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Advancing equity in mental health with technologies: lessons from the United States and China

Zoe Leung

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Introduction

Globally, the COVID-19 pandemic has magnified the risk factors associated with poor mental health, including financial distress, racial disparities, stigmatization and access to health services. The World Health Organization (WHO) reported that the global prevalence of anxiety and depression grew by 25 percent in the first year of the pandemic alone (WHO 2022). But even before the pandemic, many experiencing mental illness did not receive the care they needed due to a host of reasons, including lack of access to care and a shortage of trained professionals. While the public health crisis created shocks and disruptions to the healthcare delivery system, it has also driven urgent steps to make telehealth and digital interventions affordable and accessible. Growing acceptance and institutionalization of telehealth has in turn accelerated the adoption of digital tools for mental health.

Although relatively better understood in the United States than in China, mental health care remains a significant challenge in the U.S., particularly in the wake of COVID-19, as disparities in access to appropriate care and treatment persist. In 2020, the prevalence of mental illness among adults was 21 percent in the United States, and only half of them actually received treatment (National Institute of Mental Health n.d.). China's case is unnerving—the percentage of adults experiencing mental disorders jumped twofold, from 16.6 percent pre-pandemic to 35 percent, exacerbated by China's strict pandemic measures, and a mere 10 percent received treatment (*The Lancet* 2022; Huang et al. 2019). Although mental health is an emerging priority for policymakers and healthcare providers in China, the country continues to struggle with an acute shortage of mental health professionals and low public awareness of treatment options.

This short report seeks to dig deeper into the promises and perils of using digital tools to bridge the mental health disparity as well as the hurdles to mainstreaming them in both the United States and China. In this report, health disparities are defined as imbalances affecting access, quality and outcomes of behavioral health care. Unlike country-to-country comparative studies, this paper highlights lessons and developments informed by the numerous consultations the Bush China Foundation has conducted with U.S. and Chinese academics, health and policy practitioners, entrepreneurs and app developers in the last six months, with an eye toward supplementing the growing evidence base surrounding digital mental health. In doing so, it fills a gap in understanding the role of digital mental health solutions from the lens of best practices and knowledge-sharing between the U.S. and China. The goal is to help raise much-needed awareness around mental health disparities and spark discussions and collaborative opportunities for building better digital mental health ecosystems for people in both countries.

Digital innovations

Digital health technologies and interventions for mental health range widely from mobile apps to artificial intelligence. The list of seven below is by no means exhaustive, but it gives an indication of the many projects and considerations taking place in this evolving space. They are telemedicine, mobile applications, social media, artificial intelligence, video-modeling, sensing technology and adaptive intervention designs.

Telemedicine: The COVID-19 pandemic and related control measures have accelerated the acceptance and adoption of telehealth. The uptake is indisputable—at the peak of the pandemic in 2020, telehealth represented 40 percent of mental health and substance use outpatient visits in the United States, up from the pre-pandemic level of 1 percent (Lo et al. 2022). Technologies such as videoconferencing, remote patient monitoring and portal technology provide opportunities for long-distance clinical consultations between a patient and healthcare provider as well as continuing education for the healthcare workforce. Electronic transmission of health and medical data and records enables connectivity and asynchronized communications between different physical locations, especially when paired with other tools such as mobile apps and wearables.

In the United States, a growing number of states are introducing standards of practice for telemedicine, of which telepsychiatry is a subset. In China, internet hospitals are the model for telemedicine. As the number of trained psychiatrists and psychologists available to help in China is minuscule compared to the demand for care, internet hospitals leverage telecommunication technology to amplify resources and reach populations that otherwise had no or limited access to care. Internet hospitals' pre-pandemic penetration was already 73.5 percent of all provinces and provincial-level cities, and their numbers continue to grow rapidly (Han et al. 2020).

There is clear evidence that telehealth was effective in treating common behavioral health issues, including depression, anxiety and post-traumatic stress disorder (PTSD). However, the space where telehealth and behavioral health intersect is still nascent in the U.S. and China, and clinicians and patients may not have confidence that telehealth can help. Additionally, although these services are sometimes reimbursable, challenges arise due to the lack of integration between systems, let alone between different states and countries. In the U.S., the Biden administration's plan to end the COVID-19 public health emergency in May of this year adds uncertainty to reimbursement mechanisms. In China, some digital mental health services were offered free during the pandemic, and it is unclear as to whether that will continue.

Large health organizations like Kaiser Permanente (KP) that are both an insurer and a healthcare provider are well-positioned to integrate digital tools into workflow, offer reimbursements for these services and set best practices for digital therapeutics. For example, a KP member has direct access to digital tools referred by their clinician and the KP Wellness Program. The Wellness Program offers a suite of self-care apps for which KP has purchased licenses, such as Calm, MyStrength, SilverCloud,Thrive and gender-related coaching to help educate, destigmatize and provide support for common behavioral health issues. KP's user-centric model focuses on understanding the context of care and streamlining the referral process.

Mobile applications: Over 20,000 behavioral health apps are available in Apple and Google Play app stores, and the number continues

to grow (Carlo et al. 2019). This is fueled in part by the excitement over the explosion of demand for digital resources and services at one's fingertips, and partly by a growing awareness of mental health and wellness. There are many types of apps, from self-management apps centered on meditation and mindfulness to cognitive behavioral therapy (CBT) apps. Some apps can be supported by allowing the user to connect with human coaches or to send information to a healthcare provider.

Aside from a few hundred digital therapeutics apps (including Headspace, Calm, Pear Therapeutic and SilverCloud) regulated by the U.S. Food and Drug Administration (FDA) to varying degrees, the wellness industry is not well regulated. According to one app developer, it takes about three to six months in the United States for a non-prescription therapeutics app to be cleared by the FDA. As prescription therapeutics require clinical trials, an app can take three to five years from development to clearance. The regulatory environment of these apps is shifting, creating uncertainty for providers. In China, the app marketplace is unregulated and often flagged by experts for lacking evidence. While health management apps that can prescribe medicine (many involving mental health) are regulated by China's FDA, there are no regulations to govern the practice of online counseling. Most mental health apps (78 percent) are developed by private companies that do not necessarily have the expertise to evaluate and supervise counseling (Shang et al. 2019).

Despite their convenience and potential benefits, there is hesitancy around mental health apps related to efficacy and scientific evidence to support claims of helping users, especially when used standalone outside of the clinical setting and without human coaching. As many users discontinue subscriptions when they feel better, there is also the question of the level and length of continued engagement for the app to be effective. Healthcare providers may be reticent to recommend an app to patients, as research cannot keep up with the pace of new apps being added to the market. There are no review boards or tried

and true rules for choosing a mental health app, so consumers have little information to assess whether these apps are effective in helping them and if their data and privacy are protected.

To fill this gap, U.S. nonprofits such as Psyberguide and the American Psychiatric Association publish guides and reviews to help users and mental health care providers assess apps' credibility and evidence. Targeted platforms such as SIMHA Health (Sephardic Initiative for Mental Health Awareness) also seek to provide vetting and educational services. In China, big players in the evaluation industry are businesses, which have been filling the gap after China's labor department stopped providing certification and governing the counseling industry. One example is MyTherapists (简单心里), a leading digital mental health startup that provides education and psychotherapy on their platform. It has due diligence protocols in place to pre-vet therapists and has been involved in the professionalization of the counseling industry in China. However, as they vet their own therapists, it raises the question of conflict of interest.

The lack of trust in mental health apps is prevalent in both countries, which can shape how digital services will be provided in the future. One avenue for improving trust is for the industry to move away from a B2C (business to customers) model in favor of the B2B (business to business) and B2O (business to organization) models where apps are delivered from clinicians to patients. Kaiser Permanente (KP) mentioned above has designed an integrated workflow to get apps from clinicians to patients via text messages, bypassing their employers. In a similar vein, some apps such as Happify (now part of Twill) have moved toward more clinical and evidence-based offerings. It runs as a hybrid model combining community space, digital therapeutics and human-based care and prides itself on its high engagement rate through incorporating gamified elements into science-based games and activities.

Social media: In China, most, if not all, online

counseling platforms set up official accounts on WeChat, the ubiquitous integrated messaging, social media and payment platform with over 1 billion registered users in the country. As public interests in psychology, emotional resilience and mindfulness balloon, service providers utilize WeChat to publish articles and digital content to attract netizens and offer a diverse range of products, from Q&A modules and toolkits to cope with stress and anxiety to interventions such as internet-delivered CBT programs. International programs including WHO's Problem Management Plus (more details are below) can be adapted to WeChat to draw from community and social support while reducing the burden of training for trainers.

Artificial intelligence (AI): In the United States, research on artificial intelligence applications for mental health is still in the early stages. AI is viewed as a useful tool to understand people with mental health issues, and techniques such as machine learning and natural language processing (NLP) can be used to analyze network-censored data and records to detect symptoms associated with a specific mental health disorder. However, it has been less successful in helping clinicians to structure, understand and personalize treatments, according to a U.S. researcher working in this space. In China, the policy and investment environment are supportive of AI usage in medical practices. A researcher pointed to the easy access to big data in China as an advantage to further push the R&D and implementation of AI-based solutions.

Video-modeling: Video-modeling refers to the acquisition and generalization of a specific skill through observing and imitating the recorded desired behavior of another person on digital platforms. It is an evidence-based practice (including helping children with autism) that has the potential to bridge the gap in digital mental health by instructing patients/learners to self-collect data and translate it into information that informs behavior health analysis as well as training care providers.

Sensing technology: A great deal of research and effort has gone into developing apps that can collect data using the sensors built into ubiquitous technology such as smartphones and wearables. These sensors can record mobility and activity levels, social interactions and voice tone, which enables real-time information collection and determination of deviations from a user's typical behavior patterns before a crisis occurs. When cross-referenced with other apps on the phone, sensing technology has the potential to detect real-time changes in behavioral patterns and time the delivery of the intervention to ensure maximum receptivity. For instance, delivery can be delayed until the user finishes a call or a meeting. There have also been studies on applying sensing technology in semi-controlled environments, like in a car to record not only the physical environment but also variables in the user driving the car.

A U.S. researcher shared their work on applying passive sensing to stress, anxiety and substance abuse. Although correlations between stressors and mental health issues such as anxiety and substance abuse exist, causality has yet to be established because there is always missing information not being captured. Another challenge is the ability to detect variables and stressors accurately and consistently, which is crucial to developing better interventions. Research on applying the technology to support those suffering from severe mental conditions is inadequate.

Adaptive intervention designs: Technology has enabled new intervention designs to determine when and what interventions (such as human-based coaching and text- or system-based alerts) and the frequency of interventions will be helpful to a patient. For example, this individualized approach can answer the question of how much human interaction a user needs for digital interventions to be effective. The design can allow treatments to be continuously adapted and optimized to reach treatment goals within a given period. For instance, Just-In-Time Adaptive Interventions (JITAIs) are designed to provide intervention when the user is expected to be most receptive and available to engage with it. The adaption responds to changes in internal emotional states and external

contexts to provide the right type and amount of intervention. JITAIs use smartphones and wearables for sensing and intervention delivery when needed. These designs offer a promising pathway toward more effective suicide prevention (Coppersmith et al. 2021), among other services.

Sequential Multiple Assignment Randomized Trials (SMARTs) are an experimental design involving multiple stages of randomization based on pre-set conditions to inform when adjustments and readjustments to a treatment are needed and their sequencing. It is a tool that can help optimize adaptive interventions and follow-up actions in response to the specific needs and changing conditions of the user (Nahum-Shani and Almirall 2022).

Potential benefits of technological applications in mental health

Technology holds huge potential for patients and clinicians alike. For patients, mobile intervention and treatment can happen anytime and anywhere with anonymity, and round-the-clock monitoring is possible. Users can access information at their leisure to increase their understanding of mental wellbeing. In some cases, costs for mobile care are reimbursable and can be lower than those of traditional care. For clinicians, technology provides opportunities to amplify scarce resources, access patients from remote areas and monitor progress between traditional sessions.

The following are seven benefits from use cases in both the United States and China that illustrate the promises of technology for mental health.

Lowering the barriers: A U.S. researcher developed an automated self-help mobile intervention program called Stepping Stone for homeless youth that provides brief interventions and interactions on the phone, including coping skills and breathing strategies, and serves as a conduit to therapists who provide brief cognitive-behavior interventions. Research shows that the app's convenience reduces the burden of use for homeless youth who often face many challenges and struggles stemming from housing instability.

In China, private hospital patients seeking second opinions and medical treatments outside of China can access international teleconsultation. The service reduces the geographical barrier to accessing quality specialists and has great potential to improve mental health outcomes for patients with serious illnesses, given that a significant proportion of them have a mental health condition. However, it is an option only for patients who can afford the higher cost of these services, and the drugs prescribed may not be available locally.

Mitigating stigma: For the many people who do not want to be seen going into a psychiatrist's office, text messaging and digital platforms and devices can help provide confidentiality and lower the barriers of stigma. Reducing stigma has been found to improve early prevention of mental health conditions, as it is the leading reason for late diagnoses. The digital space and digital interactions allow for sharing stories of lived experiences, which help advance awareness and reduce discrimination.

Amplifying physicians' ability to treat: In the United States, 80 percent of behavioral healthcare is provided in a primary care setting, and primary care physicians may not have the expertise to deal with the nuances of mental health. The ability to provide care for a patient's total health—both physically and mentally—or "integrated behavior health" is deeply linked to technology. Digital tools allow for scaling and collaboration between primary care and behavioral health clinicians. These tools include remote patient monitoring, telehealth, direct messaging and care management systems.

In China, policy support has been conducive to the development and deployment of health technologies in hospitals. A researcher shared that the government has encouraged research and experimentation of innovative solutions, such as diagnostic robotics, that can help alleviate the workload of physicians and provide automation and clinical decision support amidst a mental healthcare staffing shortage. Another researcher has tested app-based programs and found them helpful in delivering interventions to treat prenatal and postnatal depression.

Scaling evidence-based treatments: The WHO offers a scalable intervention model of a version of CBT that can be administered by lay or paraprofessionals to deliver treatments to adults with mental disorders. Problem Management Plus (PM+) offers a suite of interventions including some CBT

tools, social support and a range of coping exercises. Studies have found it improves the mental health and psychological wellbeing of people who experience PTSD, anxiety and depression.

Digital interventions and apps can be adapted to different languages and cultures and localized to varying degrees. For example, a U.S. researcher specializing in trauma and disaster mental health developed a web-based intervention that was subsequently rolled out in China—following a randomized clinical trial and translation into Mandarin Chinese—as one of only a handful of empirically tested interventions available.

Servicing underserved communities: To reduce care barriers faced by rural children in the United States, more and more funding is dedicated to developing new service delivery and care coordination models that leverage telecommunications technology (such as teleconferencing). The Biden administration's initiative to provide affordable high-speed internet for everyone in America in the aftermath of the COVID-19 pandemic has amplified opportunities for expanding school- and community-based behavioral telehealth services to assess and treat illnesses and for improving the linkage between primary care and trusted care settings to provide quality care delivery. Moreover, community-focused apps such as PatientsLikeMe center on peer support and shared experiences.

As the American population is diverse, there is a growing need to better understand why health outcomes might vary for different segments of the population. Anise Health, a digital platform that offers culturally adapted therapy and coaching focused on minority communities, was founded during the height of the pandemic to address the underutilization of mental health care in the Asian American community, which itself is composed of complex cultural identities. The company pointed to provider and research bias (which has led to mis/under-diagnosis) and stigma's culture-specific effects on Asian communities as illustrations of why Asian Americans experience anxiety and other conditions differently, which affect diagnosis and treatment options.

In China, as maternal hospitals and postpartum recovery centers (facilities designed to provide care for mothers and their newborn babies) do not have expertise in mental health, digital tools enable hospitals to remotely monitor the psychological wellbeing of mothers for early prevention. These tools include standardization of screening for postpartum depression and providing information and education about the risk, signs and symptoms of maternal mental health disorders. Newer digital mental health startups in China are creating communities among their app users to enable access not only to counselors but also to groups of people who can support each other in improving their mental health. These opportunities are possible because health information privacy laws in China do not apply to non-medical settings.

Expanding solutions for workplace mental health: Awareness and demand for solutions to address mental health and wellness challenges in the workplace is increasing. Bearapy is a Beijing-based training and organizational consultancy platform dedicated to raising awareness of workplace burnout and stress management and promoting emotional resilience through tailored training programs for employers seeking to create a culture of health. The company shared that even though these tools and interventions can help companies increase productivity and save costs, their clients are primarily specific departments within multinational companies operating in China but not the whole company or local Chinese companies. Wide adoption of workplace mental health programs in both the United States and China still has a long way to go.

Launched in 2022, "Pause a moment" or PAM is a U.S.-developed web-based education platform for healthcare workers affected by COVID-19 to learn and practice coping methods for anxiety, depression and trauma and build emotional resilience. Although it does not connect users to psychotherapy, it is free and confidential and offers a range

of tools, modules and interventions that can be tailored to individual goals, symptoms, preferences and progress. It is available in numerous languages and for healthcare workers worldwide. A researcher shared that the main challenge is to increase uptake and buy-in from hospital administrators who make decisions on how to support their staff. But as all medical institutions have different systems and structures, obtaining commitment and partnership has been difficult.

Upscaling clinical training and education: E-learning platforms are a form of educational invention that supplements traditional learning and provides continuing education for healthcare professionals. These platforms have existed for decades and have become increasingly commonplace, adaptable and scalable over time.

Developed in the United States, Project ECHO (Extension for Community Healthcare Outcomes) is a free knowledge-sharing platform that creates new educational opportunities by providing a flexible and adaptable peer-learning model. Originally designed by Sanjeev Arora, M.D. at the University of New Mexico Health Sciences Center in Albuquerque, the model can be customized to suit various organizational needs to disseminate and build learning through specific case studies and frequent, low-dose training. Since its launch, Project ECHO has reached professionals in almost every country, and it has great potential to advance case-based training in mental health. Currently, 75 of the 2,500 programs on the platform apply to behavioral health.

In China, a researcher received a government grant to develop a smartphone app that would adapt and perfect "Virtual Patient" simulations for health workforce training. Virtual patient simulations are interactive computer simulations designed to represent a standard set of real-life clinical scenarios to suit various educational objectives. Previously all text- or menu-based, simulations can now be verbal and human-like to advance high-quality training for clinicians. Currently, the app has scenarios

for 12 to 15 common health conditions (including mental health) in the Chinese population. In addition to China, the app is being tested in Nepal and other low-income countries, given the urgent need to increase the health workforce's access to high-quality education and medical practices.

Remaining challenges

The digital mental health space is promising and ripe for interdisciplinary research and collaboration. However, a host of challenges remain for delivering mental health care with technologies. Overall, it is imperative to further understand what technological solutions work for which mental health conditions and on what device; when to intervene and add the "human touch"; and at what point technology is excessive. Obtaining evidence has its challenges, however, as rigorous scientific testing and trials take time and may not be able to keep up with the speed at which technology develops. As we understand more through testing and implementation, resources for updating platforms/tools with new evidence and technology and cybersecurity and data usage regulations will also be essential.

As digital mental health is a new space, there is the question of who should and will regulate the marketplace of services and technology being offered and the data collected and generated. The market may eliminate apps/platforms that are proven ineffective in time, but it is important to have laws and policies in place to hold the government and businesses accountable. In increasing access and reducing the burden of use, a fundamental concern is to address the structural inequities around the technology itself: access, know-how and connectivity. The digital divide is rooted in socio-economic factors that affect the level of digital skills and engagement with learning in the digital space.

Conclusion

The industry is rapidly evolving with the acceleration of digital transformation and expansion of care options. More research is still needed to fully understand the social and societal impacts, diffusion and uptake of digital innovations for mental health. Designing for inclusivity and accessibility are increasingly important in improving mental health outcomes in society as a whole. It is our hope that the sharing of lessons learned and collaboration can advance progress toward mental care equity in the United States and China.

Acknowledgments

Author

Zoe Leung is the senior director of research at the George H. W. Bush Foundation for U.S.-China Relations, where she oversees the Foundation's research initiatives, the Fellows Network and the research internship program. She is a regular contributor to mainstream and foreign-policy oriented publications on Asia-Pacific security issues.

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