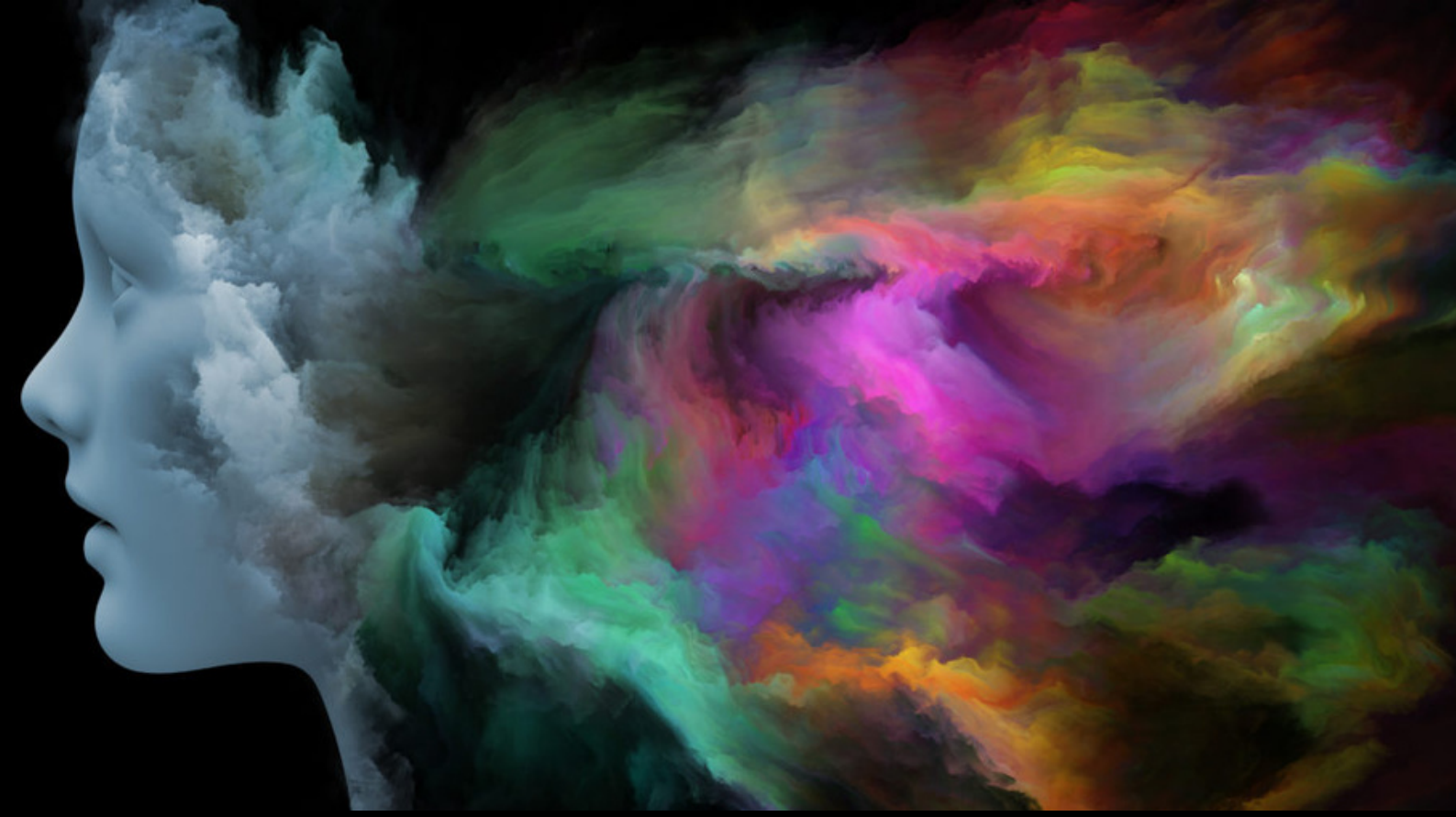


Stanford Center for Precision Mental Health and Wellness

Annual Report

DECEMBER 2021

TABLE OF CONTENTS

STANFORD CENTER FOR PRECISION MENTAL HEALTH & WELLNESS

401 QUARRY RD, PALO ALTO, CA, USA 94304

A new approach to mental health is on the horizon. And it will be more transformative than any of us can possibly imagine. It is empowered by an understanding of our own brain. The greatest innovations and opportunities to scale are ahead of us. We want to be part of this transformation in our lifetime. This is why we founded the Center for Precision Mental Health and Wellness. We need great scientists, entrepreneurs, and trailblazers to build this new world for mental health.

Mental disorders touch us all. Their impact is felt across the lifespan, but mental disorders are the most common health problem for young people. All too often they are terminal. Currently, mental disorders are diagnosed by clinical observations. There are no tests to aid diagnosis, subtyping, or treatment selection. Individuals often cycle through a series of therapies, hoping that one of them will work. Getting the 'right treatment' at the first intervention is paramount.

Our Center combines high tech, data, and neuroscience to detect different types of mental disorders more precisely and associate them with specific treatment outcomes. This approach is doing for mental health what has occurred in other medical domains such as cancer treatment: advancing clinical practice by personalizing and matching treatments more effectively to each version of the underlying disease. Clinicians can then strategically select the most effective treatment for each person, get it to them sooner, and keep them well longer.

The "Framingham study" was a moonshot that transformed how we understand and care for our heart. No longer do half of American adults die from heart disease. The Framingham study taught us that to accelerate findings into practice, we need to embed our research within local communities, study real world cohorts, and partner with visionaries. It gave us an understanding of the biology of our heart, and we use it to develop sensors that track our heart health and alert us to when we need a more detailed assessment. Now is the time to make the same transformation for mental health.

To accelerate change, our Center is unified around three research thematic areas:

Precision Preventions and Diagnostics. Develop precise tests for detecting mental illness and risk factors. Integrate circuit, behavioral, and physiological measures, across the lifespan. Improve quality of life and reduce suicidality.

Precision Treatment Matching. Optimize neuroscience-based measures to get the right treatment to each person sooner. Limit trial-and-error. Include medication, neuromodulation, behavioral and digital treatments, across the lifespan. Keep people well longer and reduce suicidality.

Precision Strategies for Novel and Exploratory Therapeutics. Advance new treatments, including selective 'repurposed' compounds, entactogens, ketamine, psychedelics, and digital therapies. Use neuroscience-based measures to understand benefits and risks, who they are effective for and why.

Our Center is the symbiosis for accelerating progress in each area and for igniting new discovery. Stanford's preeminence in precision mental health depends on active collaborations between disciplines and dynamic engagements with scientific, clinical, and industry trailblazers. Our Center has a vital partnership between Stanford and the Precision Medicine Core of the Mental Illness Research, Education and Clinical Center of Excellence (MIRECC) at the Palo Alto VA. We purposefully translate insights from human clinical studies back to basic science models. Our research members are experts in each of the discipline areas necessary for transforming mental health, including clinical neuroscience, basic neuroscience, psychiatry, psychology, engineering, brain imaging, biomarkers, innovative trial design, medicines, therapies, psychedelics, biomedical data sciences, computation, sensors, and public health.

Join us in creating a transformative approach to mental health.

Leanne Williams, Ph.D.
Director, Stanford Center for Precision Mental Health and Wellness

For inquiries about our programs, participating in and supporting the research, please check out
med.stanford.edu/pmhw or send an email via precisionmentalhealth@stanford.edu.
We can also be reached at 650-497-5137.

Stanford MEDICINE

Department of Psychiatry and Behavioral Sciences

A Message from Our Department of Psychiatry and Behavioral Sciences Chair

Precision mental health is integral to precision health.

With our experiences during the pandemic and with ongoing challenges across the world, we are more aware today than ever before of just how precious our mental wellbeing is.

As a leader in academic medicine, I feel so fortunate to have a sense of the extraordinary progress across the biomedical sciences and within psychiatry specifically. It's wonderful to see and support the translation of scientific discovery to clinical care, allowing prevention and treatments that restore good lives for people and families, and at scale create better lives for all within communities and populations. Together with our patients, scientists, clinicians, trainees and staff, we at Stanford are creating a new paradigm for modern psychiatry. The Center for Precision Mental Health and Wellness is a key to this new paradigm. Stanford's Department of Psychiatry and Behavioral Sciences is the nation's epicenter for precision psychiatry.

The Center's advances are made possible through a truly collaborative approach, bringing more precise diagnoses and treatments based on neuroscience discoveries to help people, families, communities, populations and to help future generations. Major mental health disorders are very common, affecting hundreds of millions of people worldwide, they hit early, they hit hard, and unrecognized and untreated they can change the trajectory of a lifetime and of generations. Though treatment is remarkably effective in improving quality of life and reducing the burden of symptoms and impairments, finding the right treatment is too often a process of months or years. Moreover, mental disorders may complicate and worsen the risks associated with other health conditions. For example, depression increases the risk of cardiovascular-related deaths threefold.

Mitigating such mental health consequences requires the best cutting-edge prediction, prevention and preemption strategies that translational neuroscience can provide. Harnessing advances in the fields of biomedical sciences, medicine, engineering, education, social sciences, and ethics will be key in revolutionizing the diagnosis and treatment of mental illness with greater precision, personalized care and precision health.

In this past year, it has been my great pleasure to announce the launch, here at Stanford, of a First-in-world Translational Precision Mental Health Clinic. This exciting new clinic will make scientific breakthroughs in precision psychiatry available to our patients. Because of its pioneering new approaches, the Center is leading the way for precision psychiatry within our field. Other centers at other institutions are already seeking to model their approach on the approach we have here at the Stanford Department of Psychiatry and Behavioral Sciences. In these many ways, the Center for Precision Mental Health and Wellness is a shining example of how our department has become a platform from which to branch out and serve our campus, our community, and our world.

We welcome your engagement and ongoing partnership as we realize the biomedical revolution for modern precision psychiatry.

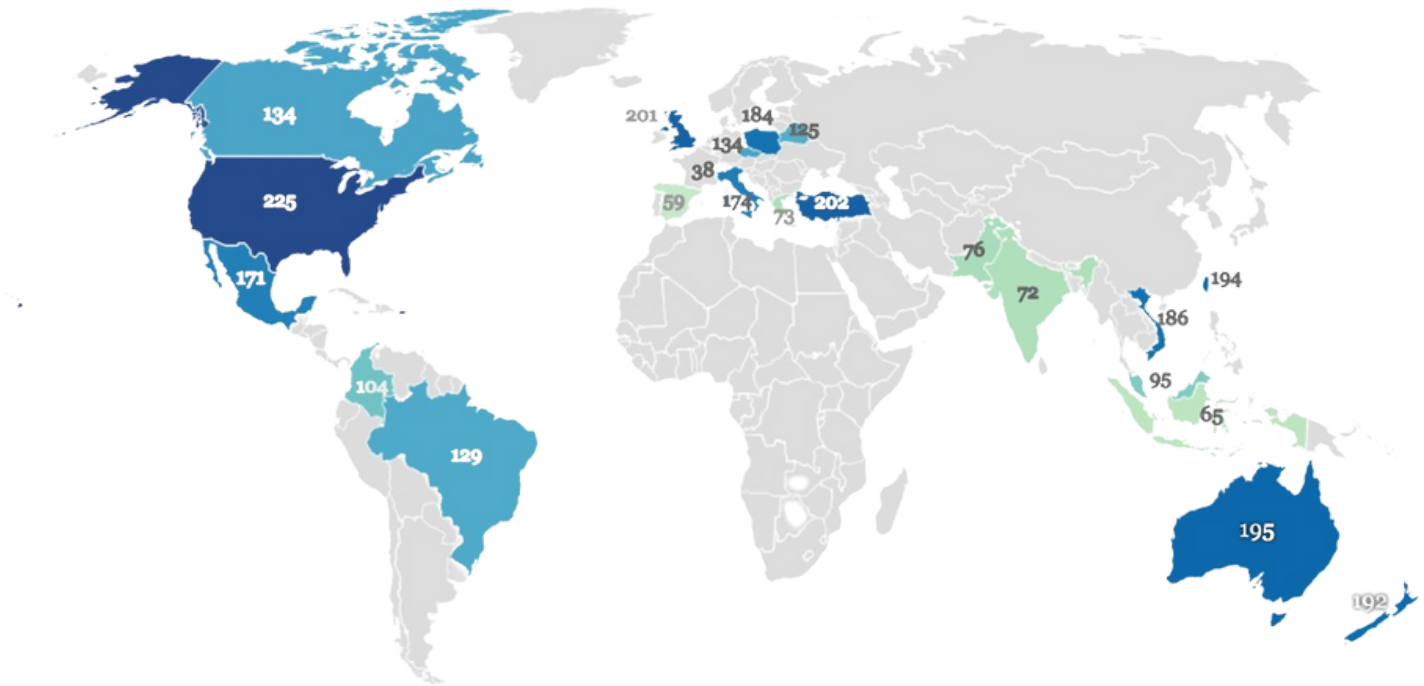
Laura Roberts, M.D.
Chairman, Department of Psychiatry and Behavioral Sciences
Katharine Dexter McCormick and Stanley McCormick Memorial Professor
Editor-in-Chief, Books, American Psychiatric Association
Editor-in-Chief, Academic Medicine

Symposium Audience

Longest Minutes Watched (per individual)

38 — 225

350 Total Viewers
624 Total Registrants



BY THE NUMBERS

2021
13,045 UNIQUE VISITORS
FROM
51 COUNTRIES

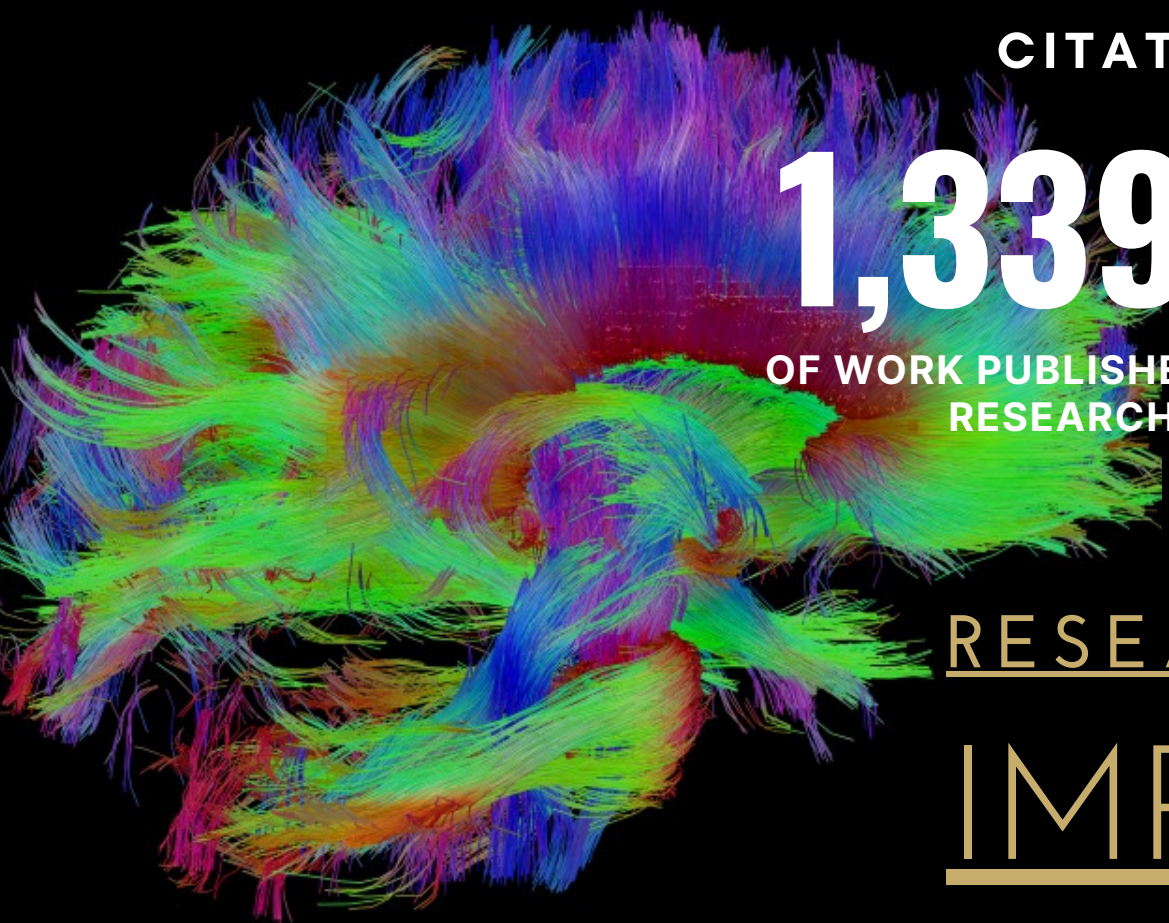
2021
9,520 UNIQUE PROFILE VISITS
278 NEW FOLLOWERS
81 TOTAL MENTIONS
36,679 TWEET IMPRESSIONS

2021
341 NEW FOLLOWERS
7,392 TOTAL IMPRESSIONS

2021
461 NEW FOLLOWERS
62.9K ACCOUNTS REACHED

6600+ BRAIN SCANS COMPLETED

FOR CLINICAL & HEALTHY POPULATIONS



CITATIONS

1,339,862

OF WORK PUBLISHED BY ALL CENTER RESEARCH MEMBER

RESEARCH IMPACT

5200+ STANDARDIZED COGNITIVE TESTS

7000+

QUESTIONNAIRES COMPLETED PERTAINING TO VARIOUS ASPECTS OF MENTAL HEALTH & WELLBEING

63

Center Research Members

MEMBERSHIP ACROSS FIVE SCHOOLS

2700+ DATA COLLECTED ON GENETIC SINGLE NUCLEOTIDE POLYMORPHISMS

Meet our

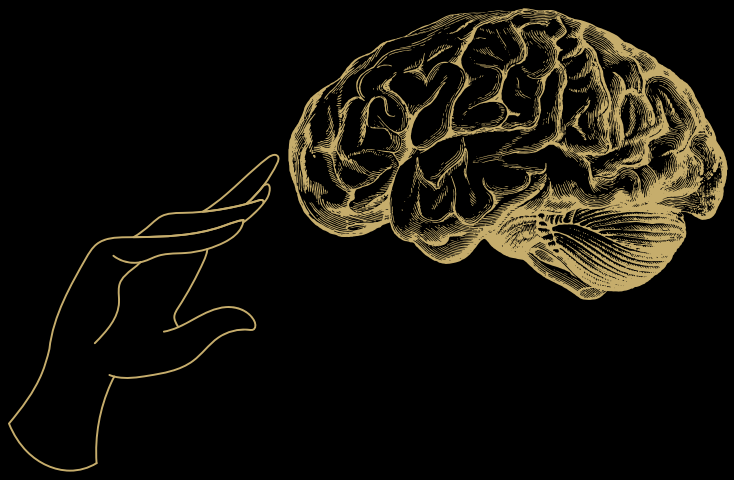
STANFORD PMHW FACULTY LEADERSHIP

TRAILBLAZING A NEW APPROACH TO MENTAL HEALTH ACROSS THE GLOBE

Leanne Williams, PhD
Director

Ruth O'Hara, PhD
Co-Director

Alan Schatzberg, MD
Associate Director



Meet our

STANFORD PMHW PROGRAM LEADERSHIP & EXECUTIVE TEAM

SUPPORTING THE TRANSFORMATIVE APPROACH TO MENTAL HEALTH

Laura Hack, MD, PhD
Director of Novel & Precision Neurotherapeutics Program

Leonardo Tozzi, MD, PhD
Director of Computational Neuroscience & Neuroimaging Program

John Hegarty, PhD
Associate Director of Strategic Program Development

Hosna Omarzad, MS
Executive Director

Anna Boken
Executive Assistant

Join Us

STANFORD PMHW RESEARCH MEMBERS

IN CHANGING THE LANDSCAPE OF MENTAL HEALTH ACROSS THE GLOBE

Russ Altman, MD, PhD

Eric Appel, PhD

Zhenan Bao, PhD

Michele Berk, PhD

Mahendra Bhati, MD

Jing Bian, PhD

Catherine Blish, MD, PhD

Hector Bonilla, MD

Daniel Bowling, PhD

Kim Bullock, MD, PhD

Weidong Cai, MD, PhD

David Camarillo, PhD

Vinicio de Jesus Perez, MD

Charles DeBattista, MD

Manisha Desai, PhD

Timothy Durazzo, PhD

Neir Eshel, MD, PhD

Lawrence Fung, MD, PhD

Grace Gengoux, PhD

William Giardino, PhD

Gary Glover, PhD

Andrea Goldstein-Piekarski, PhD

Tamar Green, MD

Kevin Grimes, MD

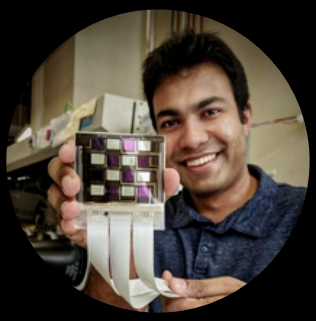
Boris Heifets, MD, PhD

Keith Humphreys, PhD

Agnieszka Kalinowski, MD

Makoto Kawai, MD

Corey Keller, MD, PhD



Yasser Khan, PhD

Brian Knutson, PhD

Tze L. Lai, PhD

John Leikauf, MD

Feng Vankee Lin, PhD

Sean Mackey, MD, PhD

Michelle Madore, PhD

Yvonne Maldonado, MD

Vinod Menon, PhD

Kari Nadeau, MD, PhD

Douglas Noordsy, MD

Michael Ostacher, MD

Claudia Padula, PhD

Pablo E. Paredes, PhD

Jeffrey Pfeffer, PhD

Russell Poldrack, PhD

Raul Poulsen, MD

Lisa Goldman Rosas, PhD

Brian Rutt, PhD

Debra Safer, MD

Manish Saggar, PhD

Gregory Sahlem, MD

Shebani Sethi, MD

Michael Snyder, PhD

Eric Stice, PhD

Kaustubh Supekar, PhD

Trisha Suppes, MD, PhD

Ranak Trivedi, PhD

Peter Johannes van Roessel, MD, PhD

Janani Venugopalakrishnan, MD

Gordon Wang, PhD

Nolan Williams MD

Hua Wu, PhD

Jerome Yesavage MD

Stanford MEDICINE | Spectrum
Stanford Center for Clinical & Translational Research & Education

Stanford MEDICINE | Mood Disorders Center
Department of Psychiatry and Behavioral Sciences

IMA | Innovative Medicines Accelerator
A ChEM-H Partnership With Stanford Medicine

U.S. Department of Veterans Affairs

Veterans Health Administration
VA Sierra Pacific Network (VISN 21)

MIRECC
Mental Illness Research, Education & Clinical Center of Excellence, Palo Alto VA

RESEARCH CENTERS AND PARTNERS

PMHW Corporate Members Program

BE A MENTAL HEALTH THOUGHT LEADER

Through the development of this program, we aimed to engage with organizations and corporate leaders across the United States and the world. Members share in the Center outcomes with a mutual goal to improve mental health and wellness in addition to connecting and building relationships with Stanford faculty. The program supports the Center's mission to reimagine mental health based on cutting edge insights from data, technology and therapeutics.

FOUNDING MEMBER FOR PRECISION PSYCHIATRY & THERAPEUTICS

Boehringer Ingelheim

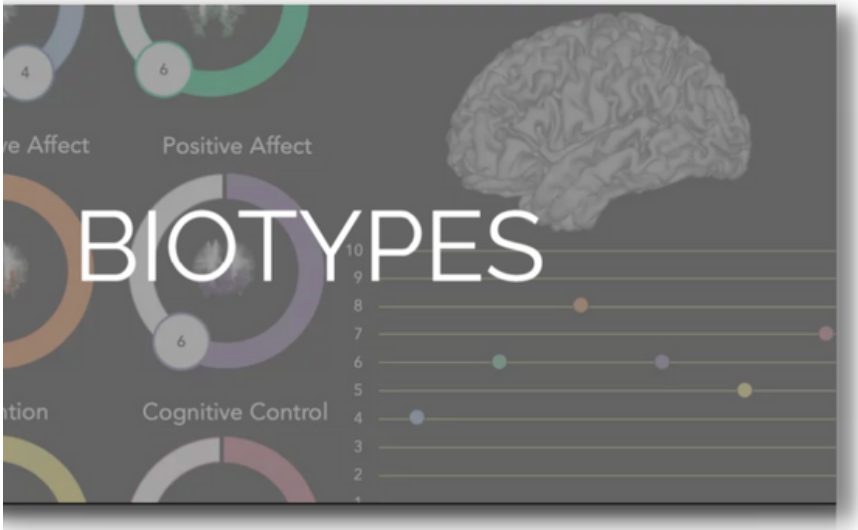
Improving the health and quality of life of humans and animals is the goal of Boehringer Ingelheim. Family-owned since its foundation in 1885, the research-driven pharmaceutical company has a rich pipeline in all phases of development, including mental health. Boehringer Ingelheim and the Stanford Center for Precision Mental Health and Wellness share a mutual interest in identifying neuroscience-based behavior and imaging markers to guide the development of targeted therapies for major mental illnesses and subtypes for which no satisfactory treatment option exist to date. By advancing new and innovative approaches and technologies to inform treatment development, we share the goal of redefining mental health to enable people to thrive.

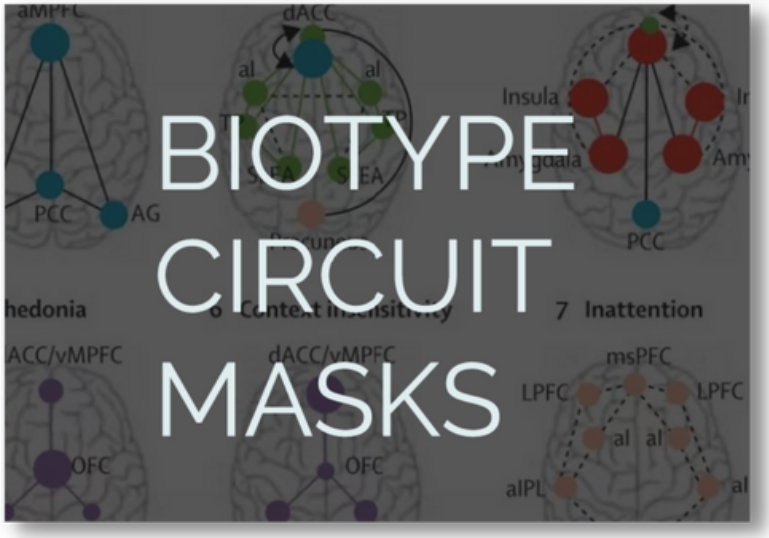
2021 PMHW EVENTS

November 12	Stanford Precision Mental Health & Wellness Seminar Series: Dr. Lorenzo Pasquini
November 4	PMHW & MIRECC Virtual Training "Implementation Science and Precision Medicine Approaches in Mental Health"
October 25	Stanford Precision Mental Health & Wellness Seminar Series: Dr. Isaac V. Kauvar
September 24	Stanford Precision Mental Health & Wellness Anniversary Symposium: Dean Lloyd B. Minor, MD Laura Roberts, MD, MA
January 28	Stanford Precision Mental Health & Wellness Seminar Series: Dr. Gary H. Glover

RESOURCES

We have formulated the first biotype taxonomy for depression and anxiety using high-definition MRI technology.





This resource includes the regions of interest (ROIs) used for the quantification of circuits of interest in an article published in Biological Psychiatry, 2021.

PMHW has built an extensive dataset for mental health research. Our database comprises of data collected across clinical and healthy populations using several different modalities.

Using biotypes to get the right treatment to the right person at the right time

Creative Science Communications Group

BE THE FUTURE OF MENTAL HEALTH AWARENESS

The Creative Science Communications Group is a yearly educational program involving students with a passion and interest in mental health research. Students engage with Stanford researchers through the Center, learning about the connection between the human brain and mental health. Students learn about how research and our findings translate into practice. In addition to receiving mentorship from research staff, students engage in a writing camp in which they develop skills in creative science writing.

Stanford University

Collaborative Funding

Accelerating progress in research
and igniting new discovery

Stanford Innovative Medicines Accelerator
Infection Recovery in SARS-CoV-2 (IRIS) Neurostudy - Phase 1

Stanford Innovative Medicines Accelerator
Infection Recovery in SARS-CoV-2 (IRIS) Neurostudy - Phase 2

Stanford Institute for
Using Wearable Electrodermal Activity (EDA) Sensors to Augment ADHD Diagnosis

Stanford | ENGINEERING

Stanford Catalyst for
Collaborative Solutions

Stanford | MEDICINE

Stanford School of Medicine
Clinical Translational
Biomedical Innovation Award

Collaboration

National Institutes of Health
Turning Discovery Into Health

Federal Funding

NIH U01
Mapping connectomes for disordered emotional states

NIMH R01
NMDAR Modulation As A Therapeutic Target and Probe of Neural Dysfunction in OCD

NIMH R01
Sleep disturbance and emotion regulation brain dysfunction as mechanisms of neuropsychiatric symptoms in Alzheimer's dementia

NIH R01
Mechanistic circuit markers of transcranial magnetic stimulation outcomes in pharmacoresistant depression

NIMH R61
A Novel Use of a Sleep Intervention to Target the Emotion Regulation Brain Network and Treat Depression and Anxiety

NIDA P50
Project 4. Mapping the Influence of drugs of Abuse on Risk and Reward Circuits

NIH UH2/UH3
Engaging self-regulation targets to understand the mechanisms of behavior change and improve mood and weight outcomes

Precision Mental Health Research

Thank you for your support!

We would like to express our sincerest gratitude to the great scientists, entrepreneurs, and trailblazers who support our mission to build this new world for mental health. Your contributions are making an impact on the acceleration of progress in the research and is igniting new discovery.

Thank you again for your continued interest in the Stanford Center for Precision Mental Health and Wellness. We value your support and encourage you to contact us with any questions.

Stanford Center for Precision Mental Health and Wellness
401 Quarry Rd
Stanford University,
Stanford, CA 94305

med.stanford.edu/pmhw
precisionmentalhealth@stanford.edu