HHS Public Access

Author manuscript

J Subst Abuse Treat. Author manuscript; available in PMC 2023 March 01.

Published in final edited form as:

J Subst Abuse Treat. 2022 March ; 134: 108549. doi:10.1016/j.jsat.2021.108549.

Mobile Technology and Task Shifting to Improve Access to Alcohol Treatment Services in Mozambique

Megan A. O'Grady[1,*], **Jennifer Mootz**[2], **Antonio Suleman**[3], **Annika Sweetland**[2], **Eugénia Teodoro**[4], **Anibal Anube**[3], **Paulino Feliciano**[3], **Charl Bezuidenhout**[5], **Palmira Fortunato Dos Santos**[4], **Wilza Fumo**[4], **Lidia Gouveia**[4], **Ilana Pinsky**[2], **Milena Mello**[2], **Bianca Kann**[2], **Milton L. Wainberg**[2]

[1]Department of Public Health Sciences, University of Connecticut School of Medicine, Farmington, CT

[2]Department of Psychiatry, Columbia University, and New York State Psychiatric Institute, New York, NY

[3]Department of Psychiatry and Mental Health, Psychiatric Hospital of Nampula, Mozambique

[4]Department of Mental Health, Ministry of Health, Maputo, Mozambique

[5]Research Unit, Foundation for Professional Development, Pretoria, South Africa

Abstract

Introduction—Unhealthy alcohol use (UAU) is a major public health challenge, particularly in low- and middle-income countries. Mozambique is the fourth poorest country in the world where half of the population lives below the poverty line. UAU is frequent among drinkers in Mozambique; however, resources and infrastructure to treat UAU are very limited. This paper examines how task-shifting and a provider-facing mobile health application are being used to improve access to care. In this paper, the feasibility, acceptability and appropriateness of a provider-facing mobile health application being used under a task-shifting model to identify UAU and provide a four-session brief motivational interviewing intervention are described.

Method—The study used a sequential exploratory mixed-methods design with a QUAL → quan structure. First, 15 psychiatric technicians and primary care providers in Mozambique's Nampula Province participated in semi-structured interviews. These interviews were recorded and transcribed. Then, 45 providers completed a 12-item quantitative survey on tablets. Quantitative analysis used descriptive statistic calculation and qualitative analysis used thematic analysis.

* Corresponding Author: Megan A. O'Grady, Assistant Professor, Department of Public Health Sciences, University of Connecticut School of Medicine, 263 Farmington Ave., Farmington, CT, 06030-6325; ogrady@uchc.edu; 860-679-5483.

Author Statement

O'Grady, Mootz, Sweetland: conceptualization, methodology, formal analysis, writing-original draft**, Suleman, Bezuidenhout:** methodology, supervision, project administration, writing-review and editing; **Teodoro, Anube, Feliciano, Fortunato Dos Santos, Fumo, Gouveia:** writing-review and editing, supervision**; Pinsky, Mello:** project administration, writing-review and editing; **Kann:** formal analysis, data curation; **Wainberg:** conceptualization, funding acquisition, writing-review and editing

Declaration of Conflicting Interests: The authors declare that there is no conflict of interest

Results—Nonspecialized providers found the mobile health app to be acceptable, appropriate, and feasible when delivering a 4-session brief motivational intervention under a task-shifting model. Central benefits of the technology were enhanced standardization and efficiency of sessions as well as feelings of legitimacy when interacting with patients. Main concerns were feasibility of implementing the intervention due to time constraints of workload and internet connectivity issues.

Conclusions—Provider-facing technology shows promise in supporting task-shifting models that can expand alcohol intervention services and increase access to care in low- and middle-income countries. Providers without specialized training in behavioral health interventions can provide critical services to patients with UAU and provider-facing mobile health applications may help bring such models to scale.

Keywords

mobile health technology; task-shifting; unhealthy alcohol use; screening and brief intervention; motivational interviewing

1. Introduction

1.1 Background

Unhealthy alcohol use (UAU), defined as a continuum of behaviors from risky or harmful use (exceeding recommended daily, weekly, or per occasion amounts) to alcohol use disorder, is a major public health challenge, particularly in low- and middle-income countries (LMICs) where disease burden per liter of alcohol consumed is greater than in high-income countries (Rehm et al., 2009). Mozambique is the fourth poorest country in the world where half of the population lives below the poverty line and 70% live in rural areas with limited healthcare access (World Bank, 2016; Pasquali, 2020; Schwitters et al., 2015).

UAU is frequent among drinkers in Mozambique (Clausen et al., 2009; Padrão et al., 2011; Pires et al., 2012; Wainberg et al., 2018). A recent study showed that of approximately 500 patients screened for mental health and substance use, 16% were identified with likely substance use disorder (Wainberg et al., 2021). However, resources and infrastructure to treat UAU in Mozambique are limited; 75–90% of people with behavioral health issues receive no care because of provider scarcity and geographic distribution (Demyttenaere et al., 2004; dos Santos et al., 2016; Dua et al., 2011).

One of the key strategies recommended by the World Health Organization (WHO) to overcome the global shortage of mental health specialists involves "task-shifting," wherein non-specialists (e.g., community health workers) are trained to deliver brief evidence-based interventions with expert clinical supervision (WHO, 2016). WHO describe task-shifting as 'specific tasks are moved, where appropriate, from highly qualified health workers to health workers with shorter training and fewer qualifications in order to make more efficient use of the available human resources for health' (WHO, 2008b). Mounting evidence suggests that training non-specialist workers to deliver alcohol interventions can be an effective and cost-effective way to increase access to care.

1.2 Task Shifting in Mozambique to Support Behavioral Health Care

Mozambique was one of the first countries in the world to formalize task-shifting within their national health platform. Faced with a critical shortage of mental health specialists in Mozambique that persists to date – currently there are still only 18 psychiatrists and 109 psychologists for a population of 29 million (dos Santos et al., 2016; Wainberg et al., 2020)– they created a mid-level professional category, psychiatric technicians (PTs). PTs receive 30-months of training to provide mental health services, including the prescription of psychotropic medications (dos Santos et al., 2016). From 2010 to 2014, the number of PTs grew from 66 to 241 allowing Mozambique to increase coverage from 60 (44%) to all 135 (100%) districts in the country (dos Santos et al., 2016). While this strategy has increased availability of mental health services, there is limited system capacity to bring evidence-based interventions for UAU to scale (Halsted et al., 2019; Suleman et al., in press; Wainberg et al., 2020).

Our multidisciplinary study team has work underway leveraging provider-facing mobile technology to enhance this task-shifting model to address UAU as part of a longstanding partnership with the Mozambican Ministry of Health (Sweetland et al., 2014). Broadly, our work seeks to explore the implementation effectiveness of PTs, primary care practitioners (PCPs) and community health workers (CHW) providing evidence-based care for UAUs (Suleman et al., in press; Wainberg et al., 2020). The WHO Mental Health Gap Action Programme Guidelines (mhGAP)(Dua et al., 2011; WHO, 2008a) recommend using Screening, Brief Intervention, and Referral to Treatment (SBIRT) (Babor & Higgins-Biddle, 2001) to reduce UAU. In our adapted version of SBIRT for Mozambique in this task-shifting model, non-specialists (e.g., PCPs, PTs, CHWs) are trained and supervised by specialists (e.g., psychologists) to identify UAU and provide a four-session SBIRT and motivational interviewing intervention (SBIRT/MI). Intervention sessions involve screening and a brief intervention using a brief negotiated interview (Bernstein et al., 1997) and incorporate principles of MI in terms of provider approach and content of the intervention (e.g., reflective listening, developing discrepancy between clients' goals or values and their current behavior, and avoiding direct confrontation). A description of the 4-session intervention is provided in Table 1.

PTs, PCPs, and CHWs are prepared to conduct the SBIRT/MI intervention in a training program held over 4 to 8 days and there is a certification process whereby successful completion of three (PCPs) or five (PTs) cases is required under supervision of specialists (Wainberg et al., 2021). Evaluation of these trainings for PCPs and PTs show effective knowledge transfer for the SBIRT/MI intervention and strong intentions to deliver its core components with fidelity (Wainberg et al., 2021).

1.3 Mobile Technology to Support Task Shifting

Little research has focused on how to sustainably support and supervise task-shifted workers delivering evidence-based practices for behavioral health in LMICs (Padmanathan & De Silva, 2013). Mobile health technology is a promising but understudied tool to support providers and supervisors under task-shifting models (Naslund et al., 2019; Triplett et al., 2021). The majority of research on mobile health technology has focused on client-facing

rather than provider-facing applications (Naslund et al., 2017). Provider-facing applications can improve clinical decision-making and patient outcomes by providing rapid access to evidence-based information and guidance to providers (Ventola, 2014). Despite their promise, only a few technology products for substance use care with provider-facing aspects have undergone usability testing (Levesque et al., 2018; O'Grady et al., 2019; Satre et al., 2017).

To support PCPs, PTs and CHWs in providing the evidenced-based SBIRT/MI intervention for UAU in Mozambique, an already-existing provider-facing mobile SBIRT (mSBIRT) application designed for use by healthcare providers in the United States was adapted (O'Grady et al., 2019). The app assists providers in quickly assessing the patient's risk due to substance use using evidence-based screening questions, calculating a risk level, and guiding providers through a brief intervention that is tailored to the patient's responses. The app is designed to be used on a tablet computer and is interactive such that its screens display graphics to engage the patient (e.g., alcohol-related health issues, drinking patterns). The app also contains scripts and discussion points for providers to use with each screen. Tablets were distributed to task-shifted providers throughout the study region for them to deliver the SBIRT/MI intervention using the mSBIRT application. Examples of app screens are provided in Appendix A.

Our adaptation process of the already-existing app for use in Mozambique focused on three areas: scientific, technological, and cultural. Scientific adaptation of screening questions, cut off-scores, and determinations of risk level was guided by a review of available literature, secondary data analysis of Mozambican patient alcohol screening data, and expert stakeholder workshops. Technological adaptation (e.g., adjustment to iconography, screen flow, and app features) was conducted in collaboration with programmers and designers, experts in SBIRT technology, and feedback from Mozambican providers. Third, cultural adaptation (e.g., language, culture, social context) was conducted in collaboration with mental health professionals from the Mozambican Ministry of Health. A manuscript that fully describes our adaptation process is forthcoming.

1.4 Research Questions

In this paper, a preliminary examination of the mSBIRT application implementation among PTs and PCPs in Mozambique in the context of task-shifting is described. The study draws from recent recommendations in the implementation science literature on characterizing implementation outcomes for behavioral intervention technology (Hermes et al., 2019). Given the dearth of literature in this area, the study focused on examining preliminary mSBIRT app acceptability, appropriateness, and feasibility. App acceptability was defined as how agreeable, palatable, or satisfactory it was to participants (Hermes et al., 2019; Weiner et al., 2017). Appropriateness was defined as perceived fit, relevance, or compatibility of the app for PCPs and PTs for their practice setting and perceived fit of the app to conduct SBIRT/MI with patients. Feasibility was defined as the extent to which the app can be successfully used within providers' daily job activities. Guiding research questions were: How acceptable, appropriate, and feasible is the mSBIRT app to PTs and PCPs in the context of task shifting?

2. Method

2.1. Design and Procedure

This study used a sequential exploratory mixed-methods design where more weight was given to the qualitative data (QUAL → quan)(Creswell et al., 2003). First, semi-structured interviews among 15 participants were conducted. Analysis used an iterative process where preliminary analysis of the qualitative data was conducted and then follow up interviews were completed with 6 of the original 15 interviewees to conduct participant checking and ask additional in-depth questions about topics that arose during the initial interviews in order to reach data saturation (Saunders et al., 2018). Trained Mozambican research assistants conducted interviews in Portuguese over the phone. Interviews took approximately 30 minutes to complete. Interviewers have had some previous interactions with participants from other research activities currently underway (e.g., trainings, app technical support, other data collection). Interviews were recorded and then transcribed verbatim and translated into English for coding. The quantitative survey was sent via Redcap to PCPs and PTs who completed it on tablets.

2.2 Setting and Participants

This study took place in the Nampula Province, the most populous province in Mozambique with a population of over 6 million. The majority of the population lives in rural areas. This study is part of formative work being completed as part of a larger parent study aimed at testing the implementation effectiveness and cost-effectiveness of using mHealth to scale up alcohol screening and intervention (Suleman et al., in press). Qualitative interview participants were purposively selected because they were trained in SBIRT and used the mSBIRT application. This study received IRB approval from the Mozambican Ministry of Health (Protocol # CIBS/FM/HCM/64/2017) as well as the last author's institution (Protocol #7485).

The 15 qualitative respondents' ages ranged from 25–51 (M=28.66/SD = 7.01). The majority were men (n=13). Nine were PTs and six were employed as PCPs; all had completed secondary education plus technical training. Two of the 15 providers were married and 1 identified as cohabitating. The remaining participants were single. Seventy-three percent of providers were from Nampula Province. Most affiliated with the ethnic group Emakhua (73%). All participants invited to the qualitative study participated.

The quantitative sample (n = 45) represents approximately 75% of PCP and PT providers in the region who are trained on the SBIRT app. Ages ranged from 21–47 (M=30.57/SD = 6.08) and the majority were women. Most participants were single (57%), with the remaining married (33%) or cohabitating (10%). Seventy-one percent were from Nampula Province. Most affiliated with the ethnic group Emakhua (77%). See Table 2 for further demographic description of participants.

2.3 Measures

The qualitative interview guide was created by the study team and consisted of core questions assessing mSBIRT app acceptability (e.g., How satisfied are you with the SBIRT

app in terms of content, features and design?), feasibility (e.g., Do you feel you could successfully use the SBIRT app every day? Why/why not?), and appropriateness (e.g., How does the app fit your needs as a provider when treating alcohol use among patients?) along with probes for each question. This guide was refined during our iterative interview process.

The 12-item quantitative survey consisted of three validated scales (Acceptability of Intervention Measure, Intervention Appropriateness Measure, Feasibility of Intervention Measure)(Weiner et al., 2017) measured on a 5-point Likert scale (1 = completely disagree, 5 = completely agree).

Instrument translation into Portuguese and culturally adaptation used methods recommended by the WHO (WHO, n.d.), including forward and backward translation by bilingual experts, cognitive pre-testing with 10 PTs and PCPs, and finalization of language through consensus.

2.4 Data Analysis

Quantitative analysis used descriptive statistics. Qualitative analysis used Thematic Analysis (Braun & Clarke, 2021). Thematic Analysis generally followed phases outlined by Nowell et al., 2017, including familiarizing ourselves with the data, generating initial codes, searching for themes, and reviewing, defining, and naming themes (Nowell et al., 2017). In this process, deductive coding was first utilized based on established definitions of acceptability, appropriateness, and feasibility. Then, once data was deductively coded into each one of these larger categories (e.g., feasibility), the team searched for themes within each coded category, identified and named these themes (e.g., time pressures) and selected representative quotations for each theme. The first author conducted the initial identification of themes which were then reviewed and finalized by the full qualitative analysis team through discussion. According to accepted conventions in qualitative methods, inter-rater reliability was not calculated because our main purpose was to eventually yield concepts and themes, rather than finite coding agreement (McDonald et al., 2019). The three-person analysis team consisted of the first and second author, PhD-level social and clinical psychologists respectively, who are also faculty members at academic medical centers and trained in qualitative methods, as well as a bilingual (Portuguese/English) research assistant trained by the study team in qualitative coding. Dedoose software was used to code and manage data.

3. Results

Below, quantitative results are presented along with the themes identified for each of the three inductively coded qualitative categories: 1) Acceptability (efficiency, experience, design/content), 2) Appropriateness (patient-provider rapport, match with SBIRT process and goals, adapting to local needs, and 3) Feasibility (time pressures and wifi connection).

3.1 App acceptability

Generally, participants were very satisfied with the app. Table 3 displays quantitative scores on acceptability by item and for the full scale, which indicate that app acceptability was high (scale mean = 4.33/5.0). Three themes were identified in the qualitative data that related to participants' views on acceptability: efficiency, experience, and design/content.

3.1.1. Efficiency.—Several participants noted that the app provides for an efficient session because of the automated calculation of the screening tool and its structured resources. One participant said, "Yes it will help me, yes, yes. First, it will be fast. Second, it will be better to understand about mental illnesses. Third, we will help the patient in terms of health in the community." (Participant 15). Another participant echoed, "For me, the application helps me in screening, it has made me more flexible in decision making, it makes it easier for me to have a quick diagnosis" (Participant 8).

3.1.2. Experience.—Participants generally reported that the app provided a good user experience. A participant (9) said "It is easy to handle," and another said, "Even for me, this app so far is not that complicated" (Participant 4). Participants felt that the application was well organized which contributed to the positive user experience. As a participant explained, "Because the questions in SBIRT, in the application are very well ordered, they are very organized. And not using the application, the questions are disorganized. So, it's easy using the app" (Participant 7). A few participants noted that they practiced using the app after training which increased its appeal over time.

3.1.3 Design/Content.—Participants were mostly satisfied with the app content and felt it helped with patient interactions. For example, a respondent stated, "I'm very satisfied because the contents there facilitates understanding for both patient and me as health provider and allows the patient to be more confident to share" (Participant 7).

In terms of specific content related to app acceptability, several participants identified screens with useful visual displays that can be used with the patient, including screens that show images of the amount of alcohol used by the patient, recommended drinking levels, and the connections between alcohol and physical health. For example, a participant indicated:

> The part that helps the most, is in relation to doses and pathologies, that the alcohol consumption itself can bring to the patient. So when we or when I show the patient that their consumption can cause this and that disease, then he ends up seeing that in fact there is a need to be able to stop or reduce consumption a little. So this has helped a lot, for me as well as for the patient himself.
>
> (Participant 11)

Screens that facilitated a discussion about readiness to change as well as behavior change plans also increased acceptability. Though, some participants noted factors that were less acceptable, including too small letters on the screen, slowness of the app, difficulty of patients being able to accurately express quantity of drinking, and questions that felt repetitive or too numerous. For example, a participant noted, "The questions are straightforward. Maybe the only thing that is a little boring is the number of questions" (Participant 14).

3.2 App appropriateness

Appropriateness scale scores are presented in Table 3 and indicate very positive views on app appropriateness (scale mean = 4.22/5). App appropriateness was illustrated by several

themes in the qualitative data: patient-provider rapport, match with SBIRT process, and adapting to local needs.

3.2.1. Patient-provider rapport.—Several participants noted the need to make the patient comfortable with the tablet and app to have a successful session. For example, by providing a pre-explanation, "…I believe they [patients] will like it depending on a pre-explanation from the provider…using the application there must be a lot of care and patience from the provider to the patient" (Participant 8).

Participants also expressed that when patients observe that they are using a standardized tool to deliver the intervention, patients feel more comfortable and that perhaps the app also provides legitimacy as a task-shared worker in the eyes of the patient. As highlighted by a participant:

> …because I think it is an already standardized instrument in which I think the patient will feel safe. When I say go [to] this step, he will feel that in fact I am doing something with technique. It is not just that we are to do it only randomly… The patient will feel more comfortable in relation to the time that we did not have the SBIRT/MI [app]. We were attending in a random way. Now with an instrument that guides us, anyone can come to like it.
>
> (Participant 5).

Similarly, a participant indicated that they, "explain to them [patient] that it is a new instrument that is being used worldwide and that aims to help patients themselves to understand about their consumption, in relation to the disadvantages. And also helps a lot in how to make them understand how much is the severity of your consumption" (Participant 12). Several participants also noted that it was important for maintaining rapport to be sure the patient understood that their data and answers were secure within the app and that privacy protections were in place.

3.2.2. Match with SBIRT process and goals.—Participants for the most part indicated that the app was a good match for them to do SBIRT/MI. They felt the app provided a guide or script for the intervention. A participant shared, "I find it easy, because we have the script that is SBIRT" (Participant 3). Another participant thought it kept them from making errors in providing the intervention:

> Because there are questions/information for the patient that help me and make the patient happy. It keeps me motivated and gives me instructions on how to proceed during the session with the patient…Because the sessions that I did not use the application could fall into a diagnosis/treatment error, but not with the application.
>
> (Participant 12)

Participants also thought that the app was highly relevant to their work because of the high rate of UAU cases. A participant shared, "because alcohol is part of mental illness, so it applies a lot and we have had many cases of alcohol-consuming patients as well" (Participant 7).

3.2.3. Adapting to local needs.—In terms of adaptations, participants most commonly discussed language. The app is in Portuguese to match the national language. However, 11 local languages are used throughout the country. Portuguese may be a second language for both providers and patients and some providers may not speak the same local language as their patients. For some patients, providers had to translate into the local language, adding time and complexity to the app session. One participant noted, "…the difficulty of translating to the local language for the patients, apart from that, everything is fine (Participant 6). Another participant described the experience of translating when they do not speak the same local language as the participant:

> For the application, when I am asking the questions for the patient I have explained, there are things that I cannot translate, nor are all the questions that I can translate, there are certain questions that make it difficult, because I cannot translate for Macua because it is not my mother tongue, and in some places it is not applicable, it could be easy, but I believe that with my local language I can do it without any problem (Participant 2).

Another provider explained that it was easier when there is a match between provider and patient local language: "As I am a Macua, it is so simple to do the translation when it comes to patients without schooling. But I always try to bring what is on the tablet/app and when they are schooled patients I have not had any complications either" (Participant 15).

3.3 App feasibility

Feasibility scale scores are presented in Table 3 and indicate that providers agreed that the app is feasible to use (scale mean = 4.17/5). One of the lowest scored items of all the quantitative items was on the feasibility scale: The SBIRT app seems easy to use, yet 91% of participants still agreed or completely agreed with this item. Two factors affected views on app feasibility in the qualitative data: time pressures and wifi network connection. Related to time pressures, participants felt that feasibility "would depend on the work flow" (Participant 10). The app added time to already busy workflows for some providers, as illustrated here:

> The app is good, but if some aspects were improved, such as minimizing questions and time. Looking at the flow because for us who do everything in our health units, it is complicated to have to be with a patient for an hour or an hour and a half
>
> (Participant 14).

Regarding internet connections, participants, especially those located in rural areas, do not have strong network connections and rely on data packages that are not available at all times. While the app can be used offline during some parts of the intervention and will synchronize when service is available, it must connect to the network to match data with the server at the start the session to provide useful information from previous sessions (e.g., change in alcohol use). This may present challenges for some participants in terms of feasibility and making sure providers understand online and offline functions. As one participant noted, "It helps in all aspects even without mobile data. With mobile data, it soon synchronizes, which can be less help if people do not know how to handle" (Participant 6).

4. Discussion

To our knowledge, this study is the first to examine nonspecialized providers' perceptions of feasibility, acceptability, and appropriateness of a provider-facing mSBIRT intervention for substance use in a low-income country under a task-shifting model. Our results showed that the vast majority of participants agreed that the mSBIRT app was acceptable, appropriate, and feasible.

Increased efficiency, experience, and design/content all related to providers' views of acceptability of mSBIRT. Providers perceived the app to facilitate screening procedures, making the intervention more efficient. A synthesis of qualitative studies that examined health workers' perceptions of using digital interventions found that increased efficiency fundamentally changed the way health workers provided care (Odendaal et al., 2020). A qualitative study in rural Nepal also found that although providers tended to have low digital literacy, they supported inclusion of mobile health technology to facilitate services (Angdembe et al., 2017). Acceptability of technology-based interventions may facilitate implementation in LMICs in contrast to high-income settings where providers and patients may be more wary (Mohr et al., 2010). The high acceptability found in our study may be due to our participatory approach when developing mSBIRT. This approach is consistent with human-centered designs known to increase acceptability and relevance of technology (Triplett et al., 2021).

Providers likewise expressed an overall sentiment that mSBIRT is appropriate to their work. While we found that providers in Mozambique shared similar concerns about maintaining rapport and the importance of introducing the app to patients as in the original mSBIRT study conducted in the US (O'Grady et al., 2019), they often mentioned patients' satisfaction with the tablet and app. Providers additionally appreciated the improved standardization of the intervention and thought it matched well with the SBIRT process they learned in training without the mSBIRT app. It appeared that in the context of task-shifting, that the app may have increased providers' feelings that they appear more legitimate in conducting UAU interventions, which may lead to greater feelings of satisfaction for the provider and increased confidence in the intervention for the patient. More research is needed from a patient-perspective to understand the experience of provider-facilitated apps. Future investigations could consider whether providers' use of apps increase patients' perceptions of competency and quality of care, and if those perceptions relate to other desired outcomes, such as reduction of stigma and improved patient outcomes.

Main concerns about mSBIRT centered around feasibility of implementation. Providers consistently lamented poor infrastructure and lack of network connectivity. Intermittent internet access in rural areas of LMICs poses a significant challenge. Concerns about loss or damage of devices and lack of network connection are challenges frequently documented in other LMIC studies (Bhardwaj et al., 2020; Merchant et al., 2020). Public scale up of services should consider costs of improving network connection infrastructure (Ruzek & Yeager, 2017), especially to reach those most marginalized and working in impoverished settings. An investment in network development, data packages, and mobile devices is

essential for sustainability of technology-based services that extend beyond time-limited funding of research studies.

Another central issue related to feasibility was unease about having enough time to complete other required tasks and facilitate mSBIRT that consists of 30 to 60-minute sessions. Constructive feedback indicated that although the app enhanced efficiency of screening and diagnosis, the number of questions and prompts was at times tedious. While task-shifting services presents opportunity for increased reach for those without access to care, tasks of service provision are often shifted to healthcare and community providers who are simultaneously pulled into facilitating care for multiple government and community-based programs. A study in Nepal, for instance, found that a main challenge was lack of feasibility due to being overburdened with responsibilities with a wide range of programs, such as maternal health, child health, and hygiene (Bhardwaj et al., 2020). CHWs in LMICs are frequently paid little or no salary and often providers are tasked with increased responsibilities and not compensated for the additional work (Bhardwaj et al., 2020). The burden on lay providers serves as a reminder that task-shifted options must occur in partnership with policymakers with collaborative goals of obtaining increased funding for behavioral health to compensate current nonspecialized workers for shouldering additional responsibilities or to hire more personnel to distribute the increased workload. In LMICs, investment in physical health is often prioritized over behavioral health. In most African countries, less than 1% of the national budget is allocated for behavioral health services (Rathod et al., 2017).

Future developments should advance patient-facing technology for implementation in community-based settings to support a provider-facing mSBIRT. Exposure to wars, food insecurity, poverty, and other social determinants are highly prevalent in LMICs and negatively affect people's behavioral health (Lund et al., 2018). In Mozambique, a religious insurgency in the province directly north of Nampula, the site of this study, has escalated. Over 674,000 civilians have been displaced, many of whom have relocated to Nampula, and 2,000 civilians have been killed (Goldbaum et al., 2021). These types of social determinants and exposure to traumatic stressors and interpersonal violence that affect entire communities must be considered within a more comprehensive community-based response that galvanizes community members to provide support for those with UAU (Ruzek & Yeager, 2017; Tol et al., 2019). Supplementing provider-facing apps with patient- and community-based apps may be necessary for ongoing and sustainable support for patients with UAU and future research should examine these approaches.

Future studies should examine additional implementation outcomes, such as adoption and fidelity, noted as important in the mobile technology field for behavioral health (Hermes et al., 2019). Using mHealth has the potential to greatly improve fidelity and clinical performance in the delivery of UAU interventions and monitor adoption by providers under real world conditions. For example, meta-data about provider usage of the app can be used to monitor length and content of sessions and identify deviations in expected delivery (e.g., amount of time spent on each screen) that can prompt corrective feedback. It can also be used to identify poorly performing providers who may require additional training and support. Key informant interviews with specialists overseeing task-shifted workers

will also be crucial in understanding how mobile technology can enhance task-shifting models for UAU interventions. Further, mobile technology opens up opportunities to utilize geo-mapping functionality that captures longitude and latitude each time a provider uses the app. This data could be utilized to map where services are being provided in comparison to disease burden in that area and allow government officials to direct intervention services to high-need areas.

Our provider-facing mHealth approach for supporting task-shifted workers may be applicable to other therapeutic approaches and evidence-based practices. For example, our team has extended this model to two additional topical areas in which studies are currently underway (Wainberg et al., 2021): Interpersonal Counseling for common mental disorders (e.g., depression) (Weissman et al., 2014) and a Safety Planning Intervention for suicide risk (Stanley & Brown, 2012). Future research should determine the types of therapeutic approaches that are most effective in task-shifted, mHealth supported models.

The findings of this study should be interpreted with consideration of its limitations. The parent study is in early stages of app implementation and providers have only been using the app for several months in the field. Providers may need more time and experience with patients who present with a range of severity of UAU and comorbidities to fully assess the app's utility for their practice as well as more time to identify barriers to implementation that may emerge over time. It would be beneficial to conduct a follow-up study to assess longer term perceptions of feasibility and acceptability. Moreover, because nonspecialized providers work for the public health system in which this implementation study is being integrated, social desirability could have influenced their responses to the quantitative surveys and qualitative interviews. To preemptively address this possibility, a script was included at the beginning of the survey and interview that reminded providers that their responses would be anonymous and not used in any way to evaluate professional merit. Yet, the mostly positive endorsement of the app could suggest social desirability biases at play. CHWs were not included in this study, the next step in the parent study is to train CHWs to facilitate SBIRT in community-based settings; therefore, feasibility, acceptability, and appropriateness of mSBIRT among CHWs should be examined in the future. Finally, the quantitative questions were self-administered via redcap on the tablets. It is possible that this method selected for providers most comfortable with and approving of technology.

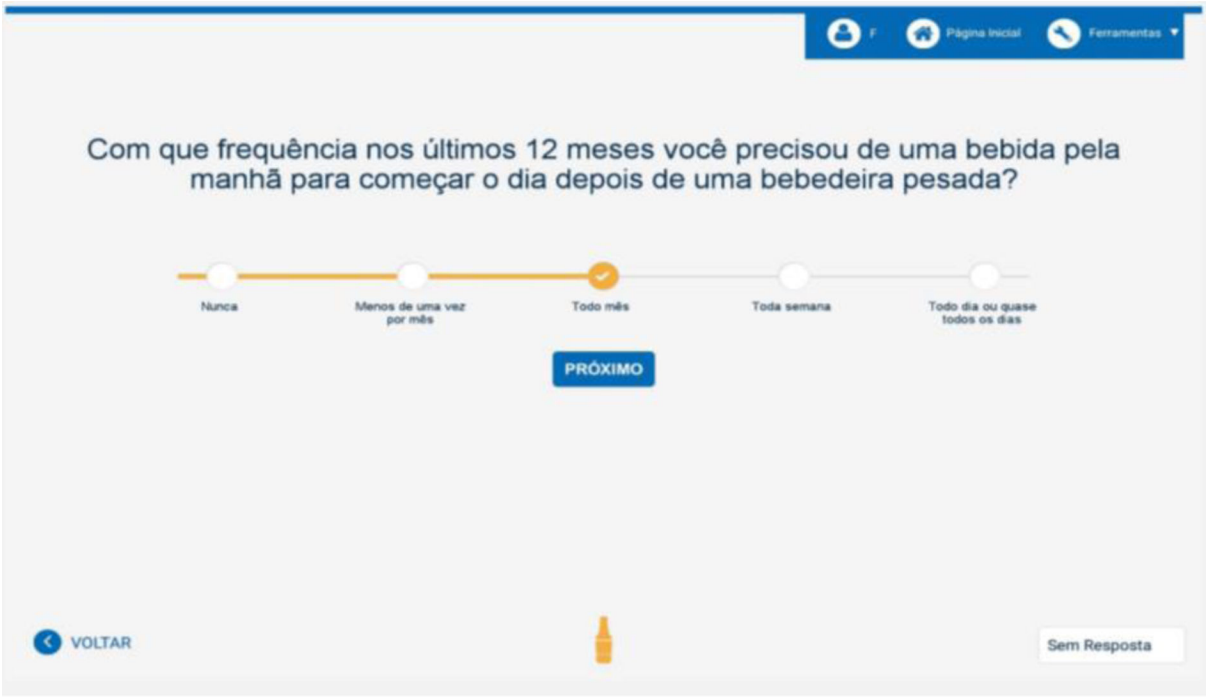
5. Conclusions

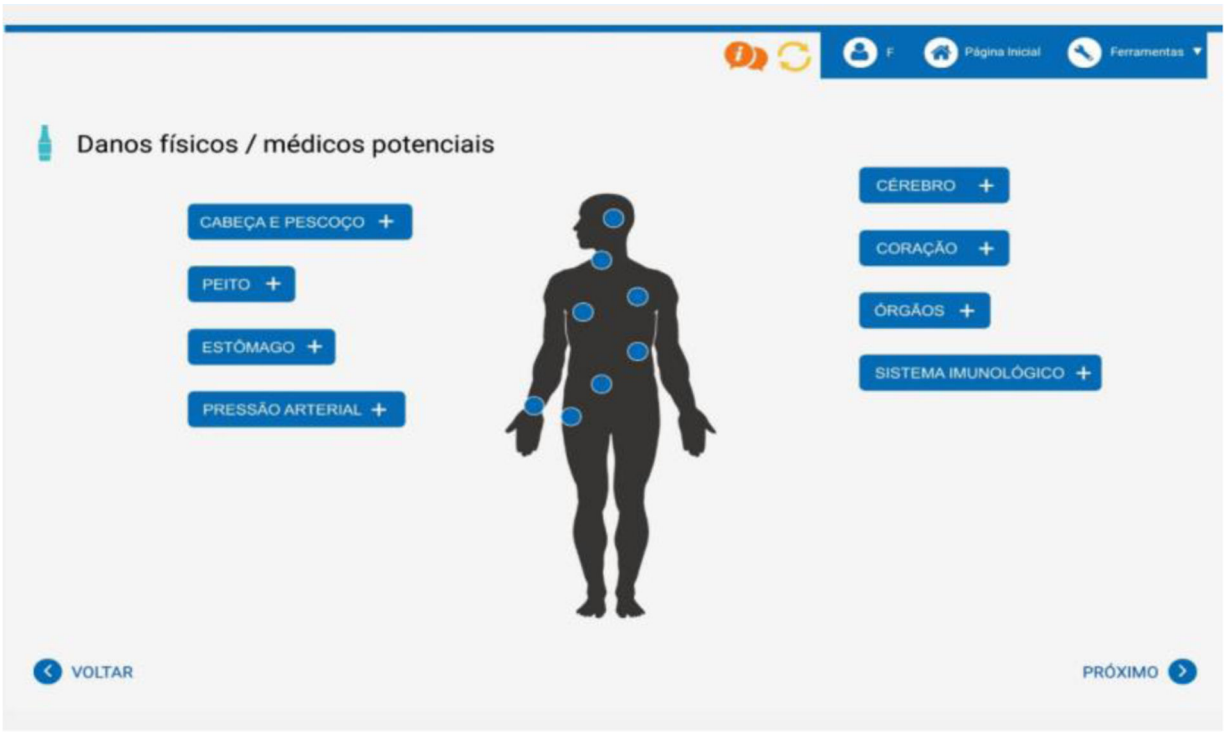
While nascent, technology that capitalizes on task-shifting models to expand alcohol treatment services and increase reach in LMICs shows great promise. Nonspecialized providers found the mSBIRT app to be acceptable, appropriate, and feasible. Enhanced standardization and efficiency of treatment were central benefits of the technology. Feasibility of implementing the intervention due to time constraints of workload and internet connectivity issues were main concerns. Future directions include: examination of patient perspectives toward provider-facilitated digital interventions, expanding interventions to include comprehensive, community-based care, and collaboration with policymakers to advocate for increased allocation of funding for mental health and addiction treatment services.

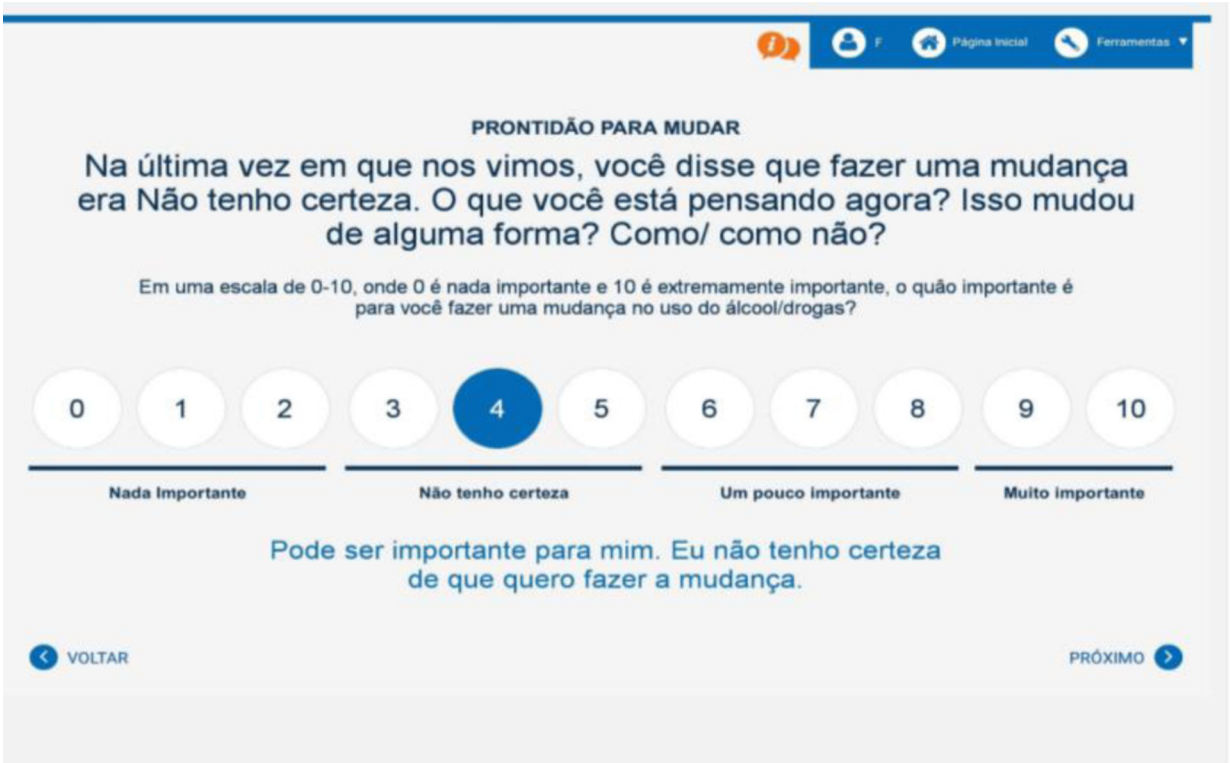
Funding:

This study was funded by the National Institute on Alcohol Abuse and Alcoholism [Grant #: R01AA025947]. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health/National Institute on Alcohol Abuse and Alcoholism.

Appendix A. Example Screens from the SBIRT/MI App







References

Angdembe M, Kohrt BA, Jordans M, Rimal D, & Luitel NP (2017). Situational analysis to inform development of primary care and community-based mental health services for severe mental disorders in Nepal.International Journal of Mental Health Systems, 11, 69. 10.1186/s13033-017-0176-9 [PubMed: 29167700]

Babor TF, Higgins-Biddle JC, Saunders JB, & Monteiro MG (2001). AUDIT: the alcohol use disorders identification test: guidelines for use in primary health care. World Health Organization. https://apps.who.int/iris/handle/10665/67205

Babor TF & Higgins-Biddle JC (2001). Brief Intervention for Hazardous and Harmful Drinking: A Manual for Use in Primary Care. World Health Organization. https://apps.who.int/iris/handle/10665/67210

Bernstein E, Bernstein J, & Levenson S (1997). Project ASSERT: An ED-based intervention to increase access to primary care, preventive services, and the substance abuse treatment system. Annals of Emergency Medicine, 30(2), 181–189. 10.1016/S0196-0644(97)70140-9 [PubMed: 9250643]

Bhardwaj A, Subba P, Rai S, Bhat C, Ghimire R, Jordans MJD, Green E, Vasudevan L, & Kohrt BA (2020). Lessons learned through piloting a community-based SMS referral system for common mental health disorders used by female community health volunteers in rural Nepal. BMC Research Notes, 13(1), 309–309. 10.1186/s13104-020-05148-5 [PubMed: 32611435]

Braun V, & Clarke V (2021). Can I use TA? Should I use TA? Should I not use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches [10.1002/capr.12360]. Counselling and Psychotherapy Research, 21(1), 37–47. 10.1002/capr.12360

Clausen T, Rossow I, Naidoo N, & Kowal P (2009). Diverse alcohol drinking patterns in 20 African countries. Addiction, 104(7), 1147–1154. 10.1111/j.1360-0443.2009.02559.x [PubMed: 19426287]

Creswell J, Plano Clark VL, Gutmann ML, & Hanson WE (2003). Advanced mixed methods research designs. In Tashakkori A & Teddlie C (Eds.), Handbook of mixed methods research designs. Sage.

Demyttenaere K, Bruffaerts R, Posada-Villa J, Gasquet I, Kovess V, Lepine JP, Angermeyer MC, Bernert S, de Girolamo G, Morosini P, Polidori G, Kikkawa T, Kawakami N, Ono Y, Takeshima T, Uda H, Karam EG, Fayyad JA, Karam AN,… Chatterji S (2004). Prevalence, severity, and unmet

need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. JAMA, 291(21), 2581–2590. 10.1001/jama.291.21.2581 [PubMed: 15173149]

dos Santos PF, Wainberg ML, Caldas-de-Almeida JM, Saraceno B, & Mari J. d. J. (2016). Overview of the mental health system in Mozambique: Addressing the treatment gap with a task-shifting strategy in primary care. International Journal of Mental Health Systems, 10(1), 1. 10.1186/s13033-015-0032-8 [PubMed: 26734070]

Dua T, Barbui C, Clark N, Fleischmann A, Poznyak V, van Ommeren M, Yasamy MT, Ayuso-Mateos JL, Birbeck GL, Drummond C, Freeman M, Giannakopoulos P, Levav I, Obot IS, Omigbodun O, Patel V, Phillips M, Prince M, Rahimi-Movaghar A,… Saxena S (2011). Evidence-based guidelines for mental, neurological, and substance use disorders in Low-and Middle-Income Countries: Summary of WHO recommendations. PLOS Medicine, 8(11), e1001122. 10.1371/journal.pmed.1001122 [PubMed: 22110406]

Goldbaum C, Schmitt E, & Walsh D (2021). As militants seize Mozambique gashHub, a dash for safety turns deadly. New York Times.

Halsted S, Ásbjörnsdóttir KH, Wagenaar BH, Cumbe V, Augusto O, Gimbel S, Manaca N, Manuel JL, & Sherr K (2019). Depressive symptoms, suicidal ideation, and mental health care-seeking in central Mozambique. Social Psychiatry and Psychiatric Epidemiology, 54(12), 1519–1533. 10.1007/s00127-019-01746-2 [PubMed: 31317245]

Hermes ED, Lyon AR, Schueller SM, & Glass JE (2019). Measuring the implementation of behavioral intervention technologies: Recharacterization of established outcomes. Journal of Medical Internet Research, 21(1), e11752. 10.2196/11752 [PubMed: 30681966]

Levesque D, Umanzor C, & de Aguiar E (2018). Stage-based mobile intervention for substance use disorders in primary care: Development and test of acceptability. JMIR Medical Informatics, 6(1), e1–e1. 10.2196/medinform.7355 [PubMed: 29295811]

Lund C, Brooke-Sumner C, Baingana F, Baron EC, Breuer E, Chandra P, Haushofer J, Herrman H, Jordans M, Kieling C, Medina-Mora ME, Morgan E, Omigbodun O, Tol W, Patel V, & Saxena S (2018). Social determinants of mental disorders and the Sustainable Development Goals: a systematic review of reviews. Lancet Psychiatry, 5(4), 357–369. 10.1016/s2215-0366(18)30060-9 [PubMed: 29580610]

McDonald N, Schoenebeck S, & Forte A (2019). Reliability and inter-rater reliability in qualitative research: Norms and guidelines for CSCW and HCI Practice. Proceedings of the ACM on Human-Computer Interaction, 3, Article 72. 10.1145/3359174

Merchant R, Torous J, Rodriguez-Villa E, & Naslund JA (2020). Digital technology for management of severe mental disorders in low-income and middle-income countries. Current Opinion in Psychiatry, 33(5), 501–507. 10.1097/yco.0000000000000626 [PubMed: 32520747]

Mohr DC, Siddique J, Ho J, Duffecy J, Jin L, & Fokuo JK (2010). Interest in behavioral and psychological treatments delivered face-to-face, by telephone, and by internet. Annals of Behavioral Medicine, 40(1), 89–98. 10.1007/s12160-010-9203-7 [PubMed: 20652466]

Naslund JA, Aschbrenner KA, Araya R, Marsch LA, Unützer J, Patel V, & Bartels SJ (2017). Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature. Lancet Psychiatry, 4(6), 486–500. 10.1016/s2215-0366(17)30096-2 [PubMed: 28433615]

Naslund JA, Shidhaye R, & Patel V (2019). Digital technology for building capacity of nonspecialist health workers for task sharing and scaling up mental health care globally. Harvard Review of Psychiatry, 27(3), 181–192. 10.1097/HRP.0000000000000217 [PubMed: 30958400]

Nowell LS, Norris JM, White DE, & Moules NJ (2017). Thematic analysis: Striving to meet the trustworthiness criteria. International Journal of Qualitative Methods, 16(1), 1609406917733847. 10.1177/1609406917733847

O'Grady MA, Kapoor S, Gilmer E, Neighbors CJ, Conigliaro J, Kwon N, & Morgenstern J (2019). Point-of-care mobile application to guide health care professionals in conducting substance use screening and intervention: A mixed-methods user experience study. ACI Open, 03(01), e1–e12. 10.1055/s-0039-1684002

Odendaal WA, Anstey Watkins J, Leon N, Goudge J, Griffiths F, Tomlinson M, & Daniels K (2020). Health workers' perceptions and experiences of using mHealth technologies to deliver primary

healthcare services: A qualitative evidence synthesis. Cochrane Database of Systematic Reviews, 3, 10.1002/14651858.CD011942.pub2

Padmanathan P, & De Silva MJ (2013). The acceptability and feasibility of task-sharing for mental healthcare in low and middle income countries: A systematic review. Social Science & Medicine, 97, 82–86. 10.1016/j.socscimed.2013.08.004 [PubMed: 24161092]

Padrão P, Damasceno A, Silva-Matos C, Laszczyńska O, Prista A, Gouveia L, & Lunet N (2011). Alcohol consumption in Mozambique: Regular consumption, weekly pattern and binge drinking. Drug and Alcohol Dependence, 115(1), 87–93. 10.1016/j.drugalcdep.2010.10.010 [PubMed: 21123009]

Pasquali V (2020). The world's richest and poorest countries 2020. https://www.gfmag.com/global-data/economic-data/worlds-richest-and-poorest-countries

Pires J, Padrão P, Damasceno A, Silva-Matos C, & Lunet N (2012). Alcohol consumption in Mozambique: Results from a national survey including primary and surrogate respondents. Annals of Human Biology, 39(6), 534–537. 10.3109/03014460.2012.710249 [PubMed: 22888809]

Rathod S, Pinninti N, Irfan M, Gorczynski P, Rathod P, Gega L, & Naeem F (2017). Mental health service provision in low- and middle-income countries. Health Services Insights, 10, 1178632917694350. 10.1177/1178632917694350

Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, & Patra J (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. The Lancet, 373(9682), 2223–2233. 10.1016/S0140-6736(09)60746-7

Ruzek JI, & Yeager CM (2017). Internet and mobile technologies: Addressing the mental health of trauma survivors in less resourced communities. Global Mental Health, 4, e16. 10.1017/gmh.2017.11 [PubMed: 29230312]

Satre DD, Ly K, Wamsley M, Curtis A, & Satterfield J (2017). A digital tool to promote alcohol and drug use screening, brief intervention, and referral to treatment skill translation: A mobile app development and randomized controlled trial protocol. JMIR Research Protocols, 6(4), e55–e55. 10.2196/resprot.7070 [PubMed: 28420604]

Saunders B, Sim J, Kingstone T, Baker S, Waterfield J, Bartlam B, Burroughs H, & Jinks C (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. Quality & Quantity, 52(4), 1893–1907. 10.1007/s11135-017-0574-8 [PubMed: 29937585]

Schwitters A, Lederer P, Zilversmit L, Gudo PS, Ramiro I, Cumba L, Mahagaja E, & Jobarteh K (2015). Barriers to health care in rural Mozambique: A rapid ethnographic assessment of planned mobile health clinics for ART. Global Health: Science and Practice, 3(1), 109. 10.9745/GHSP-D-14-00145

Stanley B, & Brown GK (2012). Safety planning intervention: A brief intervention to mitigate suicide risk. Cognitive and Behavioral Practice, 19(2), 256–264. 10.1016/j.cbpra.2011.01.001

Suleman A, Mootz JJ, Feliciano P, Nicholson P, O'Grady MA, Wall M, Mandell D, Stockton M, Teodoro E, Anube A, Novela A, Mocumbi AO, Gouveia L, & Wainberg ML (in press). Community implementation of SBIRT using technology for alcohol use reduction in Mozambique: Scale-up study protocol. Psychiatric Services.

Sweetland AC, Oquendo MA, Sidat M, Santos PF, Vermund SH, Duarte CS, Arbuckle M, & Wainberg ML (2014). Closing the mental health gap in low-income settings by building research capacity: perspectives from Mozambique. Annals of Global Health, 80(2), 126–133. 10.1016/j.aogh.2014.04.014 [PubMed: 24976551]

Tol WA, Murray SM, Lund C, Bolton P, Murray LK, Davies T, Haushofer J, Orkin K, Witte M, Salama L, Patel V, Thornicroft G, & Bass JK (2019). Can mental health treatments help prevent or reduce intimate partner violence in low-and middle-income countries? A systematic review. BMC Women's Health, 19(1), 34. 10.1186/s12905-019-0728-z [PubMed: 30764813]

Triplett NS, Munson S, Mbwayo A, Mutavi T, Weiner BJ, Collins P, Amanya C, & Dorsey S (2021). Applying human-centered design to maximize acceptability, feasibility, and usability of mobile technology supervision in Kenya: a mixed methods pilot study protocol. Implementation Science Communications, 2(1), 2. 10.1186/s43058-020-00102-9 [PubMed: 33413688]

Ventola CL (2014). Mobile devices and apps for health care professionals: uses and benefits. P & T, 39(5), 356–364. https://pubmed.ncbi.nlm.nih.gov/24883008 [PubMed: 24883008]

Wainberg M, Oquendo MA, Peratikos MB, Gonzalez-Calvo L, Pinsky I, Duarte CS, Yu Q, Green AF, Martinho S, Moon TD, & Audet CM (2018). Hazardous alcohol use among female heads-of-household in rural Mozambique. Alcohol, 73, 37–44. 10.1016/j.alcohol.2018.03.011 [PubMed: 30261452]

Wainberg ML, Gouveia ML, Stockton MA, Feliciano P, Suleman A, Mootz JJ, Mello M, Fiks Salem A, Greene MC, Bezuidenhout C, Ngwepe P, Lovero KL, Fortunato dos Santos P, Schriger SH, Mandell DS, Mulumba R, Neves Anube A, Mabunda D, Mandlate F, …Weissman MM,(2021). Technology and implementation science to forge the future of evidence-based psychotherapies: The PRIDE scale-up study. Evidence Based Mental Health, 24(1), 19. 10.1136/ebmental-2020-300199 [PubMed: 33177149]

Wainberg ML, Lovero KL, Duarte CS, Fiks Salem A, Mello M, Bezuidenhout C, Mootz J, Feliciano P, Suleman A, Fortunato dos Santos P, Weissman MM, Cournos F, Marques AH, Fumo W, Mabunda D, Alves-Bradford J-ME, Mello M, Mari JJ, Ngwepe P, …Oquendo MA, (2020). Partnerships in research to implement and disseminate sustainable and scalable evidence-based practices (PRIDE) in Mozambique. Psychiatric Services, 10.1176/appi.ps.202000090

Weiner BJ, Lewis CC, Stanick C, Powell BJ, Dorsey CN, Clary AS, Boynton MH, & Halko H (2017). Psychometric assessment of three newly developed implementation outcome measures. Implementation Science, 12(1), 108. 10.1186/s13012-017-0635-3 [PubMed: 28851459]

Weissman MM, Hankerson SH, Scorza P, Olfson M, Verdeli H, Shea S, Lantigua R, & Wainberg M (2014). Interpersonal Counseling (IPC) for depression in primary care. American Journal of Psychotherapy, 68(4), 359–383. 10.1176/appi.psychotherapy.2014.68.4.359 [PubMed: 26453343]

World Bank (2016). World bank open data. https://data.worldbank.org

WHO. (2008a). mhGAP: Mental health gap action programme: Scaling up care for mental, neurological and substance use disorders https://apps.who.int/iris/handle/10665/43809

WHO. (2008b). Task shifting global recommendations and guidelines. https://www.who.int/workforcealliance/knowledge/resources/taskshifting_guidelines/en/

WHO. (2016). mhGAP intervention guide for mental, neurological and substance use disorders in non-specialized health settings: mental health Gap Action Programme (mhGAP) – version 2.0 https://www.who.int/publications/i/item/mhgap-intervention-guide---version-2.0

WHO. (n.d.). Process of translation and adaptation of instruments https://www.who.int/substance_abuse/research_tools/translation/en/

Highlights

- Mozambique has provider shortages limiting access to care for unhealthy alcohol use
- Technology is an understudied way to support providers under task-shifting models
- A mobile application was acceptable, feasible, and appropriate among nonspecialists

Table 1.

Description of SBIRT/MI Intervention Sessions

Session Number	Core Goals of Session	Approximate Length
1	• Enter patient gender, age, and ID number • Build rapport by introducing the topic and goals of the intervention • Conduct screening using Alcohol Use Disorders Identification Test (Babor et al., 2001) • Identify risk level • Provide recommended drinking limits and feedback and health information about alcohol use patterns based on screening results • Increase motivation by discussing pros and cons of drinking, developing discrepancy between personal goals/values and drinking, and assessing readiness to change • Negotiate drinking goals by identifying patients' desired quantity/frequency and activities to facilitate that goal	45–60 minutes
2	• Reassess quantity and frequency of drinking • Assess current readiness to change and confidence in reaching drinking goal • Increase motivation to change by discussing values important to patient and fit with alcohol use	30 minutes
3	• Reassess quantity and frequency of drinking • Assess current readiness to change and confidence in reaching drinking goal • Reassess goals • Increase readiness and commitment to change by establishing detailed action plan that includes reasons to change, steps for change, identifying others who can help, and potential risks to the plan	30 minutes
4	• Reassess quantity and frequency of drinking • Assess current readiness to change and confidence in following action plan • Review action plan, how well it worked, changes to the plan, confidence in plan, and reasons to change	30 minutes

Table 2.

Characteristics of Participants

Demographic	Qualitative % or M(SD)	Quantitative % or M(SD)
Age	29 (7)	31 (6)
Professional Category		
Primary Care Practitioner	44%	67%
Psychiatric Tech	56%	33%
Race		
Black	100%	100%
Ethnicity		
Emakhwa	73.3%	76.5%
Xichangane	6.6%	4.7%
Elomwe	6.6%	4.7%
Ciuute	6.6%	0%
Echuabo	6.6%	4.7%
Makonde	0%	4.7%
Don't know	0%	4.7%
Primary Language		
Emakhwa	20%	14%
Portuguese	80%	81%
Don't know	0%	5%
Gender		
Male	87%	43%

Table 3.

Acceptability, Feasibility, and Appropriateness of the SBIRT/MI App (n = 45)

Item	% Agree/Completely Agree	Mean (SD)
Acceptability Scale		4.33 (.45)
The SBIRT app meets my approval	99.98%	4.31 (.60)
The SBIRT app is appealing to me	99.98%	4.31 (.47)
I like the SBIRT app	99.98%	4.31 (.60)
I welcome the SBIRT app	99.98%	4.38 (.61)
Appropriateness Scale		4.22 (.44)
The SBIRT app seems fitting	95.56%	4.13 (.63)
The SBIRT app seems suitable	95.56%	4.16 (.64)
The SBIRT app seems applicable	99.98%	4.20 (.55)
The SBIRT app seems like a good match	100.00%	4.38 (.49)
Feasibility Scale		4.17 (.51)
The SBIRT app seems implementable	99.98%	4.22 (.56)
The SBIRT app seems possible	95.56%	4.16 (.64)
The SBIRT app seems doable	93.33%	4.16 (.74)
The SBIRT app seems easy to use	91.11%	4.13 (.81)

Note: Scale on 1–5 where 1 = completely disagree and 5 = completely agree