioned to participate and lead in this space by the end of 2022.

Looking ahead into 2022, we are preparing to take on a bit more of a standardized operational approach to managing and nurturing a much larger research center and data services team. Again, we anticipate expanding the collaborative research model to additional clinical departments and delivering on the Big Data & Artificial Intelligence pilot projects and the institutional research data lake. Learning and new knowledge will continue to be at the forefront of our mission as we forge ahead towards better health outcomes by design.

I am most humbled and grateful as we embark on 2022 with renewed energy and drive!

_Bita A. Kash, PhD, MBA, FACHE_
Occidental Petroleum Centennial Chair in Quality and Outcomes Research
Director, Center for Outcomes Research, Houston Methodist Research Institute
Co-Director, Center for Health & Nature, Houston Methodist Research Institute
Professor of Outcomes Research, Houston Methodist Institute for Academic Medicine
Adjunct Professor of Healthcare Policy and Research, Weill Cornell Medical College, Cornell University
Co-Director, NSF Center for Health Organization Transformation (CHOT)
Professor, Department of Health Policy & Management
Joint Professor, Department of Environmental & Occupational Health
Texas A&M University School of Public Health
Vision

“Leading Health Outcomes by Design”

Mission

The mission of the Center for Outcomes Research (COR) is to conduct applied team research, develop researchers, and exert national leadership towards improved health outcomes for diverse patient populations by:

- Designing,
- Implementing, and
- Testing & validating innovations in healthcare delivery.

Purpose

Center leadership and scientists ensure that their discoveries impacting patient outcomes are implementable in actual practice. Research findings are disseminated and translated into actionable strategies for healthcare leaders to implement seamlessly.

Organizational Model

The organizational model of the center is based on the expectation that the center’s clinician-scientists from Houston Methodist, research scientists trained in health services research methods at the COR, and researchers from Texas A&M University will collaborate as “multi-disciplinary team researchers” pursuing externally-funded research agendas within the center’s mission, purpose, and research cores. Hallmarks of successful center scientists include a strong record of external funding and a high level of productivity in the publication of manuscripts and in relevant leadership activities at the national level. The center’s infrastructure is designed to assure excellence in research, remove obstacles to research and external funding, decrease research cycle time, and maximize the usefulness of research results.
Center for Outcomes
Research 2021
Organizational Chart

- President & CEO, Research Institute (E. Jones)
- EVP, Chief Physician Executive, & Specialty Physicians Group CEO (Phillips)
- Director, Center for Outcomes Research (Kash)
- Co-Director, Center for Outcomes Research (Nissk)
- Associate Director, Center for Outcomes Research (Validy)
- Administration, Center for Outcomes Research (Taylor)

- IT Services - System Level (Kumar)
- Center for Innovation (Schwartz)
- Faculty Development - System Level (Lewis)

- Data Science Services Center
  - Dir. of IT in Outcomes Research (S. Jones)
  - Division Chief, Faculty Development (Kash)
  - Division Chief, Statistics & Research Design (Ju)

- Collaborative Research Programs
  - Cancer (Cheng & Kash)
  - Heart & Vascular (Zeng & Kash)
  - Transplant (Ghazarian & Monroy)
  - Surgery (Gaber & S. Jones)
  - Neurology (Huang & Validy)
  - Ortho (Kash & YBD)
  - Critical Care (Mosel & Kash)
  - Infectious Disease (TBD & TBD)

- Research Programs
  - Division Chief, Health Economics & Machine Learning (Marath)
  - Division Chief, Population Health Science & IT (Validy)
  - Division Chief, Education & Engagement (Wardman)
  - Division Chief, Health Systems Engineering (Sanghavi)
  - Co-Directors, Center for Health & Nature (Kash & Mockler)
## Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Position in the Center</th>
<th>Faculty Rank</th>
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<tbody>
<tr>
<td>Bita Kash, PhD, MBA, FACHE</td>
<td>Director</td>
<td>Professor</td>
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<tr>
<td>Khurram Nasir, MD, MPH</td>
<td>Co-Director</td>
<td>Professor</td>
</tr>
<tr>
<td>Farhaan Vahidy, PhD, MBBS, MPH, FAHA</td>
<td>Associate Director</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>Jay Maddock, PhD, FAAHB</td>
<td>Co-Director, Center for Health &amp; Nature</td>
<td>Adjunct Professor</td>
</tr>
<tr>
<td>Stephen Jones, MD, MSHi</td>
<td>Director of Health Informatics in Outcomes Research</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>Susan Xu, PhD</td>
<td>Biostatistician</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>Adriana Ordonez, PhD</td>
<td>Biostatistician</td>
<td>Instructor</td>
</tr>
<tr>
<td>Miguel Cainzos-Achirica, MD, MPH, PhD</td>
<td>Scientist</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Terri Menser, PhD, MBA</td>
<td>Scientist</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>George Naufal, PhD</td>
<td>Visiting Scientist</td>
<td>N/A</td>
</tr>
<tr>
<td>Farzan Sasangohar, PhD</td>
<td>Scientist</td>
<td>Assistant Professor</td>
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## Affiliated Faculty

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Ohbet Cheon, PhD</td>
<td>Affiliate Faculty</td>
<td>Adjunct Assistant Professor</td>
</tr>
<tr>
<td>Mark Hobelka, MD, FACS</td>
<td>Affiliate Faculty</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Linda Moore, PhD, RDN, CCRP</td>
<td>Affiliate Faculty</td>
<td>Associate Research Professor</td>
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<tr>
<td>Raj Satkunasivam, MD, MS, FRCSC</td>
<td>Affiliate Faculty</td>
<td>Associate Professor</td>
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<tr>
<td>Joshua Swan, PharmD, MPH, FCCM, BCPS</td>
<td>Affiliate Faculty</td>
<td>Associate Professor</td>
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<tr>
<td>Stephanie Yi, MD, MPH, FACS</td>
<td>Affiliate Faculty</td>
<td>Associate Professor</td>
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## Staff

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Isaac Acquah, MBChB, MPH</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Sofiat Adegbindin</td>
<td>Research Technician I</td>
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<tr>
<td>Nima Ahmadi, PhD</td>
<td>Postdoctoral Fellow</td>
</tr>
<tr>
<td>Juha Baek, DrPH</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Eman Baig, MS</td>
<td>Research Assistant I</td>
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<tr>
<td>Abdulaziz Bako, PhD</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Lauren Beal</td>
<td>Research Technician I</td>
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<tr>
<td>Budhaditya Bose, MS</td>
<td>Data Scientist</td>
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<tr>
<td>Sara Butt, MS</td>
<td>Data Engineer</td>
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<tr>
<td>Katharine Diouhy</td>
<td>Program Project Manager</td>
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<tr>
<td>Rakesh Gullapelli, MS</td>
<td>Data Scientist</td>
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<tr>
<td>Name</td>
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<tr>
<td>Kobina Hagan, MBChB, MPH</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Enshuo “David” Hsu, MS, MA</td>
<td>Biostatistician</td>
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<tr>
<td>Zulqarnain Javed, PhD</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Imory Jefferson, MPH</td>
<td>Research Coordinator II</td>
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<tr>
<td>Carnayla Johnson, MSW</td>
<td>Research Assistant I</td>
</tr>
<tr>
<td>Osman Khan</td>
<td>Research Data Analyst</td>
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<tr>
<td>Jacob Kolman, MA</td>
<td>Senior Scientific Writer</td>
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<tr>
<td>Shubham Lahan, MBBS</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Jennifer Meeks, MS, CCRP</td>
<td>Program Project Manager</td>
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<tr>
<td>Juan “Charlie” Nicolas</td>
<td>Systems Architect</td>
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<tr>
<td>Marilyn Niravath</td>
<td>Research Data Analyst</td>
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<tr>
<td>Tariq Nisar, MPH</td>
<td>Biostatistician</td>
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<tr>
<td>Nwabunie Nwana, PhD</td>
<td>Data Scientist</td>
</tr>
<tr>
<td>Ebele Nwankwo, EdD</td>
<td>Research Coordinator III</td>
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<tr>
<td>Alan Pan, MS</td>
<td>Data Scientist</td>
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<td>Thomas Potter, PhD</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Sharmila Pratap, MSIS, MBA</td>
<td>Senior Applications Analyst</td>
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<tr>
<td>Pratima Saravanan, PhD</td>
<td>Postdoctoral Fellow</td>
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<tr>
<td>Jacob Siahaan</td>
<td>Graduate Research Fellow/ Research Technician I</td>
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<tr>
<td>Bridget Simon-Friedt, PhD</td>
<td>Postdoctoral Fellow</td>
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<td>Alec Smith</td>
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<td>Ineen Sultana, MS</td>
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<tr>
<td>Jonika Tannous, PhD</td>
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<td>Mauricio Tano, PhD</td>
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<td>Megan Taubert, MHA</td>
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<td>Jennifer Taylor, MBA</td>
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<tr>
<td>Javier Valero-Elizondo</td>
<td>Senior Research Associate</td>
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<tr>
<td>Hannah Willingham</td>
<td>Research Assistant I</td>
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<tr>
<td>Janice Wilson</td>
<td>Research Technician I</td>
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**Total COR Faculty/Staff**

<table>
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<tr>
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<td>Postdoctoral Fellows</td>
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<tr>
<td>Staff</td>
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</table>
Faculty

**Bita Kash, PhD, MBA, FACHE**
is the Occidental Petroleum Chair in Quality and Outcomes Research, director of the Center for Outcomes Research, co-director of the Center for Health & Nature, professor in the Academic Institute, and a full member of the Research Institute at Houston Methodist. Dr. Kash is also a professor at Texas A&M University’s School of Public Health and is the co-director of a seven-university National Science Foundation (NSF) industry/university cooperative research center – the Center for Health Organization Transformation (CHOT) – anchored at Texas A&M University.

**Khurram Nasir, MD, MPH, MSc**
is the co-director and the division chief of Health Equity & Disparities Research in the Center for Outcomes Research. Dr. Nasir is also the director of Cardiovascular Prevention and Wellness at Houston Methodist DeBakey Cardiology Associates. He is also professor of Cardiology and a Katz Investigator at the Houston Methodist Academic Institute.

**Farhaan Vahidy, PhD, MBBS, MPH**
is the associate director and division chief of Population Health Science in the Center for Outcomes Research and holds the Coneway Family Centennial Endowed Directorship in Quality and Outcomes. Dr. Vahidy joined Houston Methodist in January of 2020. Dr. Vahidy is also an associate professor of the Academic Institute, an associate member of the Research Institute at Houston Methodist, and an associate professor in the department of population health science at Weill Cornell Medical College.

**Jay Maddock, PhD, FAAHB**
is the co-director for the Center for Health & Nature. He is also a professor at Texas A&M University School of Public Health and at Houston Methodist he is an adjunct professor of Outcomes Research at the Academic Institute, as well as a Full Affiliate Member of the Research Institute.
Stephen Jones, MD, MSHI
is the director of Health Informatics in Outcomes Research in the Center for Outcomes Research, an associate research professor in the Academic Institute, and an associate research member in the Research Institute at Houston Methodist.

Susan Xu, PhD
is a biostatistician in the Center for Outcomes Research, an associate research professor of Biostatistics in the Academic Institute and an associate research member in the Research Institute at Houston Methodist. She is also the division chief of Statistics and Research Design in the Center for Outcomes Research.

Adriana Ordonez, PhD
is a biostatistician in the Center for Outcomes Research and instructor in the Research Institute and Academic Institute at Houston Methodist.

Miguel Cainzos-Achirica, MD, MPH, PhD
is an assistant professor of Preventive Cardiology in the Center for Outcomes Research at Houston Methodist Academic Institute. Dr. Cainzos-Achirica is also the associate director of Preventive Cardiology Research in the Division of Cardiovascular Prevention & Wellness at Houston Methodist DeBakey Cardiology Associates.
**Terri Menser, PhD, MBA**
is a scientist at the Center for Outcomes Research, an assistant professor in the Academic Institute, and an assistant member in the Research Institute at Houston Methodist.

**George Naufal, PhD**
is a visiting scientist and the division chief of Health Economics and Machine Learning in the Center for Outcomes Research. He is also an assistant research scientist at the Public Policy Research Institute (PPRI) at Texas A&M University. Dr. Naufal is working on the Occidental Petroleum funded project “Assessment of Access to Specialty Care Among Underserved Patients.”

**Farzan Sasangohar, PhD**
is a scientist in the Center for Outcomes Research, an assistant professor in the Academic Institute, and an assistant member in the Research Institute at Houston Methodist. Dr. Sasangohar is also an assistant professor in the Department of Industrial and Systems Engineering and the director of the Applied Cognitive Ergonomics Lab at Texas A&M University. He also serves as the division chief of Health Systems Engineering in the Center for Outcomes Research.
Postdoctoral Fellows

Isaac Acquah, MBChB, MPH
is a postdoctoral research fellow at the Center for Outcomes Research. He earned his medical degree at the University of Ghana School of Medicine and Dentistry and his Master of Public Health Degree at the Harvard T.H. Chan School of Public Health. Using large datasets such as the National Health Interview Survey, Dr. Acquah’s research work at Houston Methodist focuses on financial and non-financial barriers to healthcare access among individuals with cardiovascular disease. Under the mentorship of Dr. Khurram Nasir he is also working on the use of coronary artery calcium as a risk-stratification tool for preventive therapy among individuals without established cardiovascular disease. His other interests include payment systems and healthcare quality and safety.

Nima Ahmadi, PhD
is a postdoctoral fellow at the Center for Outcomes Research. He has a doctoral degree in Engineering Management. His primary area of focus is human factors engineering. Nima is passionate about behavioral assessments, development of training interventions, naturalistic studies, and data analysis. He developed gaze-based training interventions for novice drivers and pilots and investigated burnout and stress of intensive care unit (ICU) clinicians using biometric data and wearable technologies. Furthermore, Nima explored the potential of eye tracking technology in the assessment of ICU nurses’ mental workload. Currently, Nima is working on a study to develop an application for breast cancer survivors.

Juha Baek, DrPH, MPSA
is a postdoctoral fellow at the Center for Outcomes Research (COR). He earned his doctoral degree at Texas A&M University School of Public Health. His doctoral work focused on the effects of ambient air pollution on hospitalization and readmissions for children with asthma. His primary research interests include hospital readmission, hospital-community partnership, asthma/diabetes management and education, health disparity, and environmental health. Dr. Baek’s current research activities are related to digital disparity in use of telemedicine, interventions to reduce disparity for living donor kidney transplantation, and community-based specialty care among underserved patients.
Abdulaziz Bako, MBBS, MPH, PhD
is a postdoctoral fellow at the Center for Outcomes Research. Dr. Bako obtained his medical diploma (MBBS) from Bayero University Kano, Nigeria, Master of Public Health (Health Policy and Management) degree from Texas A&M University, and PhD in Health Policy and Management from Indiana University. His doctoral dissertation focused on using data mining and text mining techniques, including natural language processing, machine learning, and deep learning, to evaluate the impact of social needs and social interventions on health outcomes. At Houston Methodist, Abdulaziz is working under the mentorship of Dr. Farhaan S. Vahidy to study the epidemiology of primary intracerebral hemorrhage using nationally representative databases, as well as to evaluate the clinical and demographic factors associated with health outcomes for patients with stroke in general, and intracerebral hemorrhage in particular.

Kobina Hagan, MBChB, MPH
is a postdoctoral fellow at the Center for Outcomes Research. He obtained his medical diploma from the Kwame Nkrumah University of Science and Technology, and his Master of Public Health degree at the Harvard TH Chan School of Public Health. Dr. Hagan’s research work at Houston Methodist focuses on social determinants of COVID-19 outcomes, especially among cardiovascular disease patients and socially vulnerable groups. Under the mentorship of Dr. Khurram Nasir, he is also working on patient-reported outcome measures in cardiovascular disease populations using National Health Interview Survey and Medical Expenditure Panel Survey datasets. His other interests include sleep disturbances and exercise behaviors in migraine populations.

Zulqarnain Javed, PhD, MPH, MBBS
is a clinical epidemiologist, currently serving as a Fellow in the Center for Outcomes Research. Before joining Houston Methodist, he served as a Healthy Policy Fellow at Morehouse School of Medicine, under the leadership of Dr. David Satcher (16th US Surgeon General), and Visiting Scientist at the Centers for Disease Control and Prevention. Dr. Javed is on a mission to advance the cause of health equity locally, nationally and globally through rigorous translational research, informed dissemination, and partnerships with key stakeholders. He has extensive training in the areas of research design, epidemiological methods and data management, and the application of these skills to leading public health issues of national and global relevance. His research focuses on social determinants of health, racial/ethnic disparities in cardiovascular disease, and issues related to access and quality of care in vulnerable populations. Dr. Javed has several years of experience in big data analytics, including the use of large administrative claims and survey databases for health outcomes and comparative effectiveness research. He received his PhD from the University of Texas Medical Branch, MPH from New York Medical College, and MBBS from King Edward Medical University, Pakistan.
Shubham Lahan, MBBS
is a postdoctoral fellow in the Division of Cardiovascular Prevention & Wellness at the Center for Outcomes Research working in Nasir Lab. He completed his medical training from the University College of Medical Sciences, New Delhi, India. He has worked with the department of Cardiology at Mount Sinai, NY during his advanced clinical rotations. His research focuses on utilizing big databases and patient registries to understand social determinants of health in cardiovascular disease and improve patient outcomes. He is interested in building decision support tools using machine and deep learning applications to accelerate narrowing of cardiovascular care gaps. A list of his publications is available on PubMed & Google Scholar.

Thomas Potter, PhD
is a postdoctoral fellow in the Center for Outcomes Research. He earned his doctoral degree at the University of Houston in Biomedical Engineering, with a focus in functional neuroimaging. His primary research interest is applying neuroimaging to better understand cognition and how it is affected by external factors. His doctoral research focused on developing EEG and fMRI processing methods to better understand the brain’s processing of external and internal stimuli. At Houston Methodist, he is working with Dr. Farhaan Vahidy to explore the imaging markers of Small Vessel Disease and intracerebral hemorrhage, their contributory factors, and their relationship to long-term cognitive outcomes.

Pratima Saravanan, PhD
is a postdoctoral fellow at the Center for Outcomes Research at the Houston Methodist Hospital. She earned her PhD in Industrial Engineering with a focus on Human Factors, MS in Industrial Engineering, and MS in Bioengineering at The Pennsylvania State University. Dr. Saravanan’s doctoral dissertation focused on developing an evidence-based clinical decision support system for lower-limb prosthetic prescription by capturing expert decision-making. Her primary research interests involve cognitive sciences, human factors in healthcare, and clinical decision-making. Currently, at Houston Methodist, Dr. Saravanan is working on developing training tools for nursing students for early sepsis detection, understanding the impact of COVID-19 pandemic on the stress and workload of ICU nurses, and investigating provider burnout.

Bridget Simon-Friedt, PhD
is a postdoctoral fellow in the Center for Outcomes Research. She earned her doctoral degree at Tulane University School of Medicine in Biomedical Science. Her research focused on developing improved toxicological methods for testing exposure to relevant levels of environmental chemicals and mixtures on human health. Dr. Simon-Friedt also examined public health implications of risk assessment and communication for vulnerable populations during disasters. At Houston Methodist, her research explores the differential presentation of sepsis across age groups as well as evaluation of environmental factors and the role of social determinants on health outcomes across Texas.
Major Accomplishments

Overview
In 2021, the Center for Outcomes Research continued to focus on recruitment of new talent, external funding and further expansion planning to advance the mission and vision of the Houston Methodist Research Institute. The team remained very productive throughout the course of the year, participating in a total of 31 ongoing internal projects, 92 published articles, and 49 conference presentations. Our core funding from the Houston Methodist Research Institute was $3,962,369. We had a successful year with external funding, with funds secured totaling $8,270,844. More details on these statistics are shown below on our dashboards and through various tables.

Philanthropic Funds
The Center for Outcomes Research continues to have success securing philanthropic funds to cover salaries and support research studies. Ongoing philanthropic accounts in the Center for Outcomes Research during 2021 include:

- $100,000 annual commitment from the Marek family to support the Center for Health & Nature for 2020-2024
- $1,000,000 gift established in 2020 from the Reynolds and Reynolds Company to support infectious disease outcomes research, including the CURATOR database as well as outcomes research from COVID-19
- $2,000,000 commitment from the Walter Fund for Innovation to support the Center for Outcomes, Quality, and Patient Safety Research, which will leverage the science that supports our world-leading quality and safety program, further develop programs to deliver advances in population health, and support patient outcomes research
- $1,000,000 commitment over five years (began in 2020) from The Coneway Family Centennial Chair in Quality and Outcomes assigned to support Dr. Farhaan Vahidy’s research in the Center for Outcomes Research
- Quality Institute Initiative: $22,500 available for the Center for Health & Nature
- Center for Health & Nature Gifts: $100,048 available for use in 2021
- Occidental Petroleum Health Outcomes – Quality of Life Improvement Program and Centennial Chair: $175,000 available for use in 2021
- President’s Innovation Council: funds to cover salaries for the data scientist and statistician to assist junior clinician faculty: $250,000 available for use in 2021

Recruitment
The Center had another successful year in recruiting. We had 12 new employees start in 2021, with 3 additional recruited that will start in 2022. The positions filled include a statistician, multiple research assistant I’s, research coordinators (II and III), and research technicians, two postdocs, and two data scientists.

Retrospective Research Task Force and the COVID-19 Surveillance and Outcomes Registry (CURATOR)
At the start of the COVID-19 pandemic, a Retrospective Research Task Force (RRTF) was put in place to help with the overwhelming number of COVID-19 study proposals and protocols being generated and submitted at Houston Methodist. The Center for Outcomes Research led the efforts of the RRTF. The RRTF reviewed COVID-19 related study protocols before they were submitted to the IRB. The RRTF met weekly to review retrospective research study protocols that were COVID-19 related and to advise on next steps. Throughout the course of 2021, RRTF reviewed 25 protocols for a total of 88 since its inception in 2020.

The COVID-19 Surveillance and Outcomes Registry (CURATOR) was established as a comprehensive bioinformatics pipeline linked to a robust data warehouse that supports cross-institutional COVID-19 research. CURATOR is a true operationalization of the Learning Health Care system focus of Houston Methodist. It is an umbrella protocol with an
IRB approved scope and governance structure. The data repository is massive collecting detailed socio-demographic, clinical, and outcome information on all COVID-19 tested and vaccinated individuals. The resource has already been utilized for several high impact publications and has provided data for grant submissions. To date, CURATOR supports over 50 IRB approved protocols across several clinical domains.

Center for Health & Nature

2021 was a successful year for the Center for Health & Nature (CHN). Official agreements were signed, the 2021 Health & Nature virtual symposium was held successfully, and key personnel were recruited at the end of the year. The CHN also continued with multiple research studies, some carried over from 2020 and some new projects that began in 2021.

- **Agreements**
  - The official agreement between Texas A&M University & Houston Methodist was signed in July 2021. This agreement provides funds for the CHN through June 2024. In August 2021, Texas A&M University School of Public Health officially recognized CHN as a Center.

- **2021 Health & Nature Symposium**
  - The 2021 Health & Nature Symposium was held on December 8th, 2021. It was held virtually again due to the ongoing COVID-19 pandemic. The overall theme of the symposium was “The Nature of Change” which was then broken up into three different segments – A Healthier You, Working to Make A Difference, and Planning Comes Naturally. The format featured one keynote speaker and three to four speakers per segment. Each segment had a live Q&A and there was a reflection/ action panel at the end of the symposium that featured all the speakers.

- **Recruitment**
  - A consultant, Katy Atkiss, and a postdoctoral fellow, Omar Elsayed, were both recruited in 2021. They both will begin working for CHN in early 2022.

- **Funded Research**
  - **Nature Measures Study (PI: Jay Maddock, PhD, FAAHB)**
    - This project is a nationwide measurement development study to create social cognitive measures for spending time in nature. It is internally funded.
  - **Bayou Greenways Health Impact Study (PIs: Jay Maddock, PhD, FAAHB; Bita Kash, PhD, MBA, FACHE; Khurram Nasir, MD, MPH, MSc)**
    - This project is funded by the Houston Parks Board. This is a health impact study to measure the physical and mental health benefits resulting from use of the open access greenspace and trails developed through the Bayou Greenways Initiative 2020.
  - **Developing Health Behavior Change Scales for Health & Nature (PI: Jay Maddock, PhD, FAAHB)**
    - This project is funded by the Marek Gift. The goal of this study is to develop social cognitive measures for being in nature.
  - **Effects of Travel to Natural Environments on Health and Wellbeing. (PI: Jay Maddock, PhD, FAAHB, Courtney Suess, PhD, George Mann, PhD).**
    - This project is funded by Texas A&M University. The goal of this study is to understand the effect of nature exposure on restoration and health.
<table>
<thead>
<tr>
<th>COR Grant Applications</th>
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<tbody>
<tr>
<td><strong>Submitted</strong></td>
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<tr>
<td>Medical Record-Enriched Database on a Sample of COVID-19 Patients in TriNetX Data</td>
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<tr>
<td>Reducing Health Disparities in Stroke Care</td>
</tr>
<tr>
<td>CMR Detection of Myocardial Infarction Involvement After COVID-19: Implications for post infection CV management</td>
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<tr>
<td>NeuralCODR Fellowship</td>
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<tr>
<td>Spinal Stimulation for Standing after SCI</td>
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<tr>
<td>SBIR-Abilitech</td>
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<tr>
<td>Addressing Social Determinants of Health to Improve Health Outcomes for All</td>
</tr>
<tr>
<td>Recovery and Outcomes from Stroke (ROSE) - NIH Subaward via University of Cincinnati</td>
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<tr>
<td>Recovery and Outcomes from Stroke - Longitudinal Assessment with Neuroimaging (ROSE-LAWN) - NIH Subaward via University of Cincinnati</td>
</tr>
<tr>
<td>COVID-19 Neuro Databank/Biobank (NeuroCOVID) - NIH Subaward via NYU Langone</td>
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<tr>
<td>COVID-19 Surveillance and Outcomes Registry</td>
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<tr>
<td>COVID-19 RECOVERY</td>
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<tr>
<td>SARS-CoV-2 and Precursors of Alzheimer’s Disease and Related Dementias: An Ultrahigh Field (7T) MRI Study in a Diverse Multinational Cohort (funded as an R56)</td>
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<td>NIH R01: Non-invasive imaging of oncophysical parameters as markers for tumor progression, metastasis and response to treatments</td>
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<tr>
<td>RECALL-SONIC: Recognition of Emerging Conditions Learning Lab with Schools of Nursing Inter-university Consortium</td>
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<tr>
<td>Investigation of stress and workload of Intensive Care Unit Nurses During COVID-19 Pandemic</td>
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<tr>
<td>Near-Infrared Sensitive Nanoparticle Photothermal Ablation for Recurrent Ventricular Tachycardia</td>
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<tr>
<td>TAMU PCRP: Heart Health and Nature (H2N): Does Exposure to Physical and Virtual Nature Benefit Women at Risk for Cardiovascular Disease?</td>
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<tr>
<td>Coronary Atherosclerosis, Myocardial Injury, and Clinical Risk Prediction in South Asians in the U.S.</td>
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<tr>
<td>$100A4 mediated immune suppression in GBM</td>
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<td>Nanomedicine for Advanced Breast Cancer Personalized to the Organ Microenvironment</td>
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<td>Dyer Fellowship</td>
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<td>Building an Accessible &amp; Remote Resource Intervention for End-stage Renal Disease Options across Wide Networks (BARRIER-DOWN)</td>
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<tr>
<td>ACS: Pilot and Exploratory Projects in Palliative Care of Cancer Patients and Their Families - Virtual and Nature-based Pain Management for Cancer Patients and Caregivers</td>
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### 2021 External Funding

#### External Awards & Applications (#)
- **Non-Government**: 3
- **Government**: 6
- **Endowed Gift**: 2

Total: 11

#### External Funding Submitted
- **Non-Government**: 9
- **Government**: 12
- **Endowed Gift**: 2

Total: 23

#### Total External Awards & Applications ($) (Dollars)
- **Non-Government**: 71.0%
- **Government**: 75.6%

Total: $8.27M

#### External Funding Submitted (Dollars)
- **Non-Government**: 19.6%
- **Government**: 75.6%

Total: $23.04M

### 2021 COR Internal Projects

<table>
<thead>
<tr>
<th>Category</th>
<th>Actual</th>
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<tr>
<td>Total Actual</td>
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<tr>
<td>Target</td>
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#### By Target Service Lines

- **System Innovations**: Actual: 10
- **Heart & Vascular**: Actual: 7
- **Transplant**: Actual: 5
- **Cancer**: Actual: 3
- **Neurology**: Actual: 3
- **Surgery**: Actual: 2
- **Health & Nature**: Actual: 1
- **Population Health**: Actual: 0
### 2021 Dissemination

Click on the individual bars to see the additional detail information. Press ESC to reset.

- **Conference - Oral/Paper Presentations**
  - Actual: 7

- **Conference - Posters/Abstracts**
  - Actual: 42

- **COR Insights**
  - Actual: 3

- **Publications**
  - Actual: 92

### 2021 Faculty Development

#### Faculty Development

- **COR Collaborative Project**
  - 21 (No)
  - 77 (Yes)
  - Total: 98

- **Grant Application**
  - 19 (No)
  - Total: 20

#### Junior Faculty Development by Department

- Anesthesiology: Total: 1
- Cancer: Total: 1
- Cardiology: Total: 1
- Clinical Surgery: Total: 1
- ENT: Total: 1
- General Surgery: Total: 1
- Hematology/Oncology: Total: 1
- HMRI Biorepository: Total: 1
- Nanomedicine & CV Surgery: Total: 1
- Neurology: Total: 6
- OB/GYN: Total: 3
- Oncology: Total: 1
- Pharmacy: Total: 1
- Surgery: Total: 2
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<thead>
<tr>
<th>System Innovations</th>
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<tr>
<td>Jones</td>
<td>Chung</td>
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<td>Jones/ Kash</td>
<td>Phillips</td>
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<td>Jones/ Sasangohar</td>
<td>Steadman</td>
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<td>Jones/ Vahidy</td>
<td>Easter</td>
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<td>Montgomery</td>
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<td>Masud</td>
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<td>Vahidy</td>
<td>Masud/ Zheng</td>
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<th>Heart &amp; Vascular</th>
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<td>Nasir/ Zoghbi</td>
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<td>Nasir/ Quigley/ Abraham/ Al-Mallah</td>
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<td>Nasir/ Kash</td>
<td>Nasir/ Andrieni/ Zoghbi</td>
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<td>Nasir/ Kash</td>
<td>Nasir/ Chang</td>
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<td>Jones</td>
<td>Ibrahim/ Gaber/ Swan/ Moore</td>
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<td>Gaber</td>
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<td>Hobeika</td>
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<tr>
<td>COR Co-PI</td>
<td>Clinical Co-PI</td>
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<tr>
<td>Jones</td>
<td>Esnaola</td>
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<tr>
<td>Jones</td>
<td>Pingali</td>
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<tr>
<td>Jones/Naufal</td>
<td>Esnaola/Ajewole</td>
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**Neurology**

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<tr>
<th>COR Co-PI</th>
<th>Clinical Co-PI</th>
<th>Title</th>
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<tbody>
<tr>
<td>Vahidy</td>
<td>Horner/ Britz/ Misra</td>
<td>Neurological Outcomes Repository for patients with ICH (NeuroRICH)</td>
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<tr>
<td>Vahidy</td>
<td>Zainab/ Misra/ Immanuel</td>
<td>Neurological Outcomes in a Virtual ICU Environment (NOVICE)</td>
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<tr>
<td>Vahidy</td>
<td>Hanley/ Ziai (Johns Hopkins)</td>
<td>MISTIE CLEAR Posthoc and Bayesian Analysis</td>
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**Surgery**

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<tbody>
<tr>
<td>Jones/Naufal</td>
<td>Masud/ Gotur</td>
<td>Sepsis Predictive Modeling</td>
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<tr>
<td>Sasangohar</td>
<td>Dhala</td>
<td>Multimodal Rehabilitation Bundle</td>
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**Health & Nature**

<table>
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<tr>
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<th>Title</th>
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</thead>
<tbody>
<tr>
<td>Maddock</td>
<td>n/a</td>
<td>Developing Health Behavior Change Scales for Health &amp; Nature</td>
</tr>
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</table>
Quantifying Patient Portal Use: Systematic Review of Utilization Metrics

Use of patient portals has been associated with positive outcomes in patient engagement and satisfaction. Despite widespread adoption of and interest in patient portal use and adoption, studies vary widely in the metrics used to operationalize and track patient portal utilization, leading to unsystematic and incommensurable characterizations of use. Our research team assessed the measurements used across 87 patient portal utilization studies between 2014-2018.

There were 76 US based studies, and 24% were explicitly motivated by meaningful use stage 2 compliance and 53% at least mentioned the incentives.

The number of metrics examined was not associated with the number of citations or the publishing journal's impact factor.

Understanding how patient portal use has been defined and operationalized can encourage more consistent, well-defined, and more meaningful standards of utilization, which will inform future patient portal development.

Center for Outcomes Research
COR@houstonmethodist.org

Donation After Circulatory Death Liver Transplantation: An In-Depth Analysis and Propensity-Score Matched Comparison

Organ donation after circulatory death (DCD) is an increasing source of potentially transplantable organs for patients awaiting liver transplantation (LT). Despite this increasing availability, DCD LT remains limited due to concerns of post-transplant complications. This study evaluates differences in survival rates between DCD LT compared to standard donation after brain death (DBD) LT as a potential way to save more lives. An analysis of all LT patients between 2008 and 2018 allowed us to examine outcomes of DCD LT patients compared to matched DBD LT patients.

- DCD represents nearly 25% of organ donors, but only ~8% of liver transplants in the U.S.
- Ongoing liver waitlist mortality in the Houston region is ~20%.
- National database studies have shown improved results following DCD LT in the current era.
- Associations between donor selection, recipient selection, and operative factors with DCD LT outcomes are becoming clearer.
- This improved understanding has led to the development of perioperative metrics and novel risk scores which help predict successful outcomes and avoid potentially negative outcomes.

What we learned:
- Patient survival following DCD LT was not different when compared to the DBD LT cohort, even in very sick patients with end-stage liver disease.
- DCD LT can be safely offered to higher-risk patients by balancing recipient risk with donor and operative risks.

Center for Outcomes Research
COR@houstonmethodist.org

Rapid Response to Drive COVID-19 Research in a Learning Health Care System: Rationale and Design of the Houston Methodist COVID-19 Surveillance and Outcomes Registry (CURATOR)

OVERVIEW

During the early phase of the pandemic, Houston Methodist leadership envisioned the need to streamline COVID-19 research and established the retrospective research task force (RRTF) comprised of a multidisciplinary team of expertise in epidemiology, health systems, clinical domains, data sciences, information technology, and research regulation.

Many promising observational studies reviewed by the RRTF required similar data elements, leading to the development of a central COVID-19 data platform to expedite research processes and productivity for all investigators engaged in COVID-19 research. Following the Learning Health Care (LHC) systems approach, the RRTF decided to develop and actively maintain a registry for COVID-19 surveillance and outcomes as a key tangible output of its research acceleration function, which led to the creation of CURATOR.

Key takeaways:
- CURATOR aims to break down data silos and create true functional interoperability between various data sources, such as the EHR, viCU, CareSenta, and imaging data warehouses across the system.
- The CURATOR team continues to evaluate, validate, and develop the analytical maturity of its informatics pipelines.
- CURATOR’s framework is an operationalized example of the principles of a learning healthcare system, which promotes a rapid discovery and implementation cycle for research.
- Robust governance structures have been set up that are clearly communicated and disseminated.
- Current CURATOR structure provides tools for data insight, data exploration, and communication that facilitate regulated and efficient data democratization, and offers a highly collaborative platform for developing further stakeholder driven applications.

IMPACT

CURATOR eliminates data silos by leveraging unique and disparate big data sources for COVID-19 research and provides a platform to capitalize on institutional investment in cloud computing.

The goal is to serve as a unified, longitudinal, cross-institutional registry for COVID-19 data, to fulfill ongoing and long-term observational research data needs and enable availability of data for planning of prospective clinical trials.

It currently supports more than 45 IRB-approved protocols across various clinical domains. It has generated numerous publications from its core and associated data sources and has facilitated successful federal funding on long COVID studies.

It conforms to standard health care digitization principles in the learning health care context. Overall, it adds value and helps in engaging a wider array of stakeholders and resource allocation for continued support.

The model has significant implications for future research. It represents a data-centric health care organization that has poised itself to lead medicine and health care delivery and overcome health care digitization challenges of the future.

Its design and implementation allows for seamless integration with other unique and aligned sources of big data across Houston Methodist.

Center for Outcomes Research
COR@houstonmethodist.org
Bayou Greenways Health Impact Study

Purpose
To examine the health benefits of the Bayou Greenways trail system for Houstonians.

Main Findings
- Houstonians living in zip codes with a Bayou Greenway trail had a lower likelihood of being admitted to the hospital for certain health conditions compared to those living in zip codes without a trail.
  - Obesity-related Admissions: 80% reduction
  - Heart Disease Admissions: 77% reduction
  - Heart Attack Admissions: 71% reduction

Detailed Findings
When we examine zip codes with or without Bayou Greenway trail features, we can compare the hospital admissions for health conditions in those zip codes.

Hospital Admissions for Health Conditions
- Bayou Greenway Trail Features
  - Access Duration: 5 years of access to a BG trail
  - Access Point Density: 5.4 access points per linear mile of BG trail
  - Walk Proximity: Greater than 3% of a zip code population within 3 miles of BG trail

Reduction is a beneficial result for this study because it measured the likelihood of being admitted to the hospital. For some results, the difference in hospital admissions between zip codes with and without a BG feature was not significantly different.

An example of how to interpret:
In zip codes where populations had more than 3 years of access to a BG trail, there was a significant reduction in the likelihood of hospital admission for heart attack compared to zip codes that did not have access to a BG trail.

This was a project of the Center for Health & Nature in collaboration with...
**Publications in Peer-reviewed Journals**

**COR Lead**


Publications & Presentations

Insecurity Among Adults With Atherosclerotic Cardiovascular Disease in the United States. Journal of the American Heart Association, 10(16), e020028. https://doi.org/10.1161/JAHA.120.020028


**COR/HM Collaboration**


**External Collaboration**


Peer-reviewed Conference Presentations

COR Lead


24. Minhas, A., Ariss, R., Nazir, S., Ullah, W., Muslim, M.O., Fudim, M., **Nasir, K.** Sex and Race Disparities in Mitral Regurgitation Related Mortality Rates Among Older Adults; Data from CDC Wonder 1999-2019. Poster presentation at American Heart Association Scientific Sessions 2021, Nov 12 – 15, Virtual Conference.


COR/HM Collaboration


External Collaboration


Publications & Presentations


