ORIGINAL RESEARCH

Technology and implementation science to forge the future of evidence-based psychotherapies: the PRIDE scale-up study

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ABSTRACT
Objective To report the interim results from the training of providers inevidence-based psychotherapies (EBPs) and use of mobile applications.

Design and Setting The Partnerships in Research to Implement and Disseminate Sustainable and Scalable Evidence (PRIDE) study is a cluster-randomised hybrid effectiveness-implementation trial comparing three delivery pathways for integrating comprehensive mental healthcare into primary care in Mozambique. Innovations include the use of EBPs and scaling-up of task-shifted mental health services using mobile applications.

Main outcome measures We examined EBP training attendance, certification, knowledge and intentions to deliver each component. We collected qualitative data through rapid ethnography and focus groups. We tracked the use of the mobile applications to investigate early reach of a valid screening tool (Electronic Mental Wellness Tool) and the roll out of the EBPs

Participants Psychiatric technicians and primary care providers trained in the EBPs.

Results PRIDE has trained 110 EBP providers, supervisors and trainers and will train 279 community health workers in upcoming months. The trainings improved knowledge about the EBPs and trainees indicated strong intentions to deliver the EBP core components. Trained providers began using the mobile applications and appear to identify cases and provide appropriate treatment.

Conclusions The future of EBPs requires implementation within existing systems of care with fidelity to their core evidence-based components. To sustainably address the vast mental health treatment gap globally, EBP implementation demands: expanding the mental health workforce by training existing human resources; sequential use of EBPs to comprehensively treat mental disorders and their comorbid presentations and leveraging digital screening and treatment applications.

BACKGROUND
The first evidence-based psychotherapy (EBP) efficacy study in a low and middle-income country (LMIC) was published in 2003 and demonstrated the efficacy of group interpersonal psychotherapy for depression in Uganda.[1] The number of EBP studies conducted in LMICs has since grown significantly.[2] Similar to studies in high-income countries, most EBP studies in LMICs address treatment of one or two disorders at a time (mostly depression) through efficacy testing. Few test effectiveness or cost-effectiveness; fewer still address the lack of human resources by training community providers and testing strategies to deliver EBPs with fidelity.[3] Further, these studies seldom address sustainability by evaluating the mental health research-to-practice gap or leveraging human resources not dependent on research funding.[4]

Meeting mental healthcare needs across the globe will require: (1) moving from single-disorder interventions to testing the sustainability of comprehensive approaches that address high burden mental disorders, (2) leveraging novel technology to support the implementation and supervision of these practices and (3) employing implementation science methods to integrate EBPs into routine practice.[5]

In light of these needs, the Partnerships in Research to Implement and Disseminate Sustainable and Scalable Evidence (PRIDE)-based practices in sub-Saharan Africa—Mozambique (U19 MH 113203) study was developed through a partnership among researchers from the USA, Brazil, South Africa and Mozambique to expand the reach of the Mozambique Ministry of Health's mental health services. PRIDE is unique in that it addresses comprehensive mental healthcare, rather than care for one or two disorders. This was the result of input from policymakers who underscored that the ministry was responsible for caring for all mental health conditions. PRIDE is the first study to examine the delivery and scale-up of task-shifted[4]

comprehensive mental health services to identify and treat severe, common and substance use disorders, as well as suicide risk, with neuropsychiatric pharmacological and EBP treatment.

PRIDE leveraged an ongoing capacity building programme that began in 2014 between researchers from Portuguese-speaking African countries in collaboration with the USA, Brazil and Mozambique, funded by the US National Institute of Mental Health (NIMH) and Fogarty International Center (D43-TW009675). Our diverse, interdisciplinary team of clinicians, researchers and policymakers allowed us to explore and challenge assumptions about our respective cultures and roles and to build cohesion. In preparation for PRIDE, we used a participatory research model developed by our team[6] to review the relevant literature on fidelity-consistent EBPs previously used in the sub-Saharan African region, then contextually and culturally adapted those most suitable to Mozambique, while preserving their core evidence-based elements. The PRIDE team was trained in all chosen EBPs and produced paper manuals and mobile applications adapted to the local culture and context, which would guide providers while enhancing rigour and fidelity to the EBPs and facilitating supervision. A formal interactive training-of-trainers in Mozambique for each EBP was accompanied by parallel adaptation as 25 Mozambican trainees piloted the adapted manuals in clinical sessions under supervision. Global experts in each EBP reviewed adapted bilingual manuals and bilingual mobile applications to ensure the EBPs' core components and key constructs were maintained during the adaptation process. The final PRIDE EBP mobile applications were piloted by trainers-of-trainers and newly trained providers.

PRIDE is currently being implemented in the 23 districts of the Nampula province of Mozambique. Using a cluster-randomised, hybrid implementation-effectiveness type-2 trial, we will evaluate the delivery and scale-up of comprehensive mental health services—addressing common disorders [(depression, anxiety and post-traumatic stress disorder (PTSD)], severe disorders (psychosis and bipolar), substance use disorders and suicide risk—integrated into primary care in three delivery pathways.[7] Cluster randomisation occurred at the district level, such that all providers in one district participate in only one of three delivery pathways. Pathway 1 is 'usual mental healthcare': specialised care is provided as usual by psychiatric technicians (PsyTs) who are mid-level neuropsychiatric health specialists supervised by psychiatrists or psychologists in district-level clinics.[7] Pathway 2 is 'screen, refer and treat': community health workers (CHWs), who are lay-level general health professionals, conduct mobile application screening and refer to community clinics as needed; at the clinics, primary care providers (PCPs), who are basic-level to mid-level general health professionals, deliver EBPs and neuropsychiatric pharmacological treatment using mobile applications. Pathway 3 is 'community mental health stepped care': CHWs conduct mobile application screening and delivery of EBPs during household visits and refer cases in need of neuropsychiatric pharmacological treatment to trained PCPs. PsyTs supervise all clinical activities in pathways 2 and 3 and help manage complex cases if hospitalisation is necessary. Details on the study design are described in previous pubications.[7] To ensure sustainability, no clinical services are financed by study funds, only training and certification of trainers, supervisors and providers. The primary outcome in this study is reach of mental health services, specifically the proportion of patients with mental disorder who receive EBPs. In addition, PRIDE uses mixed methods to examine cost-effectiveness and barriers/facilitators to implementation.

We developed a 12-item instrument, the Electronic Mental Wellness Tool (E-mwTool) for non-psychiatric specialists in primary care and CHWs in community settings to screen patients for mental disorders[8] (online supplementary material 1). When administered to patients, the first three items identify any mental disorder with excellent sensitivity (94%), followed by nine additional items for further classification into four treatment categories (common, severe and substance use disorders and suicide risk) with high specificity (63%–93%).[8] When administered to a family member who is not the patient, the first three items can identify any mental disorder with high sensitivity (73%) for an affected family member.

For background on the EBPs used in PRIDE, we present an overview of EBPs adapted and implemented in sub-Saharan Africa and discuss how technology and implementation methods have been used in trials to examine the efficacy or effectiveness of EPBs.

EBPs in sub-Saharan Africa
Common mental disorders
Several EBPs have been adapted to treat common mental disorders in sub-Saharan Africa, including interpersonal psychotherapy, cognitive behavioural therapy, problem-solving therapy, thought field therapy and narrative therapy.[2 9 10] These EBPs have been developed for both individual and group settings and delivered by specialists and non-specialists. A recent review of psychological interventions task-shifted to lay health workers identified studies in Zimbabwe, Uganda, South Africa and Zambia; most focused on efficacy and none examined implementation.[9] EBPs used in sub-Saharan Africa tend to target specific demographics (eg, adolescence, pregnancy or HIV status) and focus on a singular disorder (eg, depression or anxiety) as a means of improving health outcomes (eg, care engagement or treatment adherence). For example, a recent review of depression interventions for people living with HIV in sub-Saharan Africa found psychotherapy and task-shifting interventions to be efficacious for improving mental health outcomes, with some improvement in HIV care outcomes.[10] Based on its perceived cultural relevance, brevity and evidence for task-shifted delivery, the PRIDE team chose to implement interpersonal counselling, a brief, structured, four-session version of interpersonal psychotherapy designed for use in non-specialist settings, which focuses on interpersonal problems proximal to the onset of psychiatric symptoms.[11 12]

Substance use disorders
EBPs have also been adapted to treat substance use disorders in South Africa, Kenya, Zimbabwe, Uganda and Nigeria. Most EBPs that have been tested in sub-Saharan Africa employ motivational interviewing (MI) and/or cognitive behavioural therapy techniques. Although several studies have demonstrated their efficacy for substance use, there is substantial heterogeneity in these study designs, populations, interventions and results.[13–17] These EBP studies often target specific groups (eg, sex workers) or comorbidities (eg, tuberculosis or HIV). Some are implemented as a means to change behaviour in healthcare engagement, HIV prevention or gender-based violence.[17] Based on the evidence and cultural appropriateness, we selected Screening, Brief Intervention, Referral to Treatment (SBIRT) and included MI as the brief intervention resulting in a four-session intervention that employs empathic listening to explore patients' goals, resolve ambivalence and elicit motivation to change.[18–20]

Suicide risk
No published peer-reviewed studies on EBPs specifically for suicide risk have been conducted in sub-Saharan Africa. For simplicity, yet with significant evidence and cultural and contextual fitness, PRIDE selected the Safety Planning Intervention, a brief one-session suicide risk-reduction approach for developing a personalised set of coping strategies and sources of support to alleviate a suicidal crisis when hospitalisation is not indicated.[21 22]

Technology

Digital technology in the mental health sector has proliferated globally, often focused on depression and anxiety.[23][24] Despite infrastructure challenges in LMICs, digital technology can improve overall cost-effectiveness by strengthening the mental health capacity of existing non-specialists and supporting task-shifted delivery of EBP interventions. Research on technology-assisted delivery of EBPs in sub-Saharan is still in its infancy, though gaining visibility.[4] Among the few mental health interventions using digital technology in the region, most relied on text messaging to improve session attendance and treatment engagement.[25] Most studies focused on demonstrating feasibility.[23] Recent efficacy studies evaluating mobile-delivered brief EBPs in sub-Saharan Africa identified short-term benefits, which have lower cost and produce comparable clinical outcomes to standard delivery without technology.[15] A tablet-based application was developed by PRIDE to create digital patient records, screen for all mental disorders using the E-mwTool and guide task-shifted EBP delivery allowing remote monitoring of both patient outcomes and treatment fidelity.

Cost-effectiveness and implementation science studies

Traditionally, cost-effectiveness studies only take place after a series of efficacy, effectiveness and implementation studies assessing research-to-practice adoption of EBPs. Recent hybrid effectiveness-implementation designs have shortened the time between efficacy trials and uptake of scientific discoveries.[26] These studies usually employ a mixed-method approach, combining a randomised clinical trial with quantitative and qualitative measures that inform how to increase adoption during study implementation. Several mental health implementation science trials are currently underway in LMICs, funded through NIMH's Research Partnership for Scaling Up Mental Health Interventions in LMICs. However, only a few studies conducted to-date have examined implementation of EBPs in sub-Saharan Africa[27][28] and fewer still measure cost-effectiveness.[16] As such, PRIDE uses mixed methods to examine both cost-effectiveness and barriers/facilitators of implementing different comprehensive mental health services pathways.

Objective

To report the interim results from the training of non-specialists in EBPs and use of mobile applications that we have prepared for the PRIDE study.

METHODS

Digitising EBPs

Patients are categorised into serious, common or substance use disorders or suicide risk based on the result of the E-mwTool screen.[8] For those with severe disorders, a diagnostic medication algorithm based on the WHO Mental Health Gap Action Program guidelines[5] informs PCPs to prescribe neuropsychiatric pharmacological treatment. For those with common mental disorders, substance use disorders and suicide risk, providers deliver appropriate EBPs adapted for context, culture and delivery through a digital mobile application.

The screening and treatment applications use interactive methods, such as knowledge tabs with tips and sample scripts, and programmed automated processes to ensure fidelity, recognise clinical red flags and facilitate supervision. To promote sustainability, these applications safely generate digitised patient records that are securely stored in a local cloud server, which can be easily integrated into existing medical record systems and updated over time at subsequent medical visits.

Training

At this time, all PsyTs randomised to pathways 2 (screen, refer and treat) and 3 (community mental health-stepped care) completed training in all EBPs as providers, cotrainers and supervisors. PCPs randomised to pathway 2 were trained to deliver EBPs. (table 1) Training was staggered across four contact sessions in March, June, September and November 2019. To mitigate geographic barriers,

Table 1 PsyTs and PCPs pride training overview

Training	Participants	Length*	Covered	Certification process
Training 1: March 2019				
PRIDE introduction	PsyTs	5 days	▶ PRIDE study and their roles as cotrainers and supervisors ▶ mhGAP overview	n/a
Training 2: June 2019				
mhGAP neuropsychiatric disorders and suicide	PsyTs PCPs	10 days 5 day	▶ Neuropsychiatric disorders and suicide ▶ Neuropsychiatric Medication Management ▶ Suicide Risk ▶ *EBP: SPI* ▶ E-mwTool	▶ Successful observed role-play of SPI ▶ Successful presentation of three cases and review of three completed safety plans
Training 3: September 2019				
Substance use disorders	PsyTs PCPs	8 days 4 days	▶ *EBP: SBIRT/MI*	▶ Successful completion of SBIRT with five cases under supervision (as supervisors) ▶ Successful completion of SBIRT with three cases under supervision (as facilitators)
Training 4: November 2019				
Common mental disorders	PsyTs PCPs	8 days 5 days	▶ *EBP: IPC*	▶ Successful completion of IPC with five cases under supervision (as supervisors) ▶ Successful completion of IPC with three cases under supervision (as facilitators)

*Supervisors (PsyTs) receive double the training of providers.

.EBP, evidence-based psychotherapy; IPC, interpersonal counselling; mhGAP, WHO Mental Health Gap Action Programme; MI, motivational interviewing; PCPs, primary care providers; PsyTs, psychiatric technicians; SBIRT, Screening, Brief Intervention, Referral to Treatment; SPI, Safety Planning Intervention.

providers from several Nampula districts were given transportation to attend a centralised training. Mozambican mental health specialists (trainers-of-trainers)[29] delivered a mix of didactic instruction, interactive practice and tablet application workshops. On completion, the supervisors (PsyTs) and providers (PCPs) underwent a certification process to demonstrate competency in all three EBPs. In the coming months, CHWs in pathway 3 will be trained in all EBPs, whereas those in pathway 2 will be trained in the E-mwTool only.

Mixed-methods implementation outcomes

To evaluate training, we examined attendance, certification, knowledge and intentions to deliver the core components of the EBPs and collected qualitative data through rapid ethnography and focus groups. For the SBIRT/MI and interpersonal counselling trainings, consenting trainees completed knowledge tests including 10 true–false questions pretraining and posttraining. To assess knowledge improvement, we ran paired t-tests examining mean differences with 95% CIs. Participants completed short post-training surveys on intention to perform discrete behaviour components of each EBP. (online supplementary material 2) These components were identified as fundamental to fidelity by EBP experts. The Safety Planning Intervention, SBIRT/MI and interpersonal counselling surveys captured trainees' intentions to perform each discrete behaviour and contained five, nine and six items, respectively. During and after training, we conducted a rapid ethnography methodology of free listing,[30] through which PsyTs and PCPs listed relevant barriers and facilitators to training, implementation and sustainability of PRIDE. A clinical psychologist unaffiliated with PRIDE conducted trainee focus groups to explore how PRIDE might address their communities' mental health needs and improve implementation.

To track early reach of the E-mwTool screening tool and Safety Planning Intervention application, we provided research-funded tablets to 15 PsyTs and digitally monitored mobile application use between September 2019 and August 2020. Consistent with usual care, PsyTs serve patients who have been referred for or are self-seeking specialised mental care.[7] We examined clinical data from successfully screened consenting adult patients to measure how many (1) digital records were created for new patients, (2) patients consented, (3) patients screened positive for any mental disorder (endorsed at least one of the first three E-mwTool items[8], (4) cases of each disorder, (5) cases of suicide risk that received Safety Planning Intervention.

FINDINGS
Training

The 15 PsyTs randomised to participate in pathways 2 and 3 completed all four EBP trainings. (table 2) All PCPs (n=277) working in districts randomised to participate in pathways 2 and 3 were invited to attend the Safety Planning Intervention training to ensure patient safety in these pathways. Following this training, the Mozambican Ministry of Health increased the required per-diem for training attendance threefold. As a result of this unaffordable implementation challenge, we determined PRIDE could proceed both financially and scientifically by randomly selecting 60% of the clinics within the randomised districts. We first continued training at the randomly selected clinics from only the pathway 2 districts. Among the estimated 81 PCPs from these selected clinics, 70 (86%) have completed all three EBP trainings.

The interpersonal counselling and SBIRT/MI pre–post knowledge tests showed effective knowledge transfer (table 2). Following Safety Planning Intervention training, all surveyed PsyTs indicated strong intentions to deliver all five-component items (online supplementary material 1). Following SBIRT/MI training, each item was

Table 2 Training implementation outcomes

	Trained N	Certified N	Pre–post knowledge test **mean difference (95% CI)**
Safety planning intervention			
Psychiatric technicians	15	15	Not asked
Primary care providers	277	70	Not asked
Screening, brief intervention, referral to treatment			
Psychiatric technicians	15	15	1.9 (1.4 to 2.4)
Primary care providers	71	43	2.0 (0.6 to 3.4)
Interpersonal counselling			
Psychiatric technicians	15	*	1.6 (1.1 to 2.0)
Primary care providers	70	*	2.1 (1.4 to 2.8)

*Forthcoming.

endorsed by at least 78%. Following interpersonal counselling training, the only item endorsed by less than 85% of participants was 'I plan to decide with the patient which of the four problem areas the treatment will focus on'. PCP data are forthcoming.

Early EBP delivery

Over the course of 11 months, the group of 15 PsyTs successfully created electronic patient records and captured sociodemographic information for 669 new patients. This patient population includes both psychiatric referrals and patients self-seeking psychiatric care (figure 1). Among new patients, 89% consented to be screened with the E-mwTool. Of those screened, 87% screened positive for any mental disorder. Among these 520 positive patients, the prevalence of suicide risk was 11%, severe disorders 62%, common mental disorders 91% and substance use disorders 16%. Of patients with suicide risk, nearly all had at least one comorbid condition. For such individuals, first treatment is often based on severity or patient preference. Twenty-six per cent of patients with suicide risk received the Safety Planning Intervention. Of those with suicide risk who did not receive the Safety Planning Intervention, 80% had a comorbid severe disorder, substance use disorder or both.

Qualitative feedback

Total of 14 PsyTs and 20 PCPs participated in the free-listing exercise; 14 PsyTs and 14 PCPs participated in one of four focus groups. Participants provided very positive feedback about how 'dynamic' the trainings were, how 'interactive and helpful' the E-mwTool and the EBP applications were. They also expressed that PRIDE was 'useful not only to help the community but also to (help) our families, because now we have the right knowledge to help" and how 'eager' they were to begin using that knowledge. Finally, they appreciated being consulted and heard as local experts, as it 'reduced the fear when treating people with severe disorders or suicidal'. Finally, they expressed concern regarding the sustainability of PRIDE—'is PRIDE here to stay?' after research funds end.

DISCUSSIONS AND CLINICAL IMPLICATIONS

To date, PRIDE has trained 110 EBP providers, supervisors and trainers, and 279 CHWs will be trained in the upcoming months. The trainings improved providers' knowledge about the three EBPs and providers indicated strong intentions to deliver their core evidence-based components. PsyTs are using the tablet
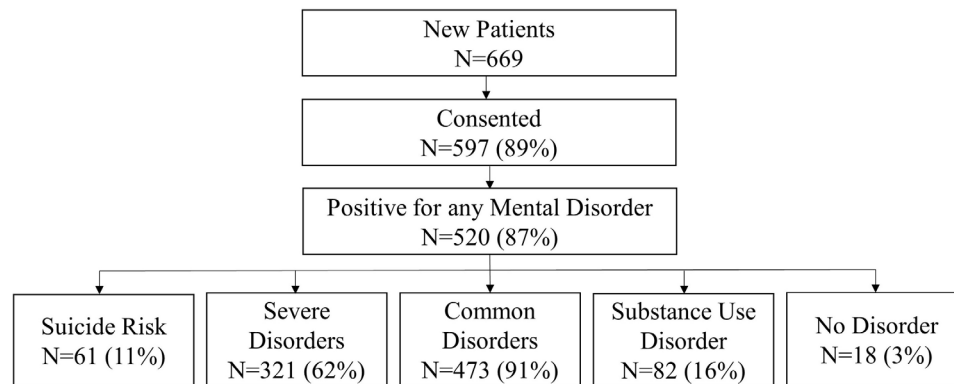
Figure 1 Early reach.

application and are able to identify cases and provide appropriate treatment.

According to the theory of planned behaviour, intention to perform a given behaviour is one of the strongest predictors of behavioural change. The lowest endorsed intention item (73%) was on interpersonal counselling 'I plan to decide with the patient which of the four problem areas the treatment will focus on'. This may reflect the universal difficulty providers face in diverging from the traditional patient–provider power structure, where providers are charged with making decisions for patients about their care. Conversely, this may suggest a deeper level of clinical acumen, showing provider recognition of this challenge. These early findings indicate providers are well positioned and motivated to provide EBPs as part of comprehensive mental health services.

The qualitative findings revealed that the trainings, quick screening and digital EBP tools were positively received and that providers felt a positive impact in providing care for their patients as well as their own families and the community. Concerns about sustainability beyond PRIDE research funding is reassuring, as it shows engagement and understanding of the concept and is also sadly reflective of a trend of cost-ineffective programmes that frustrates expectations in Mozambique. After completion of the research-funded trainings and supervision, PRIDE will focus on evaluating patient, service and implementation outcomes to inform cost-effectiveness and sustainability.

Through interactive digital methods and task-shifting, PRIDE offers easy screening using a brief and valid instrument. It then provides diagnostic categorisation among those identified and guides providers in treating cases using EBPs for specific disorders and according to severity. For individuals with comorbid disorders, sequential treatments are offered, with choice of the first treatment based on severity or patient preference. After completion of the first EBP treatment, patients are reassessed, and those who screen positive for another disorder will be offered treatment for the second condition. Cases requiring hospitalisation (eg, acutely ill with suicide risk) will be referred to specialists for evaluation and inpatient care. EBPs are delivered individually for 4 weeks. After the last session, patients are reassessed to determine further treatment need. Those whose assessment shows full or partial remission are reassessed in a month. Those who do not improve during the first treatment are referred for further assessment and medication management as indicated. Combined EBPs and medication treatment are also an option. As such, PRIDE is designed to explore how multiple short-term EBPs can be implemented within a system of care.

Adaptations in light of natural disasters and COVID-19 pandemic

PRIDE's activities have slowed down due to two cyclones in 2019 and more recently the coronavirus pandemic (COVID-19). To address COVID-19 health needs, the Mozambique Ministry of Health has established a COVID-19 helpline. Health professionals operating the helpline provide information on COVID-19 symptoms and preventive measures and also administer the first three questions of the E-mwTool. For those in need, a separate mental health helpline was established to deliver the full E-mwTool and refer cases to local mental health providers (N=120; psychiatrists, psychologists and PsyTs) throughout the country, who are being trained to use PRIDE's EBPs digital tools for telehealth treatment. The digital nature of PRIDE's screening, EBP and case-tracking tools has facilitated their rapid scale-up during a health crisis. As the Ministry of Health is preparing to restore in-person staff meetings and trainings while maintaining provider safety, PRIDE is about to reinitiate training and research activities with all advised precautions.

CONCLUSIONS

The future of EBPs requires implementation within existing systems of care with fidelity to their core evidence-based components. To do so sustainably and address the vast mental health treatment gap globally, EBP implementation demands expanding the mental health workforce by training existing human resources with diverse training backgrounds. This future envisions CHWs and peers as providers, PCPs as facilitators and mental health specialists as trainers and supervisors, who all integrate EBPs within their health-related operations. Health systems are charged with treating all mental disorders and their comorbid presentations; sequential use of EBPs considering patient choice and symptom severity will facilitate this comprehensive feat. Digitised assessments and EBPs facilitate achieving these goals, integration of mental healthcare within electronic medical records systems and quick, efficient scalability of services during crises (eg, COVID-19 pandemic) and beyond. PRIDE is examining this new future now.

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Correction notice This article has been corrected since it appeared Online First. Joint 'first' authorship has been replaced with joint 'senior' authorship.

Competing interests MAO receives royalties from the Research Foundation for Mental Hygiene for the commercial use of the Columbia Suicide Severity Rating Scale and owns shares in Mantra, Inc. She serves as an advisor to Alkermes and Fundacion Jimenez Diaz (Madrid). Her family owns stock in Bristol Myers Squibb.MMW receives royalties from Multi-Health Systems Inc. for use of the Social Adjustment Scale-Self-Report (SAS-SR) as well as book royalties from Perseus Press, Oxford Press, and APA Publishing. Additionally, MMW has received research funding from the Brain and Behavior Foundation, Templeton Foundation and the Sackler Foundation.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data collection is ongoing. Study data will be available once the study is completed upon reasonable request for de-identified data.

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