Artificial Intelligence and the Future of Behavioral Health Care

S. Craig Watkins

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Moody College of Communication

The University of Texas at Austin

#TxSP24

TEXAS
SUICIDE PREVENTION
SYMPOSIUM 2024

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GOOD
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A UT Grand Challenge

How artificial intelligence can help combat systemic racism

MLK Visiting Professor S. Craig Watkins looks beyond algorithm bias to an AI future where models more effectively deal with systemic inequality.

▶ Watch Video

Scott Murray | Institute for Data, Systems, and Society
March 16, 2022

⌄ PRESS INQUIRIES

"There's an urgency as AI is used to make really high-stakes decisions," says MLK Visiting Professor S. Craig Watkins. "New systems can replicate historical biases at scale."

In 2020, Detroit police arrested a Black man for shoplifting almost $4,000 worth of watches from an upscale boutique. He was handcuffed in front of his family and spent a night in lockup. After some questioning, however, it became clear that they had the wrong man. So why did they arrest him in the first place?

The reason: a facial recognition algorithm had matched the photo on his driver's license to grainy security camera footage.

Facial recognition algorithms — which have repeatedly been demonstrated to be less accurate

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RELATED LINKS

01. IDSS Research Initiative on Combatting Systemic Racism

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APRIL 3, 2024

Dr. S. Craig Watkins

on Why AI's Potential to Combat or Scale Systemic Injustice Still Comes Down to Humans

Four Core Questions

- What is driving the adoption of Health AI?

- How is artificial intelligence being used in the delivery of mental health care?

- What are some of the ethical issues in the application of artificial intelligence in mental health care?

- What are the goals of a new National Institutes of Health funded study on the Black youth suicide crisis?

Artificial Intelligence refers to the simulation of human intelligence in machines that are programmed to think and learn like humans.

Artificial Intelligence refers to the simulation of human intelligence in machines that are programmed to think and learn like humans. The goal is to create systems that can perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation.

1. What is driving the adoption of Health AI?

Factors Driving Adoption

- Demand/Supply Dilemma

- Feasibility

- Cultural and Generational Change

12:07

LIVONGO

5-Day Challenge 😌 Just a friendly reminder to get in your deep breathing today.

AI has surpassed humans at a number of tasks and the rate at which humans are being surpassed at new tasks is increasing

State-of-the-art AI performance on benchmarks, relative to human performance

- Handwriting recognition
- Speech recognition
- Image recognition
- Reading comprehension
- Language understanding
- Common sense completion
- Grade school math
- Code generation

Human perfomance = 100%
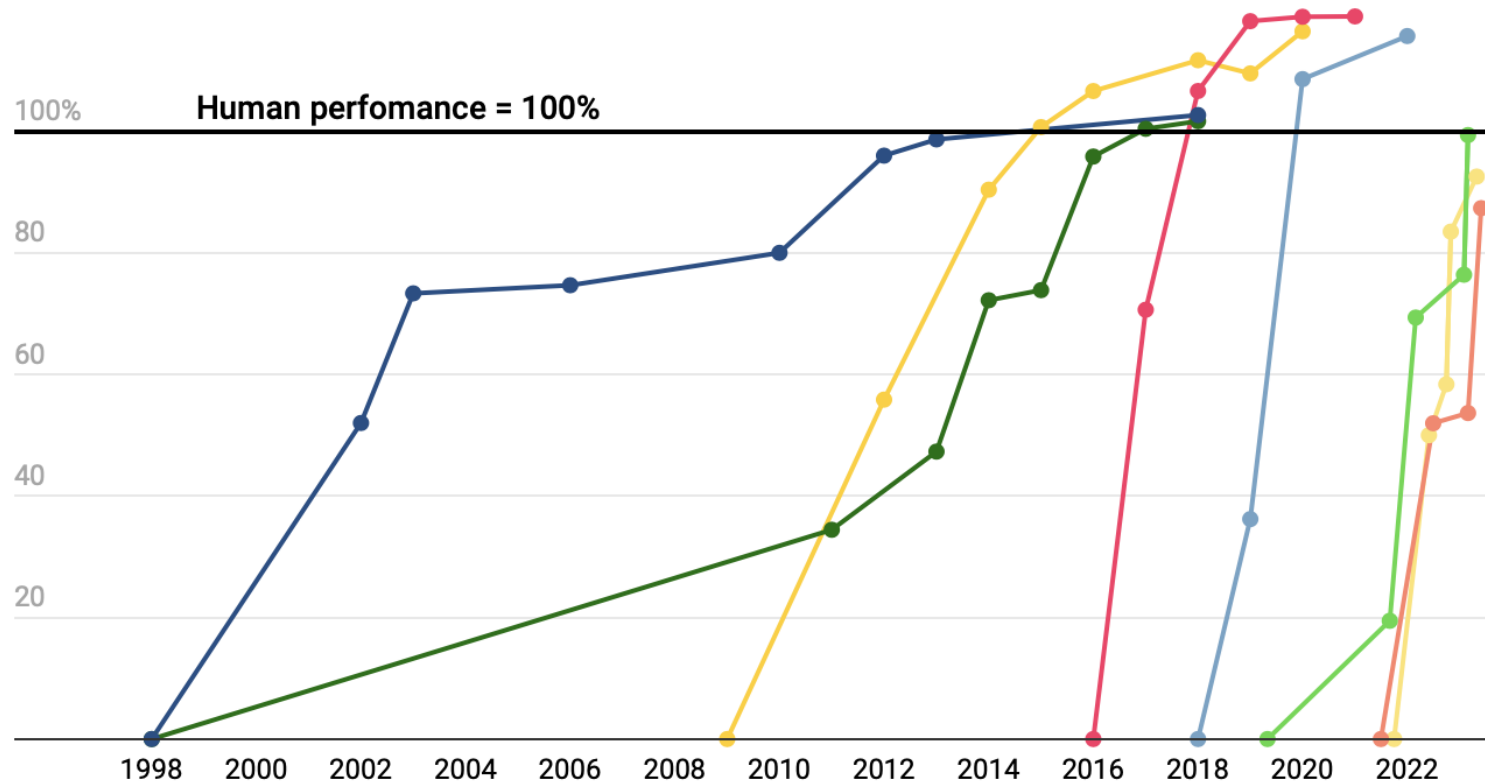
For each benchmark, the maximally performing baseline reported in the benchmark paper is taken as the "starting point", which is set at 0%. Human performance number is set at 100%. Handwriting recognition = MNIST, Language understanding = GLUE, Image recognition = ImageNet, Reading comprehension = SQuAD 1.1, Reading comprehension = SQuAD 2.0, Speech recognition = Switchboard, Grade school math = GSK8k, Common sense completion = HellaSwag, Code generation = HumanEval.

TIME

2. How is artificial intelligence being used in the delivery of mental health care?

Voice Biomarkers: Algorithmic Analysis for Depression
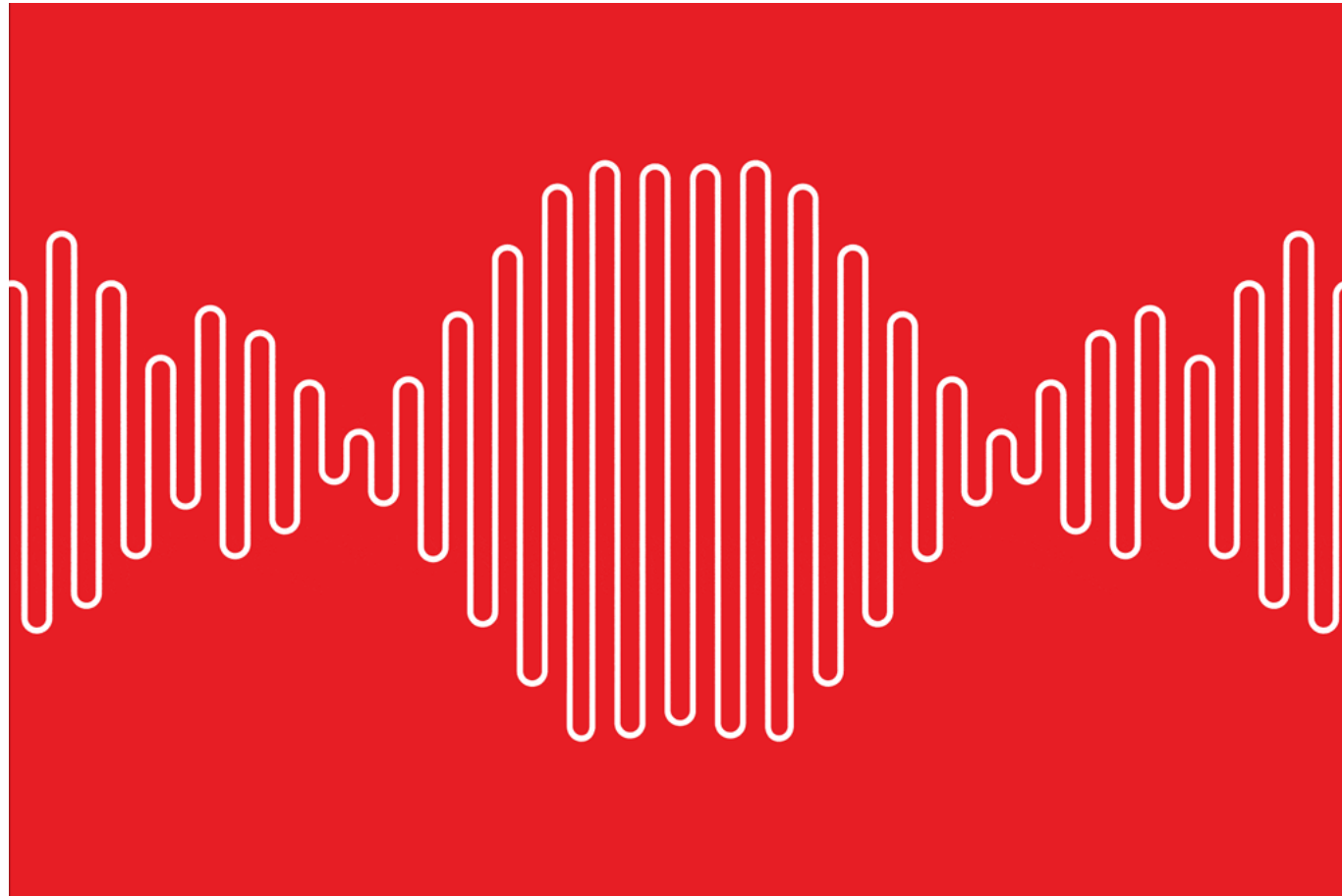
Narrative Data

Predicting depression from social media posts (Microsoft, 2021)

"The ability to illustrate and model individual behavior using their social media data, that can predict depression before their estimated onset, shows promise in the design and deployment of next-generation wellness facilitating technologies."

Having a job again makes me happy. Less time to be depressed and eat all day while watching sad movies.
"Are you okay?" Yes…. I understand that I am upset and hopeless and nothing can help me… I'm okay… but I am not alright
"empty" feelings I WAS JUST TALKING ABOUT HOW I I HAVE EMOTION OH MY GOODNESS I FEEL AWFUL
I want someone to hold me and be there for me when I'm sad.
Reloading twitter till I pass out. *lonely* *anxious* *butthurt* *frustrated* *dead*

Table 2: Example posts from users in the depression class.

Can AI identify who may be at risk for suicide?

Table 3. Frequency and example of assigned emotions.

| Description	Frequency	Example
Instructions	609	Careful, cyanide gas in the bathroom
Hopelessness	601	I just didn't want to live anymore
Love	472	I love her
Information	430	I have no debts except for what my wife knows
Guilt	423	Forgive me please
Sorrow	342	Oh, how I suffer
Blame	235	I have been pushed around too much
Hopefulness	216	You will a happy and healthy life
Thankfulness	187	You, John have been so good to me and Jane
Anger	183	Well, Jane I hope this makes you happy!
Fear	154	I am terrified
Happiness/ peacefulness	119	I'm ready for the next step with joy and anticipation
Pride	89	We have another sweet little daughter
Forgiveness	61	I do not blame you for anything, my dear
Abuse	53	Life is so cruel when you are persecuted by in-laws and ex-wife

STUDYING SUICIDE NOTES

Detecting patterns in the language, emotions, and entities mentioned

Linguistic markers that may be predictive of suicide

Identify the "language of suicide"

Develop strategies for early detection in patients who may be at risk for suicide
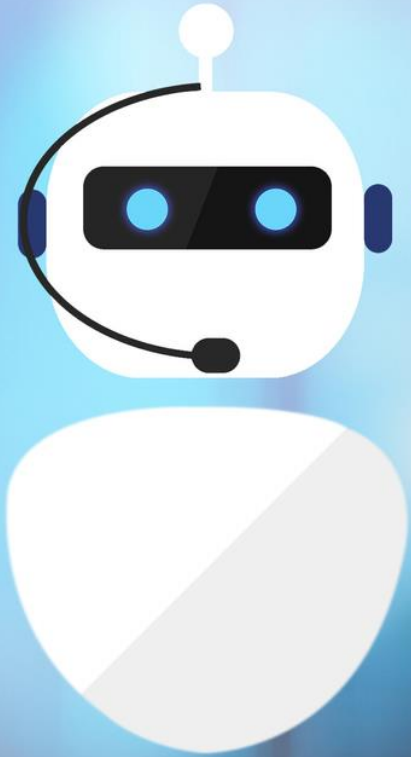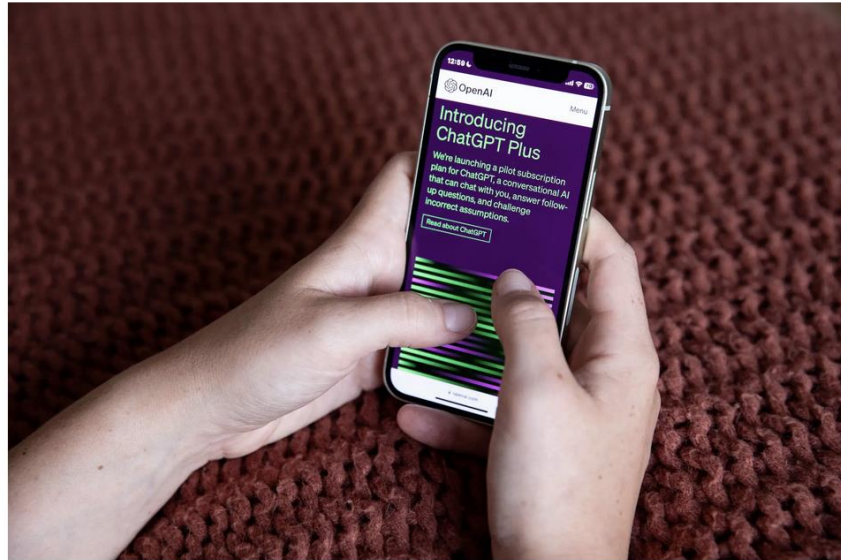
What can i help you with?

Dr. Chatbot Will See You Now

Americans are already turning to A.I. for health information in large numbers, new research suggests.

🎁 Share full article   ↱   🔖

About one in six adults use A.I. chatbots for medical advice at least once a month, a recent survey found. Jackie Molloy for The New York Times
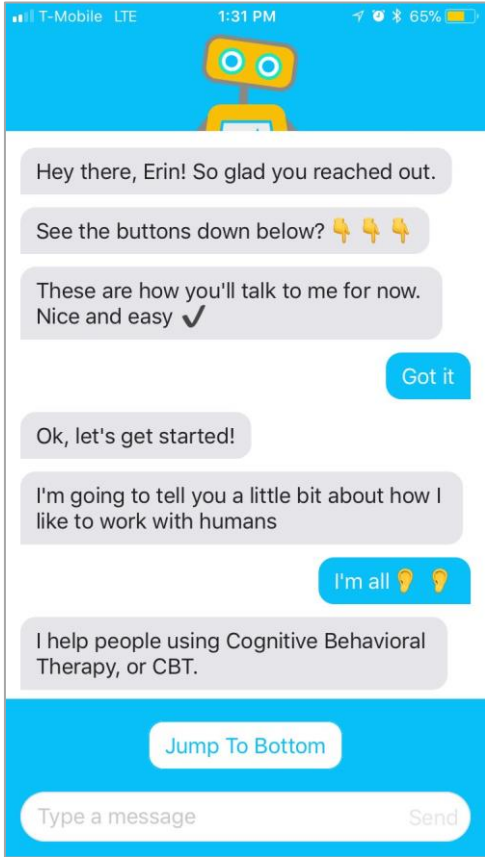
By **Teddy Rosenbluth**

Sept. 11, 2024

Sign up for the Tilt newsletter, for Times subscribers only. Nate Cohn, The Times's chief political analyst, makes sense of the latest political
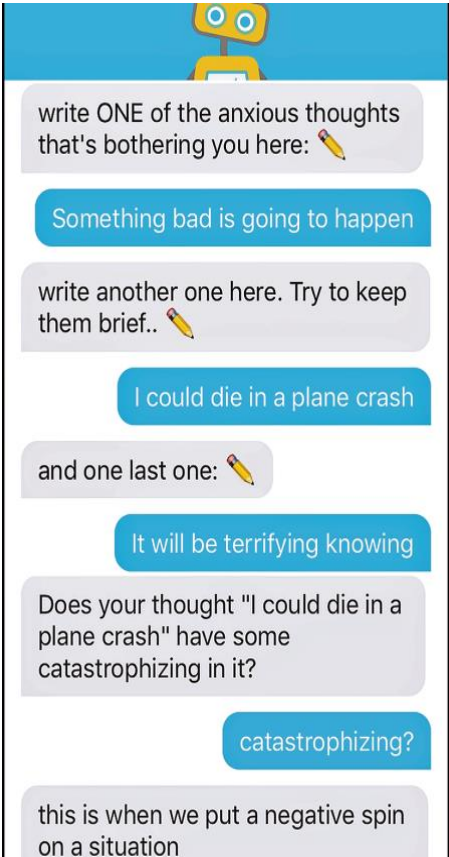
Conversational

T-Mobile LTE 1:31 PM 65%

Hey there, Erin! So glad you reached out.

See the buttons down below? 👇👇👇

These are how you'll talk to me for now. Nice and easy ✔️

Got it

Ok, let's get started!

I'm going to tell you a little bit about how I like to work with humans

I'm all 💡 💡

I help people using Cognitive Behavioral Therapy, or CBT.

Jump To Bottom

Type a message | Send

Goal setting

T-Mobile 10:34 PM 48%

Sweet! let's go with that then

Cool

Well done, you are on the 🛤 to 💡

Thanks

I'll keep an 👁 on your progess and get back to you in a week about your goal

Cool

It was lovely meeting you today and I hope we'll have the opportunity to get to know each other better

Bye for now 👋

Bye 👋

Type a message | Send

Psychoeducation

write ONE of the anxious thoughts that's bothering you here: ✏️

Something bad is going to happen

write another one here. Try to keep them brief.. ✏️

I could die in a plane crash

and one last one: ✏️

It will be terrifying knowing

Does your thought "I could die in a plane crash" have some catastrophizing in it?

catastrophizing?

this is when we put a negative spin on a situation

Chatbots and Mental Health: Insights into the Safety of Generative AI

Julian De Freitas
Ahmet Kaan Uğuralp
Zeliha Uğuralp
Stefano Puntoni

Harvard
Business
School

<u>Companion AI</u>

Systems struggled to recognize mental

health queries

*

Unhelpful Responses

*

Empathy Gap

•

Exacerbate mental health conditions

Development and Evaluation of Three Chatbots for Postpartum Mood and Anxiety Disorders

XUEWEN YAO, The University of Texas at Austin, USA
MIRIAM MIKHELSON, The University of Texas at Austin, USA
S. CRAIG WATKINS, The University of Texas at Austin, USA
EUNSOL CHOI, The University of Texas at Austin, USA
EDISON THOMAZ, The University of Texas at Austin, USA
KAYA DE BARBARO, The University of Texas at Austin, USA

In collaboration with Postpartum Support International (PSI), a non-profit organization dedicated to supporting caregivers with postpartum mood and anxiety disorders, we developed three chatbots to provide context-specific empathetic support to postpartum caregivers, leveraging both rule-based and generative models. We present and evaluate the performance of our chatbots using both machine-based metrics and human-based questionnaires. Overall, our rule-based model achieves the best performance, with outputs that are close to ground truth reference and contain the highest levels of empathy. Human users prefer the rule-based chatbot over the generative chatbot for its context-specific and human-like replies. Our generative chatbot also produced empathetic responses and was described by human users as engaging. However, limitations in the training dataset often result in confusing or nonsensical responses. We conclude by discussing practical benefits of rule-based vs. generative models for supporting individuals with mental health challenges. In light of the recent surge of ChatGPT and BARD, we also discuss the possibilities and pitfalls of large language models for digital mental healthcare.

CCS Concepts: • **Human-centered computing** → **Empirical studies in HCI**; • **Applied computing** → *Psychology*.

Additional Key Words and Phrases: postpartum depression, chatbot, rule-based, GPT, ChatGPT, PPMADs

The Problem Space

The Solution

The Experiment (65K+)

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Design Practices in Artificial Intelligence for Healthcare

- Understanding the purpose, core values of postpartum support

- Empathy is a cornerstone feature of engagement

- What key words, sentiments should the chatbot avoid?

Design Practices in Artificial Intelligence for Healthcare

- Understanding the dynamics, purpose, core values of postpartum support

- Empathy is a cornerstone feature of engagement

- What key words, sentiments should the chatbot avoid?

- Clinically informed conversational experience

- De-escalate; Don't cause harm

- Be transparent about the limits of the chatbot

Chatbot Goals for Postpartum Support International (PSI)

- Identify severe symptoms; link support seekers with emergency services staffed by humans

- Provide empathy for support seekers

- Do not offer healthcare advice
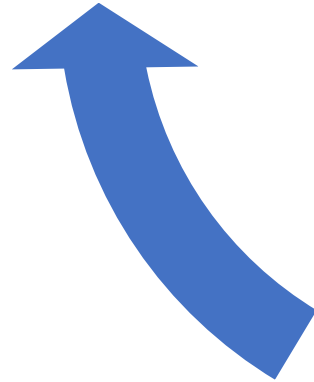
Table 1. Clusters Generated from the Responses of PSI Volunteers with Definitions and Examples

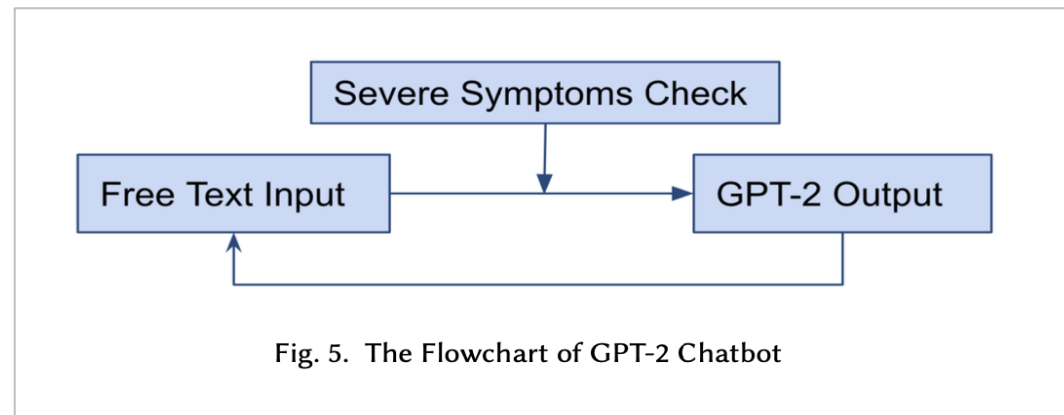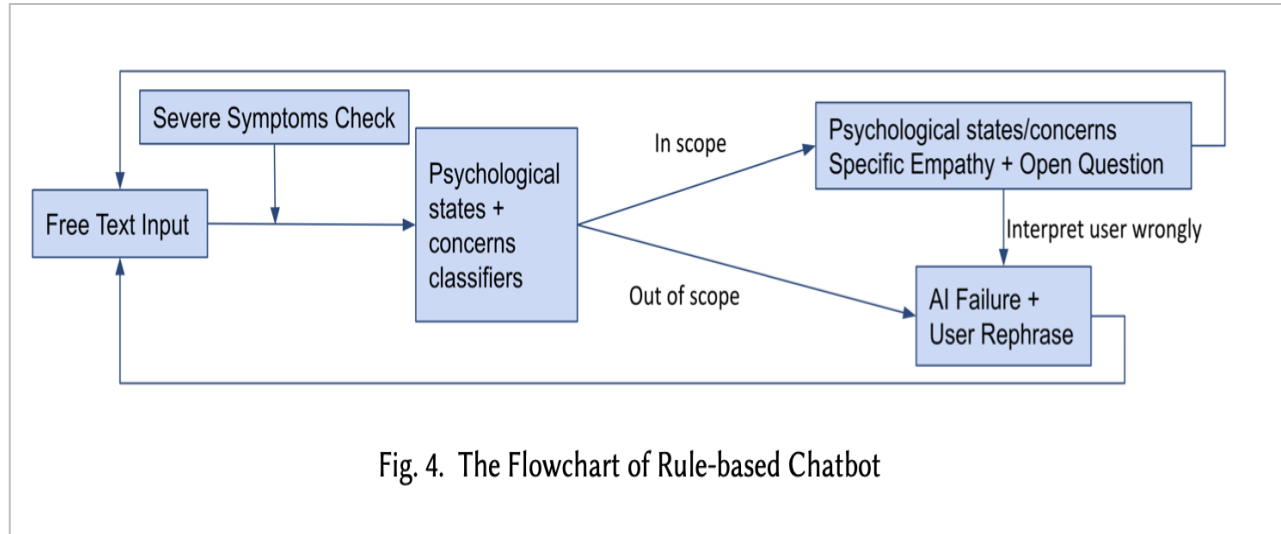| Cluster Name	Examples
Emotional Statements	
Validation for a difficult time (9.64%)	*It sounds like you've got a lot on your plate not to mention everything going in the world.*
Positive sentiment and validation (13.37%)	*Good for you for reaching out!*
Questions and validation (11.22%)	*Were you able to talk with your doctor today? & It can be really daunting sometimes, I hear you.*
PSI taglines (9.23%)	*PSI is not a crisis line. & You are not alone, you are not to blame. With help you will be better.*
Logistics	
Introduction (6.25%)	*Hi this PSI_PERSON, I'm a volunteer with PSI warmline.*
PSI info, limitations, and questions (5.19%)	*We are here to listen and connect you with resources, but we cannot diagnose or give advice regarding medications. & Do you have any support?*
Connecting to a local coordinator or therapist (16.08%)	*Ok I have reached out to our coordinator who specializes in this and I've asked her to be in touch as soon as possible.*
Assuring follow through (7.69%)	*I have reached out to your coordinator and you should hear from her within the next 24 hours.*
Online resources (5.24%)	*In the meantime, here are some additional resources through our website: [redacted]*
Crisis line info and local resources (16.09%)	*We aren't a crisis line, so if you are experiencing a crisis, please call PSI_PHONE. They provide caring crisis support.*

Fig. 4. The Flowchart of Rule-based Chatbot

Fig. 5. The Flowchart of GPT-2 Chatbot

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Table 10. Chatbot Evaluation Survey (Text Entry Questions) and Results for Baseline, Rule-based, and GPT-2 Chatbot (PSI Affiliates)

	Advantages	**Disadvantages**
Baseline	1. Quick, empathetic replies. 2. Open-ended questions that prompts in-depth answers.	1. Robotic, repeated, bland, vague, generic, short replies. 2. Not provide resources or solutions. 3. Keep asking open-ended question after details.
Rule-based	1. Empathetic, long, genuine, human-like, specific, encouraging responses. 2. Open-ended question.	1. Not recognize some concerns. 2. Not concise, sometimes too many responses. 3. No resources/advice. 4. Repeated response.
GPT-2	1. Quick, empathetic, engaging, humanlike, less robotic response. 2. Move conversation along to resources, approachable.	1. Confusing, not empathetic response. 2. Mentioned resources but didn't provide any.

3. What are some of the ethical issues in the application of artificial intelligence in mental health care?

Shots — HEALTH NEWS FROM NPR

PUBLIC HEALTH

Maternal deaths in the U.S. spiked in 2021, CDC reports

March 16, 2023 · 12:02 AM ET
Heard on Morning Edition
By Selena Simmons-Duffin, Carmel Wroth

▶ 3-Minute Listen | + PLAYLIST

The Upshot

Childbirth Is Deadlier for Black Families Even When They're Rich, Expansive Study Finds

By Claire Cain Miller, Sarah Kliff and Larry Buchanan
Produced by Larry Buchanan and Shannon Lin
Feb. 12, 2023

🎁 Give this article | ↗ | 🔖 | 💬 860

In the United States, the richest mothers and their newborns are the most likely to survive the year after childbirth — except when the family is Black, according to a groundbreaking new study of two million California births. The richest Black mothers and their babies are twice as likely to die as the richest white mothers and their babies.

Research has repeatedly shown that Black mothers and babies have the worst childbirth outcomes in the United States. But this study is novel because it's the first of its size to show how the risks of childbirth vary by both race and parental income, and how Black families, regardless of their socioeconomic status, are disproportionately affected.

HEALTH | Health Disparities | Add Topic +

Experts call out factors making pregnancy far less safe for Black people in America

Amid Black Maternal Health Week, experts are raising the alarm on the urgent need for equity. Black women and birthing people are more likely than any other racial or ethnic group in the US to die of pregnancy-related causes.

Nada Hassanein
USA TODAY
Published 4:25 p.m. ET April 11, 2023 | Updated 1:04 p.m. ET April 16, 2023

NEWS RELEASE

Racial Disparities in Maternal and Infant Health: Current Status and Efforts to Address Them

Latoya Hill 🐦 , Samantha Artiga 🐦 , and Usha Ranji
Published: Nov 01, 2022

Nov 2022
› Updated Brief on Racial Disparities in Maternal and Infant Health

ALSO OF INTEREST
› What are the Implications of the Overturning of Roe v. Wade for Racial Disparities?
› Medicaid Postpartum Coverage Extension Tracker
› How Does the ACA Expansion Affect Medicaid Coverage Before and During Pregnancy?

Summary

Stark racial disparities in maternal and infant health in the U.S. have persisted for decades despite continued advancements in medical care. The disparate impact of the COVID-19 pandemic for people of color has brought a new focus to health disparities, including the longstanding inequities in maternal and infant health. Additionally, with Roe v. Wade now overturned, increased barriers to abortion for people of color may widen the already existing large disparities in maternal and infant health. Recently, there has been increased attention and focus on improving maternal and infant health and reducing disparities in these areas, including a range of efforts at the federal level. This brief provides an overview of racial disparities for selected measures of maternal and infant health, discusses the factors that drive these disparities, and provides an overview of recent efforts to address them.[1] It finds:

The Challenge: Designing for Equity
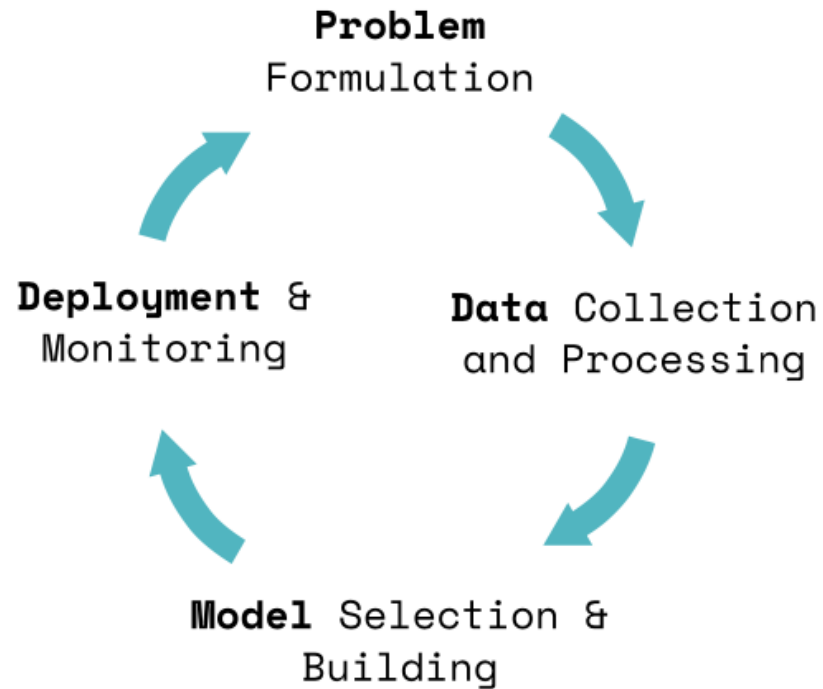
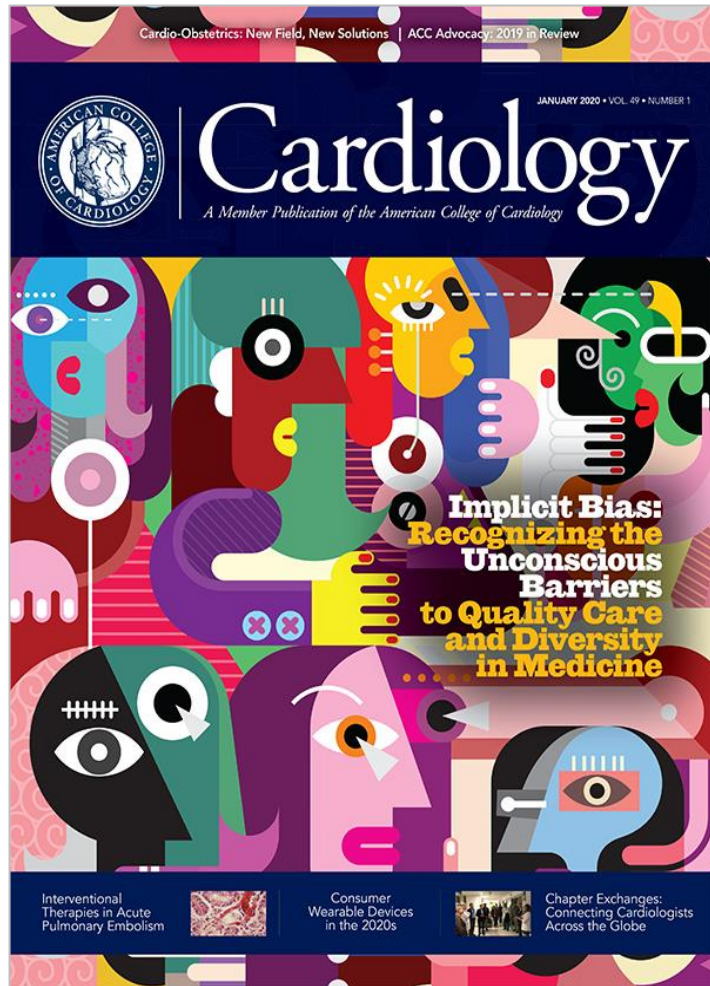**Problem:** What/Whose problem is the chatbot solving?

Data: Does the data capture/train on the systemic inequities in maternal health?

Model: What maternal health outcomes do we optimize the model for?

Deployment: What outputs support equity-centered postpartum support?

Racial Equity in Healthcare

Racial discrimination in healthcare: diagnosis and treatment; access to care; quality of care; disparate outcomes

---

How does current deployment of AI/ML techniques accelerate inequities in healthcare?

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News & Research

Skin Tone and Pulse Oximetry

Racial disparities in care tied to differences in pulse oximeter performance

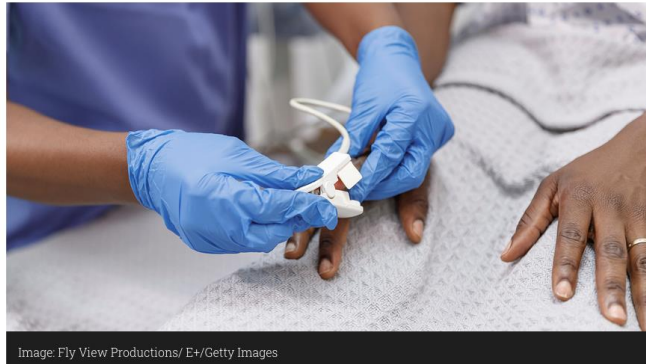By HALEY BRIDGER | Brigham and Women's Communications | July 14, 2022 | Research, Care Delivery
4 min read

Image: Fly View Productions/ E+/Getty Images

Most patients are familiar with the pulse oximeter from visits to the doctor's office. Placed on a patient's finger or ear lobe, pulse oximeters are an easy way to quickly get a measure of blood oxygen saturation (SpO_2), an important measure of how well they are breathing on their own or whether they need supportive treatment.

CORE AI ETHICS CONCEPTS
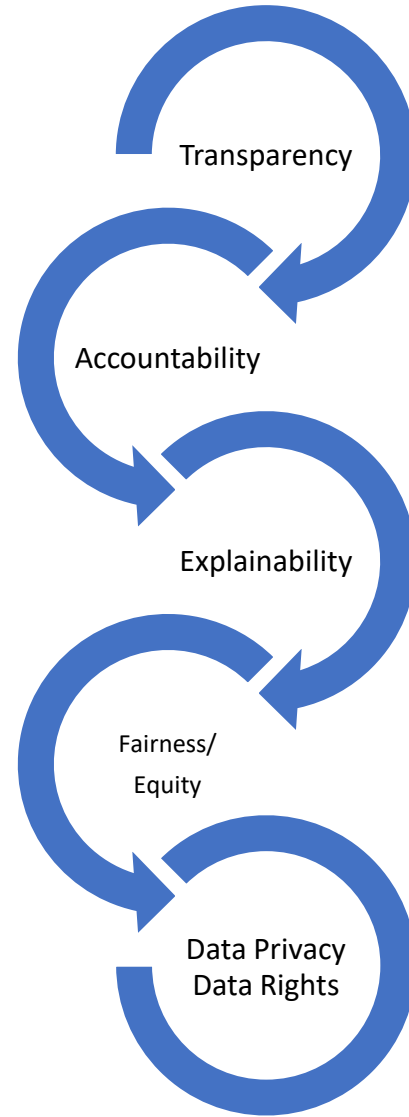
Transparency

Accountability

Explainability

Fairness/ Equity

Data Privacy Data Rights

4. What are the goals of a new National Institutes of Health funded study on the Black youth suicide crisis?

UNDERSTANDING BLACK YOUTH SUICIDE

THE RATE OF SUICIDE IN **BLACK YOUTH** < 13 YEARS OLD IS APPROXIMATELY **2X HIGHER COMPARED TO WHITE PEERS**

2008

SUICIDE **5TH LEADING CAUSE OF DEATH** AMONG **BLACK YOUTH 5-18 YEARS OLD**

5
4
3
2
1

2018

SUICIDE **3RD LEADING CAUSE OF DEATH** AMONG **BLACK YOUTH 5-18 YEARS OLD**

3
2
1

2009 - 2019
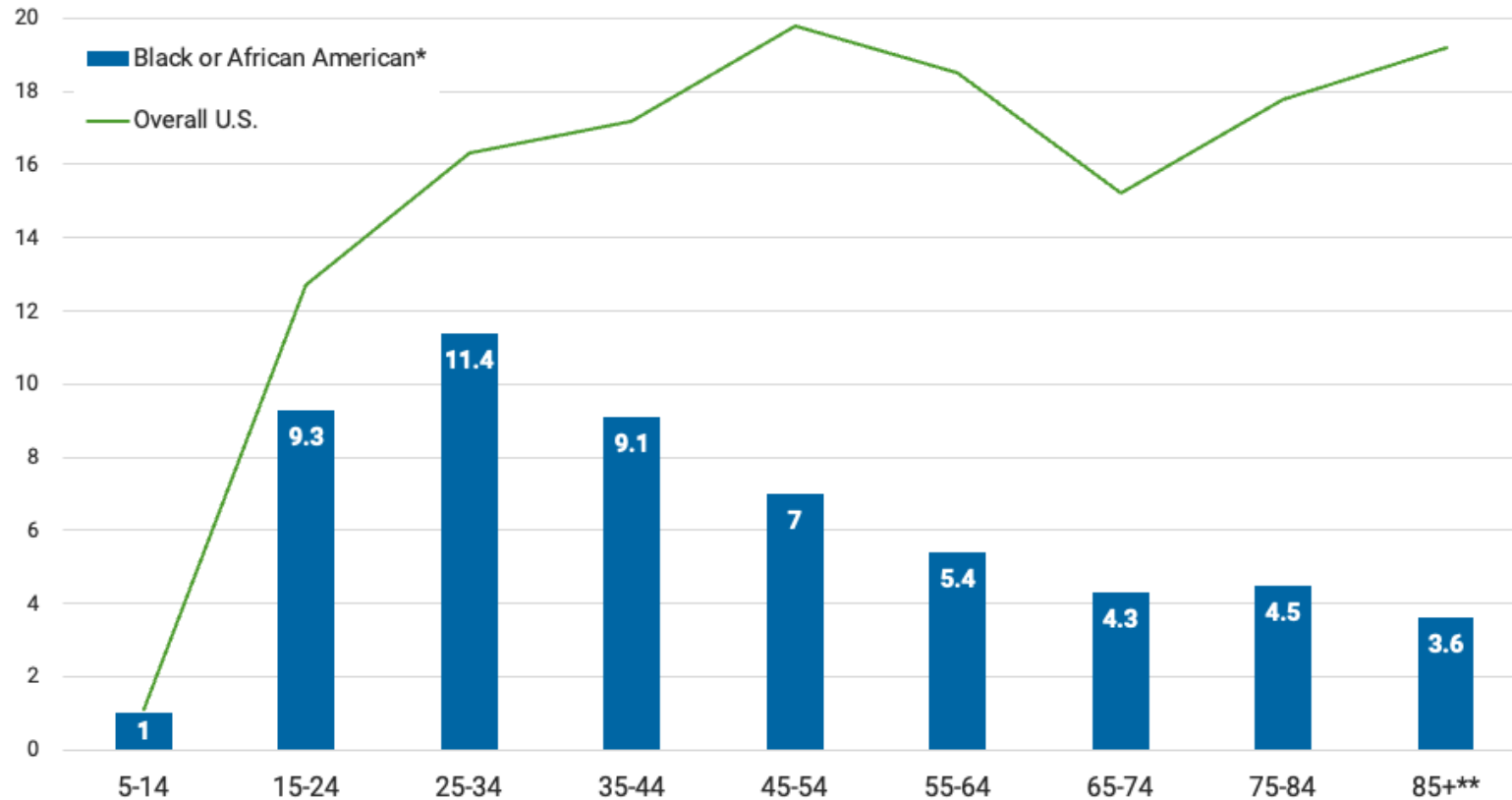
PERCENTAGE OF BLACK HIGH SCHOOL STUDENTS WHO

CONSIDERED SUICIDE **INCREASED FROM 12.95% TO 16.89%**

MADE A SUICIDE PLAN **INCREASED FROM 9.79% TO 15.02%**

ATTEMPTED SUICIDE **INCREASED FROM 7.94% TO 11.85%**

Sources: Centers for Disease Control and Prevention
Bridge JA, et al. JAMA Pediatrics. 2018;172(7):697-699.

Suicide Deaths Among Black Youth Ages 0-19 in the United States by Age Group, 2001-2021

SOURCE: *Centers for Disease Control and Prevention (CDC) Web-based Injury Statistics Query and Reporting System (WISQARS)*
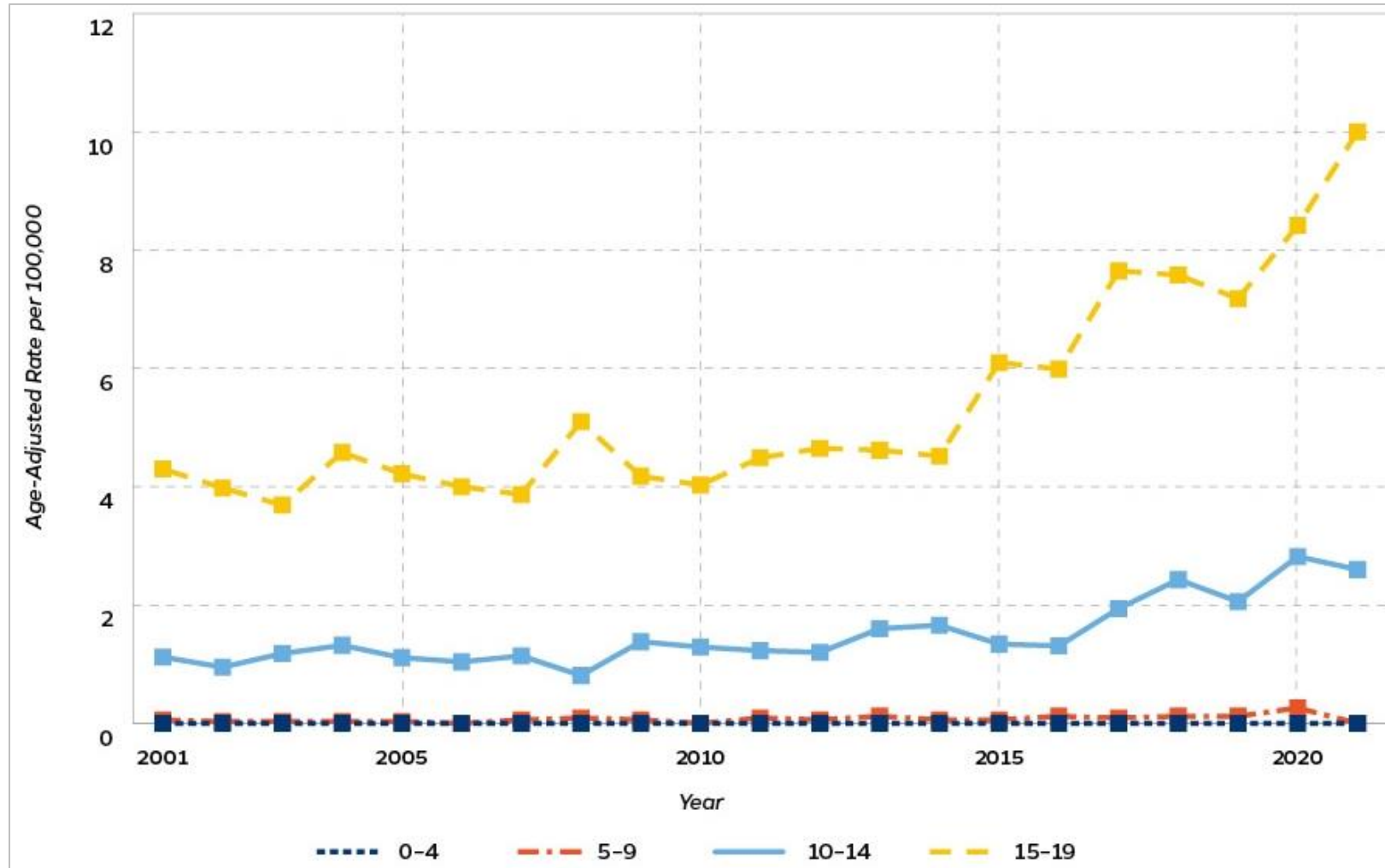
Analyzing Social Factors to Enhance Suicide Prevention Across Population Groups

Richard Li Xu*, Song Wang[†], Zewei Wang*, Yuhan Zhang*, Yunyu Xiao*, Jyotishman Pathak*
David Hodge[‡], Yan Leng[§], S. Craig Watkins[¶], Ying Ding[∥], Yifan Peng*
*Population Health Sciences, Weill Cornell Medicine, New York, USA
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[‡]National Center for Bioethics in Research and Health Care, Tuskegee University, Tuskegee, Alabama, USA
[§]McCombs School of Business, The University of Texas at Austin, Austin, Texas, USA
[¶]School of Journalism and Media, The University of Texas at Austin, Austin, Texas, USA
[∥]School of Information, The University of Texas at Austin, Austin, Texas, USA

Abstract—Social factors like family background, education level, financial status, and stress can impact public health outcomes, such as suicidal ideation. However, the analysis of social factors for suicide prevention has been limited by the lack of up-to-date suicide reporting data, variations in reporting practices, and small sample sizes. In this study, we analyzed 172,629 suicide incidents from 2014 to 2020 utilizing the National Violent Death Reporting System Restricted Access Database (NVDRS-RAD). Logistic regression models were developed to examine the relationships between demographics and suicide-related circumstances. Trends over time were assessed, and Latent Dirichlet Allocation (LDA) was used to identify common suicide-related social factors. Mental health, interpersonal relationships, mental health treatment and disclosure, and school/work-related stressors were identified as the main themes of suicide-related social factors. This study also identified systemic disparities across various population groups, particularly concerning Black individuals, young people aged under 24, healthcare practitioners, and those with limited education backgrounds, which shed light on potential directions for demographic-specific suicidal interventions.

Index Terms—Social Determinants of Health, Social Factors, Suicide

besides the psychosocial work environment issues such as conflicts with colleagues and lack of social support, physicians often have to face breaking bad news, illnesses, anxiety, suffering, and death. Additionally, perfectionism, great attention to detail, exaggerated sense of responsibility and duty are highly appreciated qualities for physicians but are also contributors to stress and depression for this population. Despite this, there is still a lack of understanding towards suicide occurrences among healthcare professionals as a result of inconsistent data reporting and limited analysis [7].

Moreover, previous work have explored the relationships between education level and suicide risk, and suggested the associations between suicide risk and various Social Determinants of Health (SDoH) factors, such as relationship problems, substance abuse problems, mental health problems, and job problems, etc. [8], [9]. However, several limitations remain as a result of outdated data, small sample sizes, and not
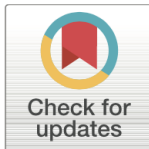
PLOS MENTAL HEALTH

The role of social determinants of health in mental health: An examination of the moderating effects of race, ethnicity, and gender on depression through the all of us research program dataset

Matt Kammer-Kerwick[1]*, **Kyle Cox**[1], **Ishani Purohit**[1], **S. Craig Watkins**[2]

1 IC2 Institute, The University of Texas at Austin, Austin, Texas, United States of America, **2** Moody School of Communications and IC2 Institute, The University of Texas at Austin, Austin, Texas, United States of America

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Abstract

We investigate how select identity characteristics moderate the role of several SDoH domains on major depressive disorder (MDD). Our study considers an analytical sample of 86,954 participants from the NIH-funded All of Us (AoU) Research Program in the USA. Our
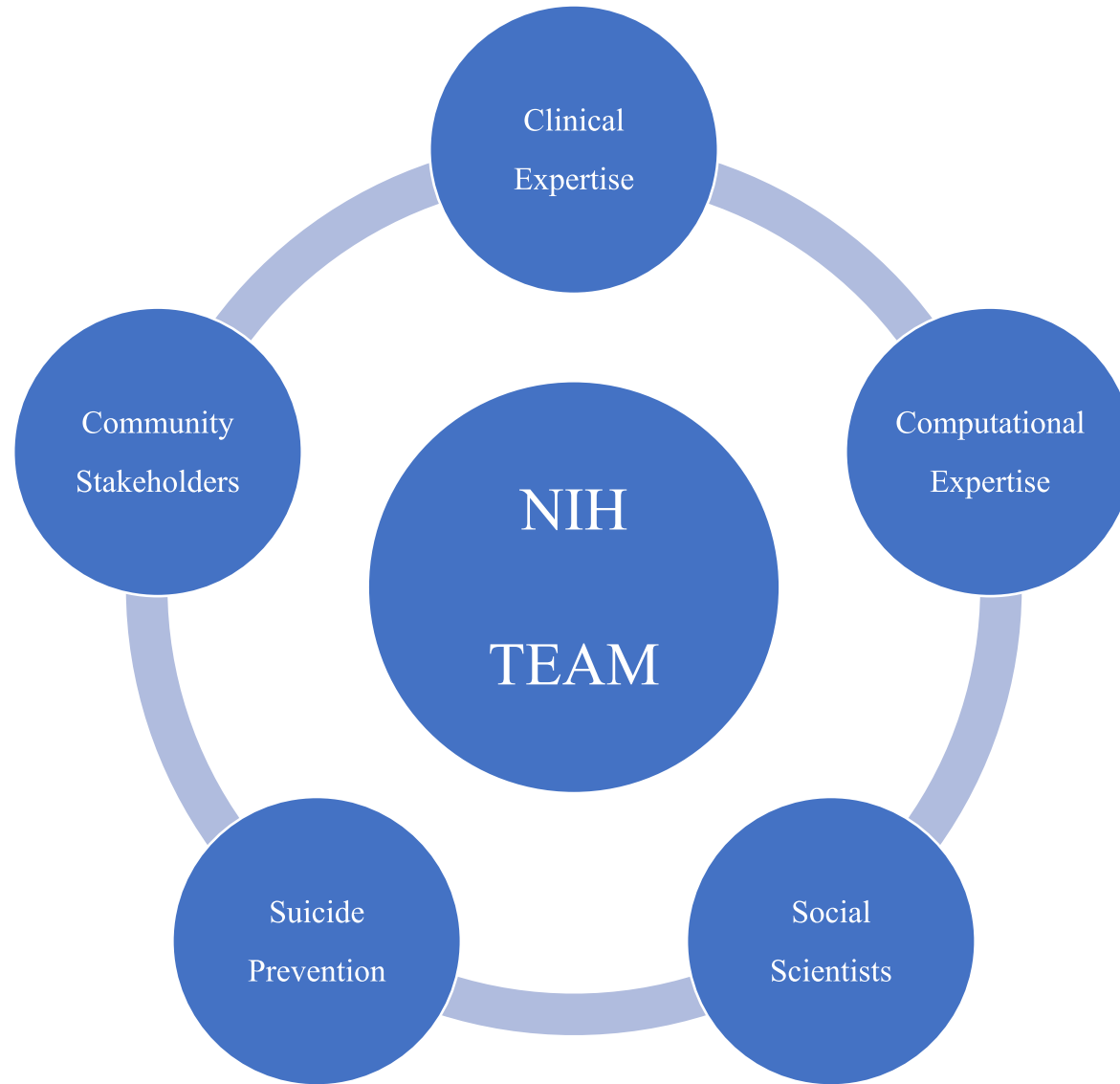
Using Generative AI to deliver mental health counseling.

The main goal of our project is to develop a LLM-based approach to automate the generation of personalized counseling advice for individuals seeking mental health on social media platforms. To evaluate the performance of our method, we will conduct a randomized controlled trial (RCT) to compare the effectiveness of AI-generated counseling advice versus traditional counseling advice, on Reddit and through lab experiments. The project aims to rigorously evaluate the impact of AI-generated advice on users' mental health outcomes, ensuring the ethical and responsible use of AI

technologies in delivering mental health interventions.

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SUICIDAL BEHAVIOR PATHWAY

Mental Health Condition → Suicidal Ideation → Suicide Planning → Suicide Attempt → Injury Via Suicide Attempt

Community-Centered Ethical Guidelines

Community Involvement and Co-Design

Cultural Sensitivity and Relevance

Youth Autonomy and Empowerment

Transparency and Explainability
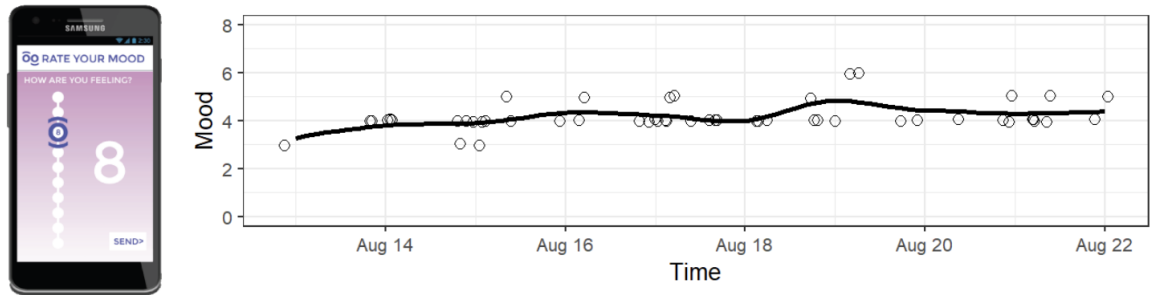
Digital Phenotyping

Figure 1.1: Active EMA: data are collected by prompting questions to participants, for instance by using an EMA app such as Moodbuster.
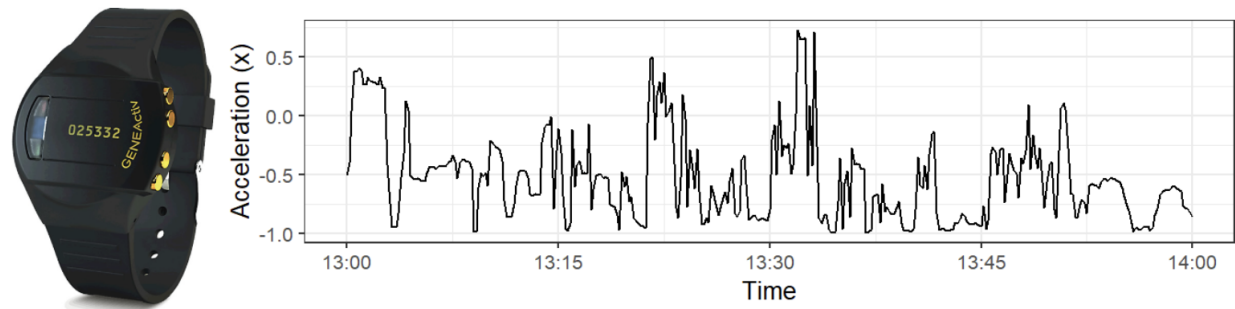

Figure 1.2: Passive EMA: data are collected automatically, for instance by a wearable device such as the GENEActiv accelerometer.

Augment the delivery of behavioral healthcare

•

Capture social, behavioral, and environmental data

*

Real-time, Over time

•

Relevant analytics and feedback

*

Collaboration:

Currently recruiting pilot partners

craig.watkins@austin.utexas.edu