DIGITAL MENTAL HEALTH INITIATIVES IN NIGERIA – A QUALITATIVE INTERVIEW STUDY

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ABSTRACT

Background: The direct and indirect impact of the SARS-CoV-2 virus and its mitigation measures have exacerbated the global mental health crisis. Digital mental health interventions (DMHIs) may have the potential to address health system gaps and global health inequalities in low-and middle-income countries (LMICs).

Purpose: This thesis aims to map the current state of DMHIs available in Nigeria and illustrate their progress, limitations, and challenges. This study aims to expand upon the findings of recent studies in LMICs by incorporating the perspectives of individuals who play a prominent role in global mental health. The lessons learned in the Nigerian context can inform the delivery of DMHIs in other low-resource settings.

Methods: This research was conducted using case study methodology. Twenty semi-structured interviews were conducted with mental health researchers, healthcare providers, digital health experts and policy makers. Data sources such as news articles, websites, research papers, and interviews were used. Interviews were recorded and transcribed, and data from multiple sources were then converged, coded, and analyzed using Dedoose via thematic analysis.

Findings: The vast majority of DMHIs in Nigeria are private mental health service delivery platforms that connect directly to mental health professionals. The target audience for most DMHIs are broad and encompass all mental health conditions and ages. Advantages of DMHIs include increasing efficiency, accessibility, addressing stigma, and filling the mental health service gap. Disadvantages include skepticism in DMHIs, limitations of applicability, lack of accessibility to internet and technology, lack of sustainability, and lack of infrastructure, funding, and policies.

Conclusions: There is a need to leverage DMHIs within the Nigerian population for mental health promotion. Future research should examine feedback from users and providers of DMHIs to allow for comparative analysis, more conclusive and replicable results to inform DMHI design and implementation.

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CHAPTER 1: INTRODUCTION

Over the last few years, countries worldwide have imposed quarantines and various social distancing measures to control the spread of COVID-19 (Lauge, 2021). The direct and indirect impact of the virus and its mitigation measures have exacerbated the global mental health crisis, including an increase in anxiety, depression, panic attacks, posttraumatic stress disorders, and suicide rates (Rauschenberg et al., 2021). The pandemic has increased the strain on mental healthcare systems and disproportionately impacted populations already marginalized due to poverty and socioeconomic distress (Ornell et al., 2020; Liu et al., 2021). Low- and middle-income countries (LMICs) face the largest consequences of this mental health crisis due to unequal access of mental health services being a prevalent issue before the COVID-19 pandemic (Brooks et al., 2020; Xiang et al., 2020). The ratio of mental health workers per 100 000 population in LMICs ranges from 2.3-23.6% of that of high-income countries (WHO, 2020). Recent studies estimate that approximately 75% of the patients with mental disorders in LMICs do not have access to mental health services (Muhorakeye et al., 2021). Inadequate access to mental healthcare can lead to considerable distress, chronicity, and increased cost of care at the individual level (Prince et al., 2007). Considering more than 80% of the world population lives in LMICs, the scale of the problem is severe (The World Bank, 2020).

Due to COVID-19 travel restrictions and social distancing measures, many countries have turned to digital interventions to continue to access healthcare (Monaghesh & Hajizadeh, 2020). Fortunately, in many LMICs, digital technologies are becoming more accessible and affordable (Livingstone et al., 2017; Rost et al., 2020). It is estimated that in LMICs, 45%–89% of people have access to mobile phones, 45%–54% to smartphones, and 7%–18% to the internet (Huang et al., 2019). As internet accessibility and mobile device usage continue to rise, internet-based health interventions that use digital technologies have the potential to help with reducing healthcare inequities and filling the gap between the demand for healthcare services and access to care (Boucher et al., 2021). Digital mental health interventions (DMHIs) have become increasingly prevalent in the current mental health landscape. Studies have shown that DMHIs are not only effective in HICs but also have the potential to improve access to mental healthcare services in low-resource settings. The World Health Organization (WHO) highlights that “rigorous evaluation of digital health is necessary to generate evidence and promote the appropriate integration and use of technologies” (WHO, 2019). Global health experts and the United Nations policy brief highlight that developing countries must continue to find innovative ways to diversify and scale up care for mental health conditions through digital self-help or non-specialist psychological counselling (Holmes et al., 2020; United Nations, 2020). Therefore, more assessment of the effectiveness of digital mental health interventions in LMICs is needed.

1.1. OBJECTIVES & RESEARCH QUESTIONS

The research evidence to support the usage of DMHIs has not kept pace with the rapid growth of the digital mental health field (Naslund et al., 2019). Some national strategies for digital health recommend that countries increase their mental health services coverage by examining the existing landscape of available and effective DMHIs and scaling up the most appropriate intervention (Roland et al., 2020). The African Union's Digital Transformation Strategy 2020 – 2030 aims for universal digital access and a single pan-African digital market by 2030 (African Union, 2020). According to the literature, internet accessibility in Sub-Saharan Africa is growing at one of the fastest paces in the world due to strong investment incentives (World Bank, 2020). The COVID-19 pandemic further accelerated Sub-Saharan Africa's digital health innovation and demand for infrastructure (Ayeni, 2020; Livingstone et al., 2017). For instance, MTN Nigeria, a multinational mobile telecommunications company, showed a 20% revenue increase at the peak of COVID-19, even surpassing the revenue in developed markets during that time (Ayeni, 2020). As the most populous country in Sub-Saharan Africa, Nigeria's youth-dominated population and rapid urbanization also increase the demand for digitalization (de Feydeau et al., 2022). In 2021, Nigeria had 108.75 million internet users, and around 15.4% of the population used social media (Johnson, 2022). Unfortunately, insufficient governance of mental healthcare systems and under-prioritization of mental health research in Nigeria has resulted in limited research evidence to accompany the growing number of DMHIs (Abdulmalik et al., 2016).

This thesis aims to map the current state of DMHIs available in Nigeria and illustrate its progress, limitations, and challenges. This study aims to expand upon the findings of recent quantitative and qualitative studies in LMICs by incorporating the perspectives of individuals who play a prominent role in the fields of DMHIs and global mental health. The lessons learned in the Nigerian context can inform the delivery of DMHIs in other low-resource settings and contribute to the growing knowledge of DMHIs usage in LMICs. The study findings can also provide further insight into developing and implementing safe, effective, and evidence-based DMHIs in low-resource settings.

The research described in this thesis has been guided by the following research questions:

RQ1: *What DMHIs have been developed in Nigeria to address mental health and wellbeing?*

RQ2: *What are the advantages and disadvantages of using such DMHIs?*

RQ3: *What are some lessons learned regarding DMHIs that can potentially be applied to other contexts?*

RQ4: *What are the current gaps and recommendations for future research?*

To answer RQ1, a literature review was conducted on DMHIs being implemented in Nigeria as well as their perceived benefits and challenges. Question RQ2 was also partially answered by the literature review but primarily addressed by the case study and semi-structured interviews conducted on individuals who play a prominent role in the fields of DMHIs and global mental health. RQ3 and RQ4 were simultaneously addressed by the interviews conducted because the interview guide focused on the types of DMHIs available, the advantages and disadvantages of such DMHIs, lessons learned from these digital approaches, and future research directions in this field. The semi-structured interviews also include several open-ended questions to allow interviewees to elaborate on specific areas which they regard as important. The data to answer RQ2, RQ3, and RQ4 were identified in the data analysis process through themes generated using an inductive approach using the phases of thematic analysis proposed by Braun and Clarke (2006). The final discussion section of the thesis also answers RQ2, RQ3, and RQ4 by applying the findings from this study and discussing its real-world implications, as well as providing other LMICs a guide on what to expect when implementing DMHIs in low-resource settings.

1.2 BACKGROUND

1.2.1 What is Mental Health and Wellbeing?

According to the WHO, mental health is "a state of mental wellbeing that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community (WHO, 2022)." Therefore, mental health plays a crucial role in the way we view and perceive the world and function and interact within it. Mental health is a fundamental human right and falls within Article 25 of the 1948 Universal Declaration of Human Rights (UDHR), which highlights "the right to a standard of living adequate for health and wellbeing." Mental health and wellbeing have been deemed essential to personal, community, and socio-economic development (WHO, 2022).

Mental health is influenced by a complex interaction of social, psychological, and biological variables and is not merely the absence of disease. Therefore, mental health and wellbeing exist on a spectrum and are experienced differently from one person to another and between different cultures (WHO, 2022). However, increased exposure to adverse social, economic, political, and environmental conditions such as poverty, civil war, disease outbreaks, and environmental crises can potentially increase the risk of an individual developing mental health conditions in their lifetime (WHO, 2022). These risk factors can occur at any point in one's life but are particularly detrimental if they occur during developmentally sensitive periods, such as early childhood or adolescence. On the

other hand, protective factors such as facilitating supportive environments and implementing mental health interventions can help build resilience in global populations (WHO, 2022).

In terms of global mental health goals, suicide prevention has been the utmost priority for some time. According to the United Nations Sustainable Development Goals, much progress can be made by limiting access to means, responsible media reporting, and promoting child and adolescent mental health through social and emotional learning and early intervention (United Nations, 2021). Building mental health resilience in local and global communities is a growing area of interest in developing countries, but action and advocacy must often extend beyond the public health sector. Implementing mental health interventions often involves collaboration and coordination among other sectors such as education, labour, justice, environment, housing, and welfare. Above all else, mental health initiatives must also be simultaneously supported through legislation level change to achieve these mental health milestones.

1.2.2 What are Digital Mental Health Interventions (DMHIs)?

A mental health intervention is considered digital when technology is used to deliver mental health services, information, support, interventions, and treatments. This includes the internet, computers, mobile phones or tablets, and text messaging services (Fu et al., 2020). DMHIs can be delivered in many ways (e.g., websites, telephone support, smartphone apps, and text or voice calls) and can be designed and catered for individuals, specific groups, or whole populations.

DMHIs can also vary in design and delivery and can include a range of digital elements (e.g., games, online activities, and chatbots) to help personalize and better meet the range of needs and preferences of users. Some of these technologies are supported by contact with a healthcare provider or other professional. In addition, DMHIs encompass "synchronous" mental health services, which are when digital mental health is delivered in real-time (e.g., therapy provided via videoconferencing), as well as "asynchronous" services, where a mental health professional will respond later. On the other hand, DMHIs can also be resources and interventions that are purely 'self-help' and therefore involve no human support to an individual user.

DMHIs can therefore be grouped into specific formats and themes. According to a literature review by Rost et al. (2020), most DMHIs address at least one or more concerns using the following service formats:

Information and education: These interventions intend to educate users about mental health and well-being. This format encompasses web-based/computerized training

modules, massive open online courses, or advice and resources using apps and websites. For example, many interventions implement learning modules that involve true stories, games, videos, animated films, or images to cater to the interests of a younger audience (Rost et al., 2020).

Reflection and self-care: These forms of DMHIs are often found as smartphone health and fitness apps and often accompanied by virtual health and mood trackers, websites, and online podcasts/webinars. Individuals can actively participate in self-care and resilience-building practices by incorporating problem-based learning exercises with reflection activities (Rost et al., 2020).

Group based digital support: These DMHIs utilize social media platforms such as chat rooms or online discussion forums to encourage youth and adolescents experiencing similar situations to connect and support each other (e.g., Sobowale et al., 2016). Many individuals enjoy using DMHIs to socialize with peers, share problems, give each other advice, and relate to others' experiences (Kenny et al., 2016). However, due to the increase in cyberbullying risks, it is recommended to utilize moderators to monitor user interactions.

Individual digital support: Online counselling, telepsychiatry, phone counselling, and online therapy are all forms of individual digital support. These platforms often incorporate online symptom checkers, mood scores, chatbots, call or text in helplines, or online support, to help diagnose mental health problems, provide support and advice. Managing and adhering to treatment plans through online therapies, virtual counselling, support apps, digital reminders, or trackers are also becoming increasingly common in recent years (Rost et al., 2020).

1.3 RESEARCH CONTEXT

The study focuses on Nigeria, a country located on the western coast of Africa and bordered by Niger, Chad, Cameroon, Benin, and the Atlantic Ocean. Nigeria is Africa's most populous country, with a population of approximately 225 million (Udo et al., 2023). The capital of Nigeria is Abuja; however, Lagos, the former capital of Nigeria, continues to be the country's leading commercial and industrial city. Approximately half of the population lives in urban areas, and the other half lives in rural areas. Although English is the official language of Nigeria, there are an estimated 250 ethnic groups in the country. As a result, hundreds of languages are spoken throughout the country, including Yoruba, Igbo, Fula, Hausa, Edo, Ibibio, and Tiv. The major religions in Nigeria are Christianity (47%) and Islam (51%) (Udo et al., 2023).

The industries that drive Nigeria's economy and account for the majority of its GDP are its agriculture, petroleum, tourism, and mining industries. These industries are also responsible for the country's exports. The main exports from Nigeria include petroleum, chemicals, palm oil, and cocoa (Labinjo et al., 2020). These industries also employ much of Nigeria's workforce, with agriculture alone employing about 30% of the country's total labor force (Labinjo et al., 2020).

Between 20-50% of Nigeria's population depends upon agricultural production (Udo et al., 2023). However, most are small-scale subsistence farmers that produce little agricultural surplus for sale and derive additional income from cash crops (Udo et al., 2023). The shortage and limited access to farmland in some regions are among the factors that restrict the size of farmland cultivated per family (Udo et al., 2023). Moreover, environmental deterioration, inadequate storage facilities, transportation systems, and a lack of investment capital on top of a rapidly growing population have led to food shortages that continue to worsen despite government interventions (Udo et al., 2023).

1.3.1 The State of Mental Health in Nigeria

The state of mental health in Nigeria has been affected by factors such as poor funding, lack of infrastructure, inequitable distribution of resources, the impact of the COVID-19 pandemic, and stigma (Adepoju, 2020). Notably, one in four Nigerians suffer from mental illness, and approximately 80% of Nigerians with serious mental health needs cannot access care (Ugochukwu et al., 2020). To put this into perspective, for every 550,000 patients, only one psychiatrist can provide care (Soroye et al., 2021),

The Nigerian healthcare system relies on a combination of tax funding, fee-for-service, and minimal health insurance coverage. However, the WHO estimates that only about 3% of the government's budget for health goes toward mental health services (Abubakar et al., 2022). As a result, there are not enough qualified healthcare professionals to begin with. Moreover, it is not uncommon for resident psychiatrists to leave Nigeria to find work in other countries, switch to private hospitals, or quit the profession (Mbamalu, 2019). After this considerable brain drain effect, the mental health professionals that remain in the country experience burnout due to the dwindling mental health labour force (Mbamalu, 2019).

A few general hospitals provide psychiatric services, but the majority of mental health services are provided by eight regional psychiatric hospitals and the psychiatry departments of 12 medical schools. Some private psychiatric centres also provide private mental health care, but the out-of-pocket payments have created a cost barrier and decreased the use of the healthcare service (Centre of Economics and Development, 2017). Free healthcare treatment was once provided in all federal and state facilities until

the commencement of health reforms in the 1980s. However, free treatment has disappeared due to commercialization and cost recovery, and healthcare now requires payment for access and is no longer a public good accessible to vulnerable and disadvantaged populations such as those living in poverty (Turshen, 1999; Allubo, 2010). In 2022, approximately 130 million Nigerians live in poverty, and due to the pandemic, their situation has become even more precarious (World Bank, 2022). Psychological treatments, in particular, are incredibly costly since health insurance does not cover the cost of mental health treatment (Otto & Roekel, 2022). As a result, these conditions could impact the demand side of DMHIs in Nigeria and the ability of the average citizen to afford these services. Even if the cost of mental health services is not a necessary barrier to care, populations living outside the major cities in Nigeria (such as rural populations) are still impacted due to the bulk of mental health practitioners practicing in big city tertiary healthcare facilities (Oyekale, 2017).

As a result of the factors described earlier, many prospective patients are driven to use traditional medicine, which is easily accessible and relatively affordable. In addition, religion is ingrained in Nigerians' national identity, and religious leaders possess strong influences and play significant roles in shaping their local communities' attitudes, opinions, and behavior (Ayande et al., 2021). Many Nigerians are more likely to listen to their religious leaders over government leaders, due to overall distrust between citizens and political elite (Ayande et al., 2021). Therefore, Nigerians often seek care from community health workers, medicine vendors, spiritual healers, traditional birth attendants, and other informal providers. Moreover, with so many languages spoken in Nigeria, the barriers to accessing mental health services in one's native tongue are even more challenging, which must also be considered when implementing DMHIs.

1.3.2 Infrastructure Background

Nigeria currently follows the same mental health legislation that was in effect before it gained its independence from the United Kingdom in 1960 (Ugochukwu et al., 2020). The 1926 Lunacy Ordinance was last amended in 1958 and governed the state of mental health and the provision of care in Nigeria. The broad definition of a "lunatic" according to the Lunacy Ordinance gives medical practitioners and magistrates authority to decide which citizens are encompassed by the law and opens the possibility for wrongful confinement of mentally healthy individuals (Westbrook, 2011).

Since 2003, the National Assembly has had a replacement bill known as the Mental Health Act. The Mental Health Act aims to protect the rights of individuals with mental disorders, ensure equal access to care and treatment, discourage mental health stigma and discrimination, and set psychiatric care standards in Nigeria. In addition, the bill sets provisions for accessing mental health services, voluntary and involuntary

treatment, accreditation of professionals and healthcare facilities, law enforcement and other judicial issues for people with mental illness, mechanisms regarding involuntary admission, and mechanism to implement the provision of Mental health Legislations. In Nigeria, bills for new laws or amendments must pass through three readings and obtain presidential assent before they become law (Ogunlesi & Ogunwale, 2012). The bill managed to pass its first reading in the Senate; however, it was later withdrawn in April 2009 after a considerable setback between the first and second reading due to the death of the bill's lead sponsor (Ugochukwu et al., 2020). Four years later, in 2013, the bill was reintroduced to the National Assembly, but again, the bill was not enacted (Ugochukwu et al., 2020). In 2019, another mental health bill, the Mental and Substance Abuse Bill, was proposed to the National Assembly to protect the rights of people with mental health issues and establish a commission for mental health (Ugochukwu et al., 2020). A public hearing for the bill took place in February 2020, but no further progress has been recorded since then (Ugochukwu et al., 2020). Even though changes in the mental health legislature at the federal level have been slow, in 2021, the Ekiti state government in Nigeria passed a non-discriminatory mental health service bill (Afolabi et al., 2021). The act declared zero-tolerance for stigma, marginalization, and abuse of individuals with mental health issues. Despite more policies addressing mental health issues in Nigeria now, statistics and detailed information on mental health disorder prevalence and effectiveness of mental health services in Nigeria are still very limited and outdated (Afolabi et al., 2021; Abdulmalik et al., 2016). These issues make it difficult to identify areas of need, coordinate mental health interventions, and make an informed decision about policy direction.

1.3.3 Impact of COVID-19

The COVID-19 pandemic exposed the weaknesses in Nigeria's public healthcare infrastructure in general and in the mental health sector (Ahmed et al., 2020). For example, when outpatient mental health services and private pharmaceutical stores were inaccessible in person due to mandated lockdowns, hundreds of thousands of patients were left unattended for months. Moreover, the uncertainty and fear of COVID infection associated with visiting hospitals persisted long after the lockdown. Notably, the pandemic also revealed the potential of digital technologies to ensure continuity of care while social distancing.

Patients with comorbid medical conditions or exacerbation of pre-existing mental illness were discouraged from coming in for inpatient care. These challenges jump-started using telecommunication tools such as telephone calls and SMS messages to continue providing care to those patients. Despite Nigeria's history of weak surveillance and diagnostic infrastructure, the rapid scale-up of COVID-19 interventions suggests that

improving other healthcare areas is also possible with sufficient local effort, resources, and funding.

1.3.4 Stigma

Mental health conditions are highly stigmatized in Nigeria, further compounding challenges related to seeking care. The existing cultural practices and belief systems have historically spread mental health stigma and misconceptions among Nigerian communities (Okafor, 2022). For instance, in a 5000 respondent survey, 84% of respondents believe that mental disorders are attributable to drug abuse, 60% believe mental health disorders are caused by "sickness of the mind," 54% by "possession by evil spirits," and 23% to a "punishment by a deity for a past misdemeanor." (EpiAFRIC and the Africa Polling Institute, 2020). This stigma has severe consequences for individuals with mental health disorders. For example, if someone were seen suffering from a mental disorder, 8% of survey respondents would take them to a traditional healer, 4% would lock them up, and 2% would try to use beating to get the disease out of the individual. Given that 48% of the survey's respondents reported knowing someone with a mental disorder, these responses' implications are significant and far-reaching (EpiAFRIC and the Africa Polling Institute, 2020).

Overall, the slow change in Nigeria's mental health policies, weaknesses in public health infrastructure, and mental health stigma have resulted in a lack of e-health policies and legal frameworks/regulations to guide and standardize DMHI implementation across Nigeria (Mbunge et al., 2022). Such frameworks include security, privacy, and protection of patients' medical data, ethical and specific electronic health legislations. Regulatory barriers also include challenges associated with licensing virtual healthcare solutions (Bhaskar et al., 2021). Additionally, the lack of technological certification standards, lack of device regulation, and inconsistency impact the expansion of DMHIs from local to more national level (Mbunge et al., 2022).

1.3.5 Nigeria's Digital Landscape

The digital age began in Nigeria around the turn of the 21st century. The internet was slowly introduced and considered exclusive until 2001, when mobile internet access was introduced, and Econnet and MTN were the primary providers (Agape, 2021). Since then, financial technology has led the evolution of digital services, with health technology close behind. Most digital health platforms were founded between 2014–2017, over a decade after the internet came to Nigeria. These platforms focused on mobile consultation, voice-prompted awareness for common illnesses, or advocacy on specific health problems (Agape, 2021). However, only in the last few years have DMHIs begun to integrate with online platforms, help lines, SMS services, social media, and even

virtual reality to reach out to more Nigerians and address the service gap between demand and provision of healthcare. Therefore, digital health interventions have only recently established a foundation in Nigeria and have much more space to grow and evolve.

Recent evaluations estimate that there are over 190 million active mobile phone lines in Nigeria, or about one per inhabitant, with mobile internet subscriptions of 105 million monthly (Nigerian Communications Commission, 2020). The penetration of mobile devices has provided millions of people in rural areas access to reliable communication and data transfer technology and created a successful avenue to reach younger demographics (Pfeiffer et al., 2014). Ethnographic research has found that mobile phones are important to African youth in terms of identity, personhood, and relationships (Kenny, 2018). This is interrelated with youth using the internet to access social media platforms such as WhatsApp, Facebook, Instagram, and Twitter (Pfeiffer et al., 2014). Additionally, the mandatory lockdowns in 2020 due to the COVID-19 pandemic also played a pivotal role in increasing Nigeria's adoption of digital health interventions.

With the increased adoption of digital health services, more funding has been raised in this sector. For instance, Techpoint Africa reported a $23 million increase, which was 404% higher than the year before (Paul, 2021). With this increase in funding, several international companies and new startups have seen this as a profit opportunity. Moreover, with digital health technology's growing accessibility to the public and filling an existing gap in health service provision, DMHIs have gradually grown across the country with a particularly high uptake in young adults. Therefore, experts have projected digital health investments to continue to rise well into the next decade and that the country should anticipate digital health's growing influence on traditional healthcare services.

CHAPTER 2: LITERATURE REVIEW

The following section will begin by providing an overview of the methodology used to perform the literature review, followed by a summary of the literature findings to address the first and second research questions of "what DMHIs have been developed in Nigeria to address mental health and wellbeing?" and "what are the advantages and disadvantages of using such DMHIs?"

2.1 METHODOLOGY

Since there are few studies focused on the effectiveness of DMHIs in the Nigerian context, this literature review will begin with an overall analysis of DMHIs used in LMICs countries, followed by potential benefits and challenges of DMHIs. Lastly, it will cover any DMHIs pertaining to the Nigerian context.

The electronic databases Pubmed, PsychINFO, and Embase were used to conduct a primary literature search on this research topic looking for keywords in article titles and abstracts. The following categories of search terms were used: Mental Health, Digital Intervention, and LMICs. The inclusion criteria included articles, reports, and conference proceedings published in English from the year 2000 and onwards. Moreover, the studies included must focus on developing countries (LMICs) as the setting, and research focusing on DMHIs and mental health. The exclusion criteria eliminated articles that were not written in English and were published prior to the year 2000 (i.e., around the time Nigeria and other African countries were becoming more digitalized) or focused solely on policy development/developing global mental health guides.

The search terms within each category were combined using the Boolean operator OR. Each category was combined using the Boolean operator AND. Specific search terms in each category are provided in more detail in Table 1. A grey literature search using the same search terms was also conducted using Google and Google Scholar. As part of the grey literature search methodology, the reference lists of relevant articles were also reviewed, and **5** additional articles were found. The software, Covidence, was used for screening the articles found during the literature search.

85 articles were found that met the inclusion criteria. Within these, **54** were individual DMHI studies (**5** pertained to DMHI studies in Nigeria), **19** were systematic reviews or scoping reviews, **7** were reports, **5** were editorials/news articles. Findings are shown in a PRISMA below (Figure 1).

Table 1: Search Terms

Categories	Mental Health		Digital Intervention		LMICs
Search Terms	**OR**	**AND**	**OR**	**AND**	**OR**
	Mental Health Psych*		App Call Digital E-mental health E-Health Helpline Internet Mobile Online Telemental health Technology Virtual		Developing* LMIC* Low and middle-income countries

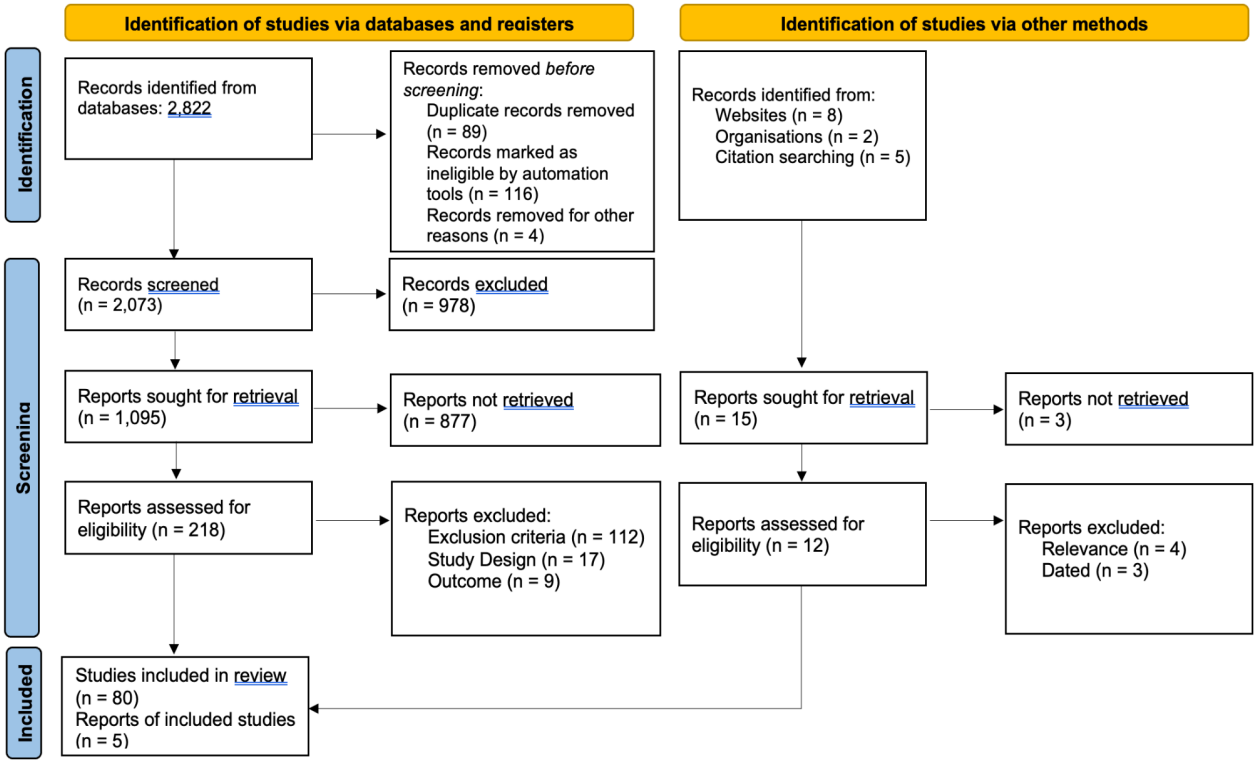

Figure 1: PRISMA diagram

2.2 APPLICATION OF DMHIS IN LMICS

Recent reviews summarized the use of digital mental health interventions in LMICs (Jimenez-Molina et al., 2019; Kaonga & Morgan, 2019; Naslund et al., 2017; Kane et al., 2022). The studies showed strong support for the feasibility and acceptability of online, mobile, and text-messaging services aimed at treating or preventing mental disorders in LMICs (Naslund et al., 2017). Moreover, DMHIs demonstrated promise in reducing symptoms of mental disorders such as depression (Firth et al., 2017), psychotic disorders (Gire et al., 2017), and other severe mental illnesses (Naslund et al., 2015), as well as improving medication adherence (Rootes-Murdy et al., 2018).

In a 2020 systematic review of the effectiveness of digital psychological interventions for mental health problems in LMICs, a diverse range of digital formats for delivering psychological interventions was found, with content similar to traditional face-to-face interventions (Fu et al., 2020). However, evidence on the long-term effects, process quality, and cost-effectiveness of digital approaches to address mental health are limited (Rauschenberg et al., 2020). There is still a large need to develop and test new methodologies and measurement tools for assessing DMHIs and target users, readiness, and usability (Huang et al., 2019).

2.2.1 Task Shifting

The WHO defines task shifting as "shifting service delivery of specific tasks from professionals with higher qualifications to those with fewer qualifications or creating a new cadre with specific training" (WHO, 2007). The purpose of task shifting is to reduce the workload of healthcare specialists and to ensure that patients with difficulty accessing specialists can access some level of mental health services (Patel et al., 2007). By allowing specialists to focus on more complex mental health cases, the overall quality of mental health care delivery may also be improved (Weinmann & Koesters, 2016). Several systematic reviews have found that task shifting has improved health systems efficiency in LMICs. The evidence indicates that task shifting for activities across a broad range of diseases, including tuberculosis, HIV/AIDS, malaria, childhood illness, and non-communicable diseases, can result in cost savings without compromising clinical quality (Seidman & Atun, 2017). The literature also suggests that DMHIs are overall acceptable, appropriate, and feasible for task-shifting to expand mental health services (Le et al., 2022). Therefore, the WHO and many other global health experts have recommended a task-shifting approach to deliver mental health care in LMICs. For example, one study in Nepal piloted the mobile phone version of the Community Informant Detection Tool (mCIDT) to deliver mental healthcare to rural communities. The intervention was delivered through female community health volunteers and

involved structured text messages. The intervention improved the timeliness of case reporting and encouraged follow-up and case record-keeping compared to the paper-based approach (Bhardwaj et al., 2020). This method has also proven effective in improving adherence, symptoms, and functioning and reducing relapses and re-hospitalizations among people with schizophrenia in rural China (Xu et al., 2019; Cai et al., 2022). Similarly, two studies in rural India also found that using digital technology to train and support community health workers to deliver brief psychological treatment for depression was acceptable and feasible in low-resource settings (Muke et al., 2019; Maulik et al., 2018).

More specialized mental health interventions such as trauma-focused cognitive behavioral therapy (CBT) and addiction best practices have also shown promise in being delivered via lay counsellors. For example, an RCT in Kenya trained teachers and community health volunteers to provide trauma-focused CBT and used mobile technology to supervise care (Triplett et al., 2021). Another digital intervention piloted in India was periodically connecting counsellors from rural and underserved districts to multidisciplinary specialists through a smartphone app for virtual mentoring of mental health and addiction best practices (Mehrotra et al., 2018).

The successful implementation of mobile health applications for screening depression in patients was also noted in South Africa and Zambia (Lahti et al., 2020). Women with higher psychosocial vulnerabilities (such as those living with HIV) also indicated the usefulness of mHealth-based self-care interventions delivered by nurses in rural India (Chandra et al., 2018). Using digital platforms and mHealth interventions to train field-level health officers and community health workers in lay counseling was also deemed feasible for supporting perinatal mental health conditions in India (Lakshminarayanan et al., 2020; Ilozumba et al., 2018).

2.2.2 Child and Adolescent Mental Health

Much progress has been made in the development and implementation of DMHIs in LMICs, but there is still limited evidence to demonstrate the successful implementation and impact of DMHIs on children and young people (<18 age) in LMICs (Huang et al., 2019; Valimaki et al., 2017).

A recent review by Jones et al. (2022) found several DMHIs that targeted youth and adolescents in HICs, but only 3 out of 33 studies were from LMICs. One study evaluated the effectiveness of the Dorehye Amozeshie Dokhtaran (DAD) program on female students in Iran. The DAD program is a course informed by social cognitive theory that uses modules, videos, and animations to treat depression (Moeini et al., 2019).

In their analyses, the intervention group resulted in an improvement in depression within the first 12 weeks. A Kenyan study evaluated Shamiri-Digital, a single-session digital intervention for depression, anxiety, and well-being. Shamiri-Digital consists of empirically supported modules on growth, mindset, gratitude, and value affirmation, particularly in response to various challenges (Osborn et al., 2020). This was the first report of a brief, computerized single-session intervention that reduces depressive symptoms in adolescents in sub-Saharan Africa. Compared to the control, which was no intervention, Shamiri-Digital produced a greater reduction in adolescent depressive symptoms in both the full sample and a subsample of youths with moderate to severe depression symptoms from baseline to 2-week follow-up (Osborn et al., 2020). The effects exceed the mean effects reported in meta-analyses of full-length, face-to-face psychotherapy for youth depression. However, there were no significant effects on anxiety symptoms, well-being, or happiness (Osborn et al., 2020).

Lastly, a study piloted Smartteen, a computer-assisted CBT program that used interactive quizzes, vignettes, and diaries to reduce depressive symptoms in adolescents in India (Srivastava et al., 2020). Over 12 weeks, Smartteen was significantly more effective than the control in reducing depression symptoms, improving functioning, and treatment compliance (Srivastava et al., 2020).

Similarly, two studies in South America also implemented internet-based programs for the prevention and early intervention of depression in adolescents. “Cuida tu Ánimo” (Take Care of Your Mood) was piloted in Chile and Colombia to study the feasibility and acceptability of the program and evaluate its effects (Martínez et al., 2021). These studies showed moderate to high acceptance levels; however, adherence was lower than expected. The authors suggested that increasing the level of personalization could result in greater DMHI adherence and, therefore, greater benefit from the intervention (Martínez et al., 2021). Additionally, online focus groups (OFGs) via Microsoft Teams were developed for adolescents in Colombia during the COVID-19 pandemic. The study found that OFGs have great potential in research settings, especially during current and future public health emergencies. It is important to remember that even with the advantages of OFGs, technical issues (i.e., internet speed and access to technology) are significant obstacles in LMICs. Further research is required and should carefully consider the appropriateness of OFGs in different settings (Calvo-Valderrama et al., 2021).

Existing studies had difficulty drawing conclusions and extrapolating findings due to small sample sizes; therefore, the effects of DMHIs on youth are still being determined at this time, especially in children ten years of age and younger. Although it is too early to recommend e-health interventions for children, given the growing global access to

technology, there appears to be room for developing and evaluating acceptable and effective technology-based treatments to suit children and adolescents with chronic mental conditions.

2.2.3 Maternal Mental Health

Although effective interventions exist for common mental disorders that occur during pregnancy and postpartum, most cases in LMICs go untreated due to a lack of trained professionals (Green et al., 2020). A recent scoping review by Dosani et al. (2020) found several studies that demonstrated the potential of mobile phone applications to provide mental health services for postpartum depression in low-resource settings (Sun et al., 2019; Chan et al., 2019; Green et al., 2020; Jannati et al., 2020; Li et al., 2020; Zuccolo et al., 2021). For instance, one study in Kenya created the mHealth intervention Healthy Moms, which uses an AI system called Zuri to engage patients in conversation via text messaging (SMS). Either Zuri or the patient can start a conversation, but as a safety measure, conversations with patients needing additional support can be transferred to live counselors if required (Green et al., 2020). Other mobile apps combined psychoeducation, behavior monitoring, and gaming elements into their interventions or allowed mothers to ask questions that obstetricians answered via private, direct messages within the application (Chan et al., 2019; Zuccolo et al., 2021).

Additionally, a study in Nepal used passive sensing data generated from wearable digital devices to personalize care for mothers and distinguish which mothers might benefit from additional psychological services (Poudyal et al., 2019). Passive sensing does not require users' active input and encompasses smartphone accelerometers to detect activities such as walking, riding in a vehicle, and standing (Poudyal et al., 2019). Passive sensing data provides a window into individuals' experiences, behavior, and environments, all of which are important to understand mental health and mental illness (Poudyal et al., 2019). Moreover, a different study piloted a helpline phone service in India and found it feasible and acceptable for addressing mother-baby psychiatric cases. Mothers discharged from a maternity ward within 18 months were provided a helpline number where social workers answered the calls (Ragesh et al., 2020).

2.2.4 Depression and Anxiety

A few systematic reviews of DMHIs in LMIC environments found studies that demonstrated significant improvement in patients' depression and anxiety following online CBT, self-help and guided self-help interventions (GSH), and mental health mobile apps (Acharibasam et al., 2018; Fu et al., 2020).

Two studies evaluated the effects of Internet-delivered transdiagnostic cognitive behavioral therapy (iCBT) among college students with symptoms of major depression disorder (MDD) and general anxiety disorder (GAD) in two LMICs in Latin America (Colombia and Mexico). iCBT was found to be a low-cost and scalable intervention that can be delivered without additional strain on the already limited resources in LMICs (Benjet et al., 2022; Salamanca-Sanabria et al., 2020). Another study assessed the Chinese version of the My Trauma Recovery website, a guided self-help intervention for treating post-traumatic stress disorder (PTSD) symptoms in patients (Wang et al., 2013). Separate rural and urban participant groups were evaluated, and both samples showed a significant decrease in PTSD symptoms after the first 30 days; however, the rural sample showed less improvement than the urban sample (Wang et al., 2013).

A study conducted in Pakistan also investigated the feasibility of online culturally adapted CBT-based therapist-guided self-help for patients with anxiety and depression in Pakistan (Latif et al., 2021). A similar study in India found that internet and CBT-based unguided and guided self-help interventions reduced Generalized Anxiety Disorder (GAD) symptoms among college students with clinical and subthreshold GAD (Kanuri et al., 2015).

Lay counsellors and helpers have also supported DMHIs that focus on reducing symptoms of depression. For example, an Indonesian study evaluated an internet-based behavioral activation treatment paired with lay counselors to provide phone support and online feedback on assignments (Guided Act and Feel Indonesia) on its ability to treat MDD or persistent depressive disorder (Arjadi et al., 2018). The intervention was found to reduce symptoms of depression efficiently and could help to bridge the mental health gap in LMICs. GSH, such as the WHO-guided DMHI, Step-by-Step, in which a nonspecialist helper supported participants, was also found to be effective in reducing depression among Syrian refugees in Lebanon (Cuijpers et al., 2022; van 't Hof et al., 2021). Step-by-Step provides psychoeducation and training in therapeutic techniques such as stress management, identifying strengths, positive self-talk, increasing social support, and relapse prevention online. Step-by-Step has been designed to be adapted for use in numerous settings, cultural contexts, and resource availability (Carswell et al., 2018). Another study also tried to extend digital mental healthcare to refugees.

SMS-based methods to screen for depression risk among refugees in South Africa were compared against the face-to-face approach. However, they found no significant difference in preference rating between the two methods (Tomita et al., 2016).

Using an innovative conversational format, mental health self-help chatbots such as Vitalk have also been piloted in Brazil to reduce stress, anxiety, and depression in Portuguese speakers (Daley et al., 2020). Vitalk is a free automated chatbot hosted within an instant messenger platform and accessible from any internet-enabled device. Vitalk offered conversations about mental health and self-help strategies and demonstrated promising findings to improve well-being over 90 days (Daley et al., 2020). A study also piloted a Spanish Cognitive Behavioral VoiceThread app for Dominican primary care patients with depression (Caplan et al., 2018). For both studies, accessibility to mobile devices and the internet played a role in the feasibility and acceptability of the intervention.

2.2.5 Schizophrenia and Psychotic Disorder

A 2020 review found four additional studies in LMICs that pertained to severe mental health disorders (Merchant et al., 2020). All studies used text messages to facilitate medication adherence, improve clinic attendance and improve functioning in patients with schizophrenia or psychosis (Chen et al., 2007; Fang et al., 2011; Sibeko et al., 2017; Maiga et al., 2011). One notable outcome was from a pilot RCT by Sibeko et al. (2017). The text message intervention improved adherence to medication and clinic visits in mental health service users with schizophrenia, psychotic disorder, and bipolar mood disorder in South Africa. However, although efficacy outcomes favoured the intervention, they were not statistically significant. Moreover, the text message component of the intervention was found to be acceptable but not feasible in its current form due to cost in low-resource settings (Sibeko et al., 2017).

2.2.6 Suicide and Self-injury

Other DMHIs have been proposed as an adjunct to therapy to reduce non-suicidal and suicidal self-injury behaviors. For instance, a pilot RCT from Argentina evaluated the acceptability and effectiveness of CALMA, a free Spanish mobile-health application based on dialectical behavioral therapy skills (Rodante et al., 2020). Compared to the control group, self-injury behavior was reduced significantly more in the group that received CALMA. The authors claim CALMA may be especially useful in LMIC Latin American countries, but scaling up this intervention to include a larger study population is still necessary to confirm the results (Rodante et al., 2020).

2.2.7 Depression and Alcohol Use Disorder

Depression and alcohol use disorder are among the most common causes of death and disability. Therefore, healthcare systems are constantly seeking ways to use digital health applications to screen, evaluate, and treat these conditions.

In the South American country Suriname, ehealth.sr is a digital mental health website that offers preventive information, self-tests, and unguided digital self-help for depression, anxiety symptoms, and problematic alcohol use in patients (Jadnanansing et al., 2022). Promotion via social media led to more visitors to the website than newspaper or radio advertisements, and younger demographics visited the website more often. The study highlighted that the successful implementation of digital mental health websites relies on attracting and retaining the target audience of the intervention (Jadnanansing et al., 2022). Another study combined technology-enhanced screening with decision-support tablets to guide doctors in treating and diagnosing depression and alcohol use disorder. The intervention was feasible to implement and led to dramatically higher diagnoses of depression and alcohol use disorder in clinics in Colombia (Torrey et al., 2020). This intervention was applicable in urban and rural primary care settings.

2.2.8 Depression and HIV

Due to the stigma associated with HIV, people living with HIV are at a higher risk for mental health disorders (Guo et al., 2018). Mobile-based counselling represents a potentially novel and scalable platform for delivering interventions targeting individuals living with HIV in LMICs.

In a pilot study conducted in Kenya, a trained HIV counselor facilitated WhatsApp groups according to a structured curriculum to encourage positive support between members, introduce weekly group discussion topics, and answer participant questions (Chory et al., 2022). Additionally, the WhatsApp chat platform remained open outside the structured modules to allow for natural communication among participants, and the study counselor monitored these conversations. Participants reported positive experiences and indicated that the platform encouraged peer network development (Chory et al., 2022). A study in China also implemented a WeChat-based DMHI called Run4Love to address the need for depressive symptoms intervention for people living with HIV (Guo et al., 2018). Run4Love is a cognitive-behavioral stress management (CBSM) course delivered through the WeChat platform, and the results revealed significant reductions in depressive symptoms in the treatment group (Guo et al., 2018).

2.3 CHALLENGES OF DMHIS

The literature has identified several challenges associated with the use of DMHIs in low-resource settings, including cost and affordability, technical and infrastructure challenges, user trust and motivation, as well as 'pilotitis' and dependency on donor funding.

2.3.1 Cost and Affordability

Previous studies have reported that DMHIs could be most helpful for people who are poor, refugees, or living in remote and rural areas (Soron et al., 2020). However, the literature has also noted that the inability to purchase a suitable device, poor mobile network, and internet coverage, and financial crisis may be barriers to accessing DMHIs. For example, certain rural areas may lack internet access/network service, and certain DMHIs require an additional cost to subscribe to mental health-related apps. Additionally, if the mental health apps are from a context outside the LMIC, it also involves an elevated exchange cost. Furthermore, the cost of the internet and data for using digital mental health apps is a consistently reported barrier to DMHIs when an economic collapse is forcing vulnerable communities, such as those living below the poverty line, to prioritize food over mental healthcare (Stiles-Shields et al., 2017; Nwaogu et al., 2021).

2.3.2 Technical and Infrastructure Challenges

Other challenges and barriers to DMHIs in LMICs include technical difficulties and a lack of digital literacy among users (Boydell et al., 2014; Huckvale et al., 2015; Baumel et al., 2019), as well as institutional barriers. The literature has noted that technical difficulties may arise from a sudden failure in the functionality of mobile apps. Difficulties downloading and logging into mobile apps, disappearing apps (from the digital interface or dashboard), system freezing, and loss of power are significant factors that can affect the usability of digital interventions in managing mental health (Simblett et al., 2018). Other literature reviews highlight the lack of government support and funding, the reluctance of telecommunication providers to collaborate and invest in the health sector, and a lack of technical expertise by the healthcare providers as additional roadblocks to implementing DMHIs (Adiukwu et al., 2022; Kruse et al., 2019; Sarikhani et al., 2021).

2.3.3 User Trust and Motivation

Consumer concerns about confidentiality and effectiveness often go hand in hand with the level of education and lack of transparency, which can significantly influence

how consumers accept and interact with DMHIs (Schreiweis et al., 2019). A review also suggested that effectiveness concerns could be linked to a lack of experimental validation for many publicly available DMHIs (Bakker et al., 2016). Without the right motivation, trust, belief, and attitude of DMHIs' intended users, there can be no adoption or full-scale implementation of the intervention in a country's mental health services (Emmanuel, 2021).

2.3.4 'Pilotitis' and Dependency on Donor Funding

According to the literature, LMICs and Sub-Saharan Africa, in particular, still need to overcome several obstacles to delivering efficient and effective DMHIs. Some of these challenges are due to 'pilotitis,' a term coined to express the frustrations of DMHIs that fail to scale or survive beyond the pilot phase (Huang et al., 2017). Most of the funding for DMHIs are dependent on international donor financing (Mustapha et al., 2022). The success of pilot DMHIs are sometimes described from a technical standpoint rather than health outcomes and cost-effectiveness, which can lead to reporting bias (Mustapha et al., 2022). For example, certain implementing agencies fail to mention or consider the pro-bono support provided by their staff members, equipment donations from manufacturers, or cost subsidies by telecom companies (Mustapha et al., 2022). As the LMICs' infrastructure cannot support many pilot projects and the grants they require to operate, once those initial funds run out, the DMHI unfortunately ends. This 'pilotitis' has resulted in insufficient evidence of the sustainability and evaluation methodologies to measure DMHI effectiveness in LMICs, which is necessary to guide policymakers on decision-making and public health action (Franz-Vasdeki et al., 2015; Marcolino et al., 2018). Therefore, many scholars argue that more research is still required to analyze DMHIs in LMICs at a larger scale (O'Connor et al., 2020).

2.4 FACILITATORS OF DMHIS

The literature on DMHIs is often contradictory, as the very factors that could be barriers to the uptake of DMHIs are also facilitators at times. Nevertheless, DMHIs have been noted for their potential to improve access and efficiency to mental healthcare services in low-resource settings through the extensive reach of the internet, remote access, anonymity, and the diversity of formats and languages (Fairburn & Patel, 2017; Naslund et al., 2021). Furthermore, in areas where stigma and discrimination are severe, DMHIs also present a safe and confidential avenue for people to access mental health interventions (Semrau et al., 2015). Therefore, DMHIs can reach a greater proportion of the population and ensure the dissemination of large amounts of mental health services, support, and information (Okyere-Twum, 2021; Malhotra & Shah, 2018).

A 2020 scoping review also documented several advantages of DMHIs, including ubiquity, flexibility, and timely communication (Bergin et al., 2020). With the implementation of asynchronous and synchronous formats, more DMHIs now include on-demand 24/7 access for an unlimited number of patients, no scheduling of appointments, no travel costs to appointments, enhanced sense of privacy and avoidance of social stigma, and high fidelity to treatment (Bergin et al., 2020). As a result, DMHIs represent a cost-effective approach that overcomes geographical and practical barriers to engagement, allowing patients to receive clinical care faster (Ross et al., 2018).

2.5 DMHIS IN NIGERIA

Now that sub-Saharan Africa has the fastest-growing mobile networks and smartphone access, new DMHI efforts have been underway (Livingstone et al., 2017). As a result, more people on the continent can use their mobile devices to access healthcare advice. Studies in rural Africa have even shown that using mHealth technologies improves the perceived quality of care and increases adherence to health protocols (Osei et al., 2021). However, despite the recent growth in the use of DMHIs in African countries, the number of conducted and ongoing studies in Nigeria and Africa, more generally, is still low compared to HICs and other LMICs (Rojas et al., 2019). A systematic review conducted in August 2020 identified 37 studies on digital mental health interventions in LMICs (Carter et al., 2021). However, only three of the 37 studies were conducted in Africa, with two of these being in Nigeria. Another 2020 review found seven studies in LMICs for the management of severe mental health disorders, but only one was conducted in Nigeria (Merchant et al., 2020). The lack of funding and under-prioritization of mental health research in Nigeria has resulted in even less robust research evidence to accompany the growing number of DMHIs (Becker & Kleinman, 2013; Petersen et al., 2017). Therefore, more research is needed to document and understand the usage and types of DMHIs available in the Nigerian context.

One of the studies mentioned above was a pilot RCT from Nigeria that evaluated the effectiveness and acceptability of mobile telephone adherence support for depression management (Adewuya et al., 2019). Compared to the control group, the mobile telephone-supported Collaborative Stepped Care (mCSC) had a significantly higher recovery rate, a better quality of life, retention in treatment, was more cost-effective, and had a high level of acceptance amongst patients with moderate to severe depression (Adewuya et al., 2019). Mobile phone technology substantially aided the scale-up of mental health services in Lagos, Nigeria (Adewuya et al., 2019).

The other Nigerian study was a group RCT that evaluated the effectiveness of therapist-guided internet-assisted intervention (GIAI) on depression reduction among

educational technology students of Nigerian universities (Ofoegbu et al., 2020). Online modules with regular guidance from therapists via phone and the internet were implemented to manage depression (Ofoegbu et al., 2020). The authors concluded that GIAI significantly reduced depression among university students in the treatment group compared to those in the control group. Therefore, educational technologists, counselors, psychologists, health workers, and other social workers were recommended to adopt educational intervention using GIAI to help university students undergo depression reduction. However, while these studies confirmed the feasibility of DMHIs in Nigeria, the shortage of studies on effectiveness and cost-effectiveness makes it difficult to disseminate and scale up these interventions.

The last study evaluated the effect of short message service (SMS) reminders on clinic attendance among outpatients with psychosis at a psychiatric hospital in Nigeria. The analysis showed that receiving an SMS reminder independently reduced the risk of a missed next appointment by 50% compared to the control group (Thomas et al., 2017).

During the grey literature search of DMHIs in Nigeria, a few non-profit mental health initiatives were brought to light. For example, Mentally Aware Nigeria Initiative (MANI) is a mental health service consisting of volunteer counselors, psychiatrists, and medical officers that provides immediate intervention and mental health first aid to Nigerians through a free suicide/distress hotline (Adepoju, 2020). MANI also harnesses the power of social media (e.g., Twitter and WhatsApp) to educate the public about mental health issues and refer callers for specialized care if necessary.

Another non-profit organization mentioned was PsyndUp, a platform that assists Nigerians with accessing proper mental healthcare. PsyndUp operates a free online database and directory service to connect the public to mental health professionals within their proximity (Mental Health Innovation Network, 2022). The platform also aims to create an online community of mental health ambassadors for increasing awareness and reducing mental health stigma in Nigeria (Mental Health Innovation Network, 2022).

A few news articles have also mentioned the mental health-focused platform “She Writes Woman.” In 2016, She Writes Woman established a 24/7 helpline powered by a team of in-house and volunteer psychiatrists and counselors. The helpline provides access to psychiatric help, counselling, community, and information about mental health issues for both genders. Since the pandemic, the helpline has experienced 60% more calls, and most inquiries now focus on coping with uncertainty, fear, and anxiety. However, none of the initiatives identified through grey literature have been evaluated.

According to recent news reports, Nigerians are opening up to telemedicine for mental health. They are joining the rest of the world using social messaging tools such as WhatsApp to provide telemedicine services. However, most DMHI research in Nigeria still comes from grey literature sources, and the few studies conducted in Nigeria were pilot studies. This indicates the need for well-funded research and publications within this field that will result in permanent and growing support for DMHI services. The implications of having primarily pilot studies indicate a need for larger, nationally scaled approaches for DMHI research to understand how this technology can be best used and applied in developing countries.

CHAPTER 3: STUDY DESIGN & METHODOLOGY

The following section will explain and justify the study design and methodology used to answer the research questions. The methods used to ensure the study's trustworthiness and rigor as well as ethics approval will also follow.

3.1 STUDY DESIGN

A qualitative research design using a single case study-based approach was employed. According to Yin (2003), a case study design is used when 1) the focus of the study is to answer “how” and “why” questions; 2) the behaviour of those involved in the study cannot be manipulated; 3) contextual conditions should be taken into consideration because they are relevant to the phenomenon under study; or 4) the boundaries are not clear between the phenomenon and context. Yin also further categorized case studies as explanatory, exploratory, or descriptive. An exploratory case study is used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes; therefore, an exploratory single case study in the Nigerian context was chosen for this study (Yin, 2003). The single case study approach offered insights into the advantages and disadvantages of different types of DMHIs in the Nigerian context and the lessons learned from implementing these DMHIs. Another strength of case study research is the usage of multiple data sources to enhance data credibility (Patton, 1990; Yin, 2003). This study used data sources such as news articles, websites, research papers, and interviews. Data from these multiple sources were then converged in the data analysis process, where each piece contributed to the researcher’s understanding of the whole phenomenon. This approach adds strength and rigor to the study findings as the various data sources merged to promote a greater understanding of the case (Stake, 1995; Crowe et al., 2011).

3.2 STUDY POPULATION

The study population of interest were individuals who play a prominent role in the fields of DMHIs and global mental health. Respondents included clinical and research experts (such as psychologists, psychiatrists, general physicians, academic researchers, social workers, occupational therapists), digital health experts, community leaders, and people who work for or have used or heard of DMHIs in Nigeria. Respondents were identified based on diversity of expertise and affiliations, years of work experience, and recent publications in the fields of digital mental health and global mental health. Inclusion criteria included individuals over 18 with a role in the global mental health field or who have been a part of a mental health organization’s mission, strategy, goals, and activities for a minimum of a year.

3.3 SAMPLING & RECRUITMENT

A purposive sampling method was used to recruit study respondents (Mays & Pope, 1995). Relevant research studies and reference lists, reports, guidelines, and websites of national and local organizations and non-governmental organizations (NGOs) were searched. Respondents were identified based on diversity of expertise and affiliations, years of work experience, and recent publications in the fields of digital mental health and global mental health. Snowball sampling (where enrolled research respondents help recruit future subjects for a study) was also done to increase the sample size (Goodman, 1961).

All respondents were contacted by phone or email by the primary researcher (TC). The invitation to participate in the study contained the study's background and purpose (Appendix). After obtaining consent, respondents were asked to participate in a 30-minute semi-structured interview conducted over Zoom.

3.4 DATA COLLECTION

The primary researcher (TC) developed the interview guide with the guidance of Dr. Archer, who has experience conducting digital health research in African countries. To better understand how the interview guide questions will be understood in the local Nigerian context, Patricia Ogba, a Ph.D. student conducting research in Nigeria, provided insight and feedback. The interview questions focused on the types of DMHIs available, the advantages and disadvantages of such DMHIs, lessons learned from these digital approaches, and future research directions in this field (Appendix). The semi-structured interviews also allowed interviewees to elaborate on particular areas which they regarded as important. Interviews were audio-recorded and transcribed using Zoom, and thematic analysis was conducted using Dedoose. Data collection continued until sufficiency was reached (Malterud et al., 2016). Recognizing that sufficiency depends on both the rigor of the analytical process and the richness of the data it generates, sufficiency was defined using information power, the same concept that was used to justify sample size in this study. To determine whether case study findings were sufficient, the data collected were examined alongside the aims of the study, the specificity of the sample, the use of theory, the strategy for analysis, and the quality of the interviews (Malterud et al., 2016; LaDonna et al., 2021).

During the data analysis process, the data and themes generated were related back to the study aims and research question to ensure the sufficiency of the findings. In terms of the specificity of the sample, purposive sampling was conducted in conjunction with data collection and analysis to determine a sufficient sample size. TC identified a priori an initial analysis sample, which was used for the first round of analysis. A comparative

method for theme sufficiency (CoMeTS) was also used. This method compared the findings of each new interview with those that have already been developed, and if it did not yield any new themes in relation to the research questions, it is assumed sufficiency has been established (Constantinou et al., 2017). Lastly, for the quality of the interviews, data collection for each participant was very detailed and thorough since Morse (2000) states that the more usable data collected from each participant, the fewer participants are needed. Moreover, open-ended questions were utilized for this study because empirical research has shown that open-ended questions during qualitative interviews tend to produce richer data (Ogden & Cornwell, 2010).

Twenty semi-structured interviews were conducted virtually by TC between June and August 2022. Before each interview, respondents were reminded of the purpose of the study and the potential risks and expectations. Respondents were also reminded that they could refrain from answering any questions or withdraw from the study at any time. Interviews were recorded and transcribed semi-verbatim with respondents' consent. Written and verbal consent was obtained and recorded before each Zoom interview. The respondents who agreed to be interviewed represented a variety of professional disciplines and healthcare organizations. The study sample consisted of three mental health researchers, two public health pharmacists, three social workers, one public health physician, three psychiatrists, two clinical psychologists, one counsellor, one occupational therapist, one policy maker/lawyer, and three digital health specialists.

3.5 SAMPLE SIZE

A qualitative research design using a case study-based approach was employed. For this study, Malterud's model of information power in qualitative interview studies was used to guide an adequate sample size (see Figure 2). Information power indicates that the more relevant information the sample holds, the fewer study respondents are needed (Malterud et al., 2016). According to the Malterud framework model, considerations about the study aim, sample specificity, theoretical background, quality of dialogue, and strategy for analysis should determine whether sufficient information power will be obtained (Malterud et al., 2016). Whether the study aim is broad or narrow determines how large the sample size needs to be. To offer sufficient information power, a narrower study aim would not need as large of a sample size compared to a broad study aim because the phenomenon under study is less comprehensive. Since the study aims for this thesis were narrow, a smaller sample size would suffice. In regard to specificity, a sample population with a denser specificity of experiences and knowledge coincides with a higher information power (Malterud et al., 2016). Hence, the purposive sampling method used for this study was done to allow for a denser specificity and higher information power. In terms of established theories, a study that applies specific theories

in the methodology and data analysis corresponds to higher information power. Due to the recency of DMHIs in LMICs, few DMHIs have been documented to be informed by theory (Naslund et al., 2017). Therefore a larger sample size may be required to compensate for the lower information power. In regards to the quality of the interview dialogue, a study with strong and clear communication between the researcher and participants requires fewer participants to ensure sufficient information power compared to a study with ambiguous or unfocused dialogues (Malterud et al., 2016). Therefore, for this thesis, an interview guide created under the guidance of mentors with experience conducting digital health research in Nigeria helped to better understand how the interview guide questions will be understood in the local context and improve overall strength and clarity of dialogue during interviews (Appendix). For this study, the quality of the dialogue was considered high due to participants providing in-depth and well thought out responses to the interview questions. In terms of analysis strategy, information power is related to the strategy chosen for data analysis. A study that uses in-depth analysis of interview responses requires fewer participants to ensure sufficient information power compared to a study with a more surface level approach (Malterud et al., 2016). Therefore, Braun and Clarke's (2006) phases of thematic analysis, which is an in-depth analysis, were used for this thesis.

This study combined all participant responses to form one Nigerian case study. A preliminary sample size of 20 respondents was decided upon. After the first three interviews, the data was reviewed, and suggestions for changes and modifications were made. The data collection process was more efficient by initial and consecutive assessment of information power. Information power influences the potential of the available empirical data to provide access to new knowledge using analysis and theoretical interpretations (Cohen & Crabtree, 2008; Kvale, 1996). Therefore, sample adequacy, data quality, and variability of relevant events are often more important than the number of respondents in research and therefore prioritized in this study (Kuzel, 1999; Marshall, 1996).

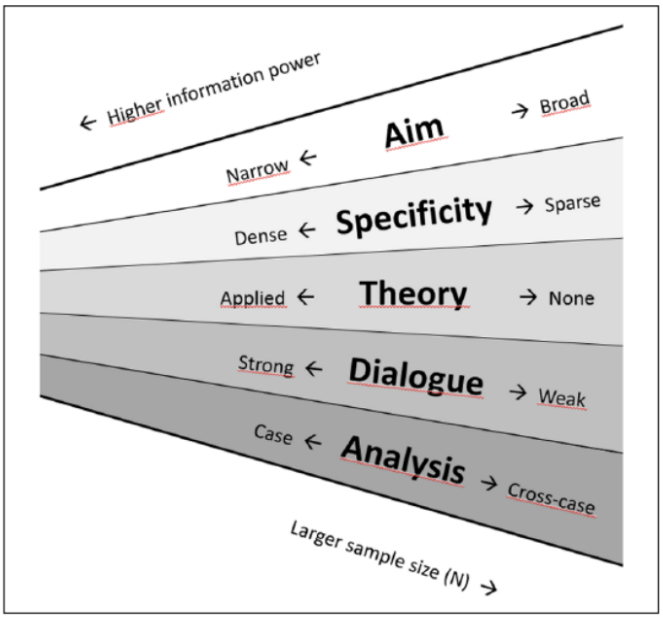

Figure 2: Information Power in Qualitative Interview Studies—The Model
Note. Adapted from "Sample Size in Qualitative Interview Studies", by Malterud, K., (2016). Retrieved from https://doi:10.1177/1049732315617444

3.6 DATA ANALYSIS

Thematic analysis was conducted using Dedoose. Dedoose is a qualitative data analysis software that organizes, analyzes, and synthesizes qualitative information. Data was managed using Dedoose and analyzed using thematic analysis with an inductive approach (Braun & Clarke, 2006) (Table 2). An inductive thematic analysis is data-driven, meaning no pre-existing coding scheme was used; codes were developed directly from the data (Patton, 1990).

Following the phases of thematic analysis by Braun and Clarke (2006), during Phase 1: Familiarization, the primary investigator (TC) reviewed to become familiarized with the data by listening to the audio recordings of the interviews. The interviews were first transcribed automatically through Zoom and checked for accuracy by the primary investigator. For this research paper, a single coder approach was used, in which the first author iteratively identified codes from the data and refined themes throughout the analysis. Following transcription, the data collected were repeatedly and actively read to search for meanings and patterns. The entire data set was read thoroughly three times beforehand to help identify initial ideas, following Phase 2: Generating Initial Codes. During this phase, the primary researcher also took notes and marked ideas for coding, which were revisited in subsequent phases (Figure 3). Next, the primary researcher systematically coded interesting features across the entire data set and collated data

relevant to each code (Figure 4). The coding phase sets out the recurring and common themes within the study and labels them via highlighted color coding. After generating the initial codes, the codes were combined into potential themes (Phase 3: Searching for themes) and checked for themes that were relevant to the entire data set (Phase 4: Reviewing themes) (Figure 5). After this step, a thematic map of the analysis was generated, and continuous refinement of the definition and names of the themes was performed (Phase 5: Defining and naming themes). Coding was continuously developed and defined throughout the entire analysis. Lastly, a final analysis of the data extracted was conducted to relate it back to the research question and literature.

Table 2: Braun and Clarke Thematic Analysis

Phase	Description	Result
1: Familiarizing with the data	Transcription of data, reading/re-reading data, noting down initial ideas	Preliminary codes
2: Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire dataset, collating data relevant to each potential theme	Comprehensive codes
3: Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme	Candidate themes
4: Reviewing themes	Checking if themes work in relation to the coded extracts (level 1) and the entire dataset (level 3), generating a thematic map of the analysis	Coherent recognition of themes
5: Defining and naming themes	Ongoing analysis to refine the specifics of each theme and the overall analysis, generating clear definitions and theme names	Theme analysis/contribution of data
6: Interpretation and Reporting	Final opportunity for analysis. Selection of compelling extract examples, final analysis relating back to the research question and literature	Description/reporting of results

Note. Adapted from "Using thematic analysis in psychology.", by Braun, V., & Clarke, V. (2006). Retrieved from https://doi.org/10.1191/1478088706qp063oa

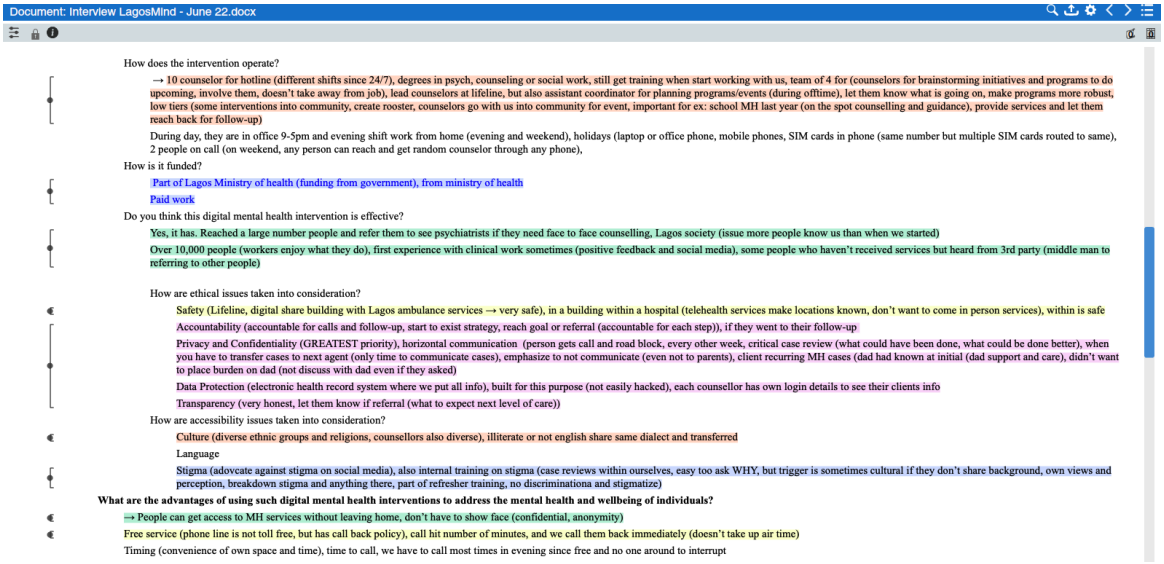

Figure 3: Phase 2: Generating initial code via color coded highlighting using Dedoose.

Media	Accessibility consideration	Cultural Adaptation +Local	Hearing impairment	Languages covered	Race	Advantage	24/7 for emergency reaching out	Anything is better than nothing	Asynchronous	Cost effective	Free service, call back for tolls	Helpful to have options + connect	Languages spoken	Less anxiety, not overwhelmed,	MH Stigma	Anonimity + confidentiality	Nigerian therapist better than	No travel (volunteers and	Transparency on social media	Wherever in country	DMHI Define	AI + Mobile Apps and social	DMHI KNOWN	Asido Foundation	Digital apps for depression	Empathy Space	Google App	Happify International	Jela Development Initiative	Kira app + Support groups	LaFiya Telehealth	Love, Peace and Mental Health	MANI
Interview Yusuf Hassan Wada -															1							1										1	1
Interview SURPIN - June 25.docx				1									1					1		1		1				1							
Interview Stephanie Urigwe - June								1				1			1					1	1												
Interview SOBCA - June 13.docx					1					1				1	1	1						1											
Interview Questions John Enoh	1		1					1				1				1															1		
Interview Prince Ekoh - June							1						1			1		1															
Interview Obinna Emmanuel - June												1			1												1	1		1			
Interview Oasis of Love - June				1						1		1	1		1			1			1												
Interview MANI - June 7th.docx				1						1						1																1	
Interview LagosMind - June 22.docx				1	1						1				1			1			1											1	
Interview Julian Eaton - June		1		1														1			1				1							1	
Interview Gift Kenneth - June		1		1						1		1			1		1		1	1	1				1							1	
Interview Frances Adiukwu - June				1			1						1					1			1			1								1	
Interview Dr. Lola Kola - June				1								1	1							1					1								
Interview Dr. Khalid Mohammed -		1		1											1						1											
Interview Dr. Janet Nwaogu - June							1			1			1		1			1			1												
Interview Dr. Ifeanyi Nsofor - June		1	1	1								1									1								1			1	

Figure 4: Phase 3: Searching for common themes via Coding Presence and Frequency from interviews

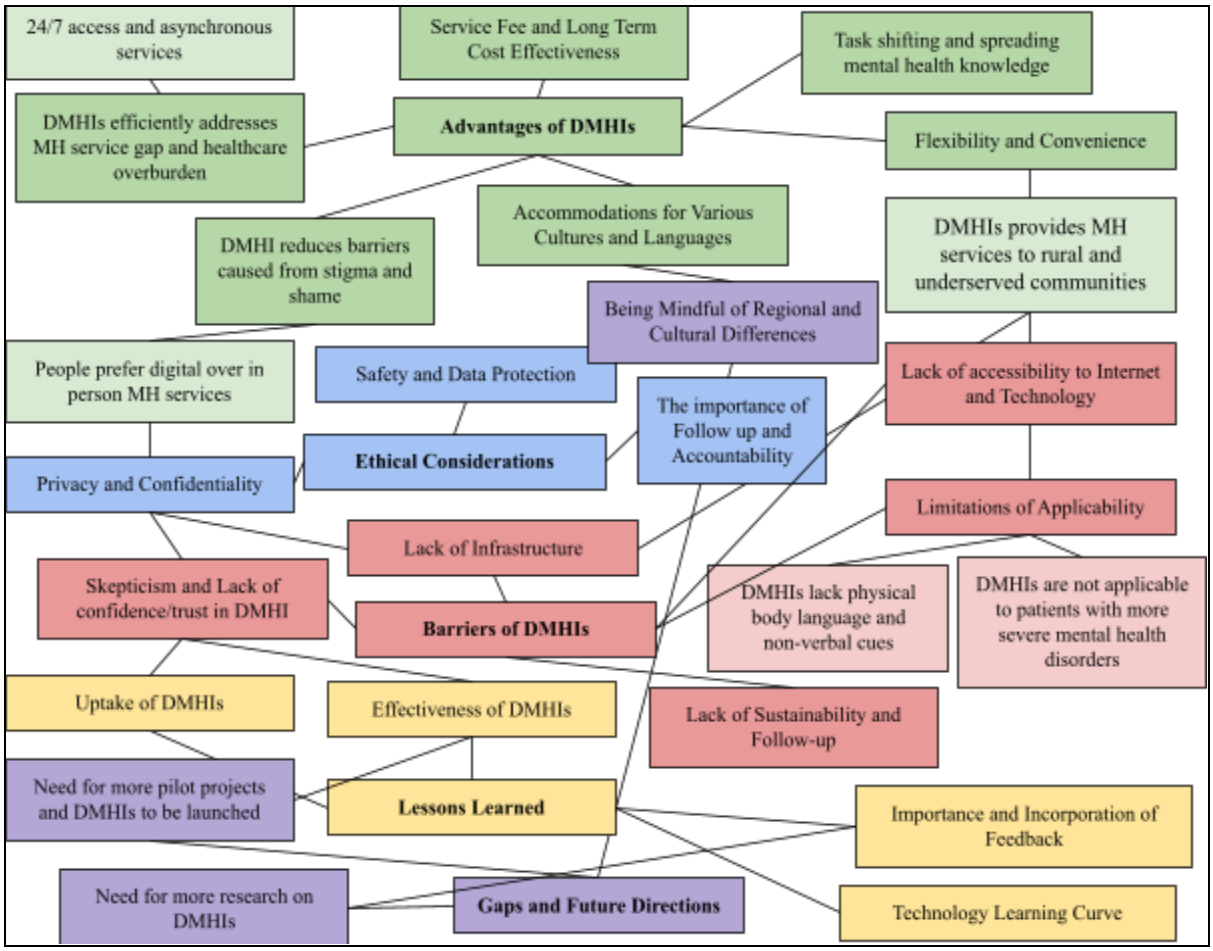

Figure 5: Phase 4: Reviewing themes and thematic mapping

3.7 TRUSTWORTHINESS AND RIGOR

To ensure the study's rigour, Lincoln and Guba's (1985) framework for ensuring the trustworthiness of data in qualitative research was also applied (Table 3). They refined the concept of trustworthiness by introducing the criteria of credibility, transferability, dependability, and confirmability. According to Tobin & Begley (2004), credibility addresses the "fit" between respondents' views and the researcher's representation of them. To address credibility, Lincoln and Guba's framework (1985) suggested several techniques, including prolonged engagement, persistent observation, data collection triangulation, and researcher triangulation. For this study, data source triangulation, which involves the collection of data from different types of people and different sources of data, was done to gain multiple perspectives. Transferability is defined as the degree to which the results can be generalized or transferred to other contexts or settings (Tobin & Begley, 2004). To address transferability, a thorough description of the research context and the assumptions central to the research was performed. This allows other researchers to judge whether these research findings can

transfer to other contexts. Dependability involves the repeatable potential of the study findings if the study was performed within the same cohort of respondents, coders, and context again (Tobin & Begley, 2004). To achieve dependability, the research process documentation was logical, traceable, and clear. Lastly, confirmability is concerned with the study's findings being derived from the data and requires the researcher to justify how conclusions were reached (Tobin & Begley, 2004). According to Guba and Lincoln (1985), confirmability is established when credibility, transferability, and dependability are all achieved. To further ensure confirmability is reached, the recommendation by Koch (1994) was applied, which involves providing the reasoning behind theoretical, methodological, and analytical choices made throughout the study.

Table 3: Lincoln and Guba's quality criteria

Lincoln and Guba's quality criteria	Meaning	Analog in Quantitative Research
Credibility	Confidence in the truth of the data and interpretation of them	Internal validity
Dependability	Stability of data overtime and conditions	Reliability
Confirmability	Potential for congruence between two or more independent people about the data's accuracy, relevance, or meaning	Objectivity
Transferability	Extent to which findings can be transferred or to have applicability in other settings or groups	External validity
Authenticity	Extent to which researchers fairly and faithfully show a range of realities	-

Note. Adapted from "Naturalistic Inquiry.", by Lincoln, Y. & Guba, E. (1985).

As a qualitative researcher, it is also important to acknowledge my role in the research process. My prior experiences, assumptions, and beliefs influence the research process, and acknowledging this "researcher reflexivity" is important in establishing rigour in qualitative research (Watt, 2007). How we understand the world influences the types of questions we ask and our research strategies. This is especially true in global health research, as we often have to work across disciplinary boundaries and develop new

approaches to tackle the many barriers to conducting equitable research. My volunteer work as a crisis responder with Kids Help Phone's Crisis Text Line and as a Safety and Wellbeing Responder with the Canadian Red Cross Society influenced my research and interest in pursuing this research topic.

Therefore, while conducting interviews I aimed to create safe space for respondents to share their own opinions and perspectives without imposing my own. During the data analysis section, I also tried to ensure that the findings were an authentic representation of the data collected. I acknowledged the importance and barriers associated with beneficial social relations and authentic partnering in global health research. Authentic partnering involves equitable research relationships, processes, and outcomes and creates and maintains a strong foundation of trust (Cleaver et al., 2016). In my case, the greatest challenge I encountered with respect to authentic partnering was with research participants. It should be acknowledged that during my research methodology development, I had no pre-existing partnership with the research populations I hoped to recruit. Therefore, the methodology, research questions, and study design had to be created beforehand for research ethics board approval. I did consult a Ph.D. student also researching a similar study population; however, having the methodology already set in place beforehand still eliminates the possibility of directly collaborating with the study participants to gain their insight into the best practices and approaches.

3.7 ETHICS

The study (Project Number: 14941) has been reviewed and approved by the Hamilton Integrated Research Ethics Board (HiREB) in Hamilton, Ontario, Canada (Appendix). All respondents were provided with written consent forms to read and sign after being given an introduction and brief overview of the project by the primary researcher.

CHAPTER 4: RESULTS

This chapter describes key themes that were developed from the 20 interviews conducted discussing respondents' opinions and experience with DMHIs in Nigeria. First the findings will focus on what DMHIs have been developed in Nigeria to address mental health and wellbeing, followed by advantages and disadvantages of using such DMHIs, and lessons learned regarding DMHIs that can potentially be applied to other contexts.

4.1 RESPONDENT DEMOGRAPHICS

The twenty respondents who agreed to be interviewed represented a variety of professional disciplines and healthcare organizations. The study sample consisted of three mental health researchers, two public health pharmacists, three social workers, one public health physician, three psychiatrists, two clinical psychologists, one counsellor, one occupational therapist, one policy maker/lawyer, and three digital health specialists.

4.2 FINDINGS

Each interview began with a discussion of what defined mental health and what was considered DMHIs. All respondents viewed mental health as a combination of social, mental, and physical wellbeing and involved one's ability to cope and adapt to social and environmental stressors. Several interviewees also emphasized that mental health was not simply the absence of negative emotions or mental health disorders; mental health also encompassed one's sense of fulfillment and satisfaction in life and one's ability to contribute to society. Most respondents directly referenced the WHO definition of mental health, which is "a state of wellbeing in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to contribute to his or her community" (WHO, 2022).

The definitions provided for the term DMHIs were also consistent and similar among respondents. Most respondents defined DMHIs as any digital intervention or technology used for providing mental health services, support, interventions, or treatments. When asked to elaborate on specific examples of DMHIs, respondents suggested telehealth, apps that provide assessment and counselling, crisis helplines, artificial intelligence, and interventions accessible through the internet and digital technology (e.g., phone, tablets, computers).

4.3 DMHIs AVAILABLE IN NIGERIA

Understanding the DMHIs currently available in Nigeria was a central component of this research study. Within this section of the findings, the following will be described: how DMHIs operate and are understood, who are the target audience and how they are reaching out to them, and how DMHIs are funded.

4.3.1 How DMHIs operate and are Understood

Many respondents were only aware of private and non-governmental organizations (NGOs) that provide DMHIs in Nigeria. All of the DMHIs discussed in this section fall under individual digital support, such as virtual counselling, phone helplines, and text services to help diagnose mental health problems and provide support and advice through digital applications. A few DMHIs also incorporate aspects of reflection and self-care, and group-based digital support but only in addition to individual digital support.

The most frequently mentioned DMHI among respondents was Mentally Aware Nigerian Initiative (MANI), which was familiar to clinical psychologists, psychiatrists, public health physicians, mental health researchers, social workers, and AI engineers. MANI was described as "promoting mental health awareness and providing access to volunteers and psychologists [to those] who needed someone to speak to" by one of the social workers interviewed. Additionally, a clinical psychologist affiliated with MANI elaborated on how MANI provides psychological first aid through virtual mental health services and a 24/7 suicide hotline. MANI was recognized by many respondents as the largest provider of digital crisis support services in Nigeria.

SheWritesWomen's was also familiar among physicians, pharmacists, and policymakers, as well as MANI affiliates. As described by one of the public health physicians, SheWritesWomen's 24/7 helpline "helps to alleviate and aid mental health in terms of the healing process." Like MANI, this private helpline consists of a team of volunteer psychiatrists and counselors to provide free counselling, psychiatric help, and emergency interventions over the phone. As mentioned by one of the pharmacists, SheWritesWomen focuses on "advocating against sexual violence and supporting mental health across groups, schools, and organizations so other mental health resources such as mental health education for both genders are also accessible through the helpline."

PsyndUp was also brought up by one of the clinical psychologists for its ability to "connect mental health professionals to people who need services…by registering consumers and mental health professionals on an app and website and linking them."

PsyndUp was described as a "find a therapist platform," enabling users to find mental health support close to where they reside. According to one of the clinical psychologists, "PsyndUp has over 200 people registered on it, and it often holds discussion sessions with clinical psychologists." However, some concerns regarding whether this DMHI is still active were also brought up by the same clinical psychologist, as their website has gone down despite the heavy promotion being done beforehand.

Another popular NGO mentioned by respondents that offers DMHIs is the Suicide Research and Prevention Initiative (SURPIN), a suicide prevention initiative launched by Lagos University Teaching Hospital to conduct mental health research, provide education, crisis intervention, and mental health treatment. SURPIN was familiar to several psychiatrists, social workers and other DMHIs. One social worker affiliated with the DMHI described SURPIN as:

> "primarily a suicide hotline but also provides online and in-person training. Suicide is viewed as taboo in Nigeria, and we need to get people to understand that is not the case. We train religious leaders and traditional healers as well as journalist for responsible reporting regarding suicide. Since the age bracket with highest stats for death suicide are youths and teens, we also talk to teachers and students to make them aware of the existence of hotlines and also talk to school boards for early detection and making sure they are informed and equipped to deal with mental health crisis."

According to one of the clinical psychologists, "SURPIN was initially created to fill in a service gap in the country (target age 15-50), but the suicide hotline accepts everyone since they operate as a diverse healthcare team that can target anything." As stated by the same social worker above, the 24/7 suicide hotline is "operated on a volunteer basis, and if any caller requires a referral, we will partner and link them within a 48-hour window. We also make sure they have contacted the target people, to protect confidentiality and ensure proper follow-up." Since the initial launch in 2017, SURPIN has now spread to over 40 health institutions across 28 states in Nigeria.

LaFiya Telehealth, a mobile health startup was also referenced by a digital health specialist in Nigeria. LaFiya Telehealth aims to provide affordable healthcare access to the uninsured and underserved individuals. Since LaFiya Telehealth operates internationally in the US and in Nigeria, there are no specific visitation hours and services are accessible 24/7 and 365 days a year. It connects board-certified doctors, patients, hospitals, laboratories, pharmacies, and insurance companies in one integrated telehealth and AI platform so even patients living in remote and rural areas can access healthcare easily. As described by the digital health specialists:

> "LaFiya Telehealth uses HD video, voice calls or chats via smartphones, computers and AI-powered medical kiosks to provide mental health services, online prescription, tele-diagnosis and referral when needed. It can also uniquely collect, transmit and store medical information about the patient's physiological parameters and vital signs."

LaFiya Telehealth can be downloaded from the iTunes store and Google Play Store (accessible using any device with an internet connection) and their solar and satellite broadband powered community telehealthcare kiosks doubles as an "entrepreneurship program and employment opportunity to rural communities to reduce poverty, stimulate the economy, improve healthcare outcomes, and facilitate health education."

LaFifya Telehealth acknowledges that the digital infrastructure for DMHIs may not be available in certain rural regions of Nigeria, and therefore takes it upon itself to invest and establish the broadband and telecommunications requirements for DMHIs.

A few of the healthcare providers also shared that they were invited in the past to offer digital mental health services to patients and family who need it. One of those DMHIs mentioned was called Mental Health +. According to the psychiatrist that provided their services through the DMHI:

> "Mental Health + is a software/platform where they enroll professionals and experts in designated fields (in this case mental health) to build a repertoire of staff with various skills. If a patient requires a service, the platform connects them to the appropriate service provider for an online consultation and lets them know how much to pay for services."

The same psychiatrist commented that:

> "Most people who use these services are people who are living abroad and have relations back home in Nigeria that need mental health care, and this virtual mental health intervention can be used when individuals are not able to support and take family members to the hospital in person."

The only publicly funded DMHI mentioned throughout the interviews was Lagos Mental Health in Development (Lagos MiND). Lagos MiND is funded by Lagos State Ministry of Health, as an initiative committed to adhering to international best practices in delivering mental health care and serving as a focal point for policy and program

development. The digital aspect of Lagos MiND is their 24/7 hotline provided to residents in the Lagos Space. As described by a social worker affiliated with Lagos MiND:

> "10 counselors with training in psychology, counselling, or social work, work daytime shifts in the office and then evening and weekend shift work from home. The helpline operates through multiple office mobile phones using the same number but multiple SIM cards. 2 counselors are always on call at any time to provide shorter wait times. Since the initiative provides mental health care to residents in the Lagos area only, others who do not fit these criteria are referred to more nationally scaled interventions such as MANI and SURPIN."

EmpathySpace, a Lagos-based virtual mental health service delivery platform and consulting service was also mentioned by one of the social workers. According to their website, EmpathySpace has been operating since 2018 and managed by private mental health practitioners. It provides online therapy, online support groups, mental health information, treatment services as well as consults. Like Mental Health +, clients can select specific mental health care professionals depending on their needs. As described by the social worker, "it focuses on counselling, public speaking, psychotherapy, marital therapy, cognitive behavioral therapy, and addiction treatment."

One of the respondents, a Data Protection Advisor and Legal Practitioner, also mentioned Truthshare, an online Nigerian mental health application that started in 2019 to address depression, mental illness, and suicide in the country. According to the Data Protection Advisor, the application utilizes the internet to provide a safe place where people can express themselves anonymously and get access to certified counselors for therapy and mental health treatment." Unlike Mental Health + and Empathy Space, Truthshare relies on paid counselors as well as volunteer counselors. Volunteer counsellors do not require a practicing license or certification but must go through their listening course and webform to join the team.

Another Nigerian DMHI startup that was mentioned by a digital health expert was Nguvu Health. Nguvu Health is an on-demand teletherapy app available on both Android and IOS that provides affordable therapy using the platform's chat and video features. As described by one of the digital health specialists, who also uses Nguvu Health themselves, "you get matched with licensed therapists (clinical psychologists) which you can communicate via text, audio and video (as in instant messaging) and also schedule live video therapy sessions (in-app video calls)."

When asked about their experience and impression, the respondent recommended the app because "you can tell the app is run by a psychologist himself and Nguvu provides the same services accessed in-person therapy, such as assessment, diagnosis, management, and follow-up but more convenient."

Other DMHIs, mentioned by individual participants, included the Sanctuary provided by the Nigerian well-being centre, Neem Foundation and the mental health app, Kira App, founded by a Nigerian teenager. These DMHIs offered a variety of services, including confidential mental first aid 24 hours on weekdays through a telephone support line, psychotherapy, and a safe confidential space for people of all ages and backgrounds to access psychosocial support. The purpose of these DMHIs is to make it easier for people to talk about their problems without feeling embarrassed.

These Nigeria-based DMHIs are also complemented by continent-level initiatives, including those conducted in collaboration with other countries and regions. Happify was noted to be one of the most commonly used DMHI apps in Nigeria by another one of the public health researchers. According to their website, Happify is a global mental health and wellness app that combines evidence-based approaches from CBT, mindfulness and the game industry to support the mental health of individuals, organizations, and populations. The app provides month-long programs that guide members through goal-based journeys, some of their most popular programs focus on conquering negative thoughts, and building mindfulness through meditation. Happify is available in 10 languages and over 100 countries around the world and emphasizes using culturally appropriate mental health approaches.

4.3.2 Target Audience of DMHIs

Most interview respondents acknowledged that a popular target audience of DMHIs in Nigeria were youth and adolescents. MANI, the most commonly mentioned DMHI for instance, is a youth-run and youth-focused mental health organization. According to their website, over 80% of cases were between the ages of 10 and 25. Similarly, Nguvu Health, according to one of the digital health specialists who was interviewed, "also seems to target youth and young adults (Millennial and Gen Z mostly), but it also goes beyond that." Additionally, the DMHI Truthshare's website states that the target age and demographics are also primarily students and young adults but is open to all.

Answers among respondents were very similar for this section of the interview. Most respondents believe that young Nigerians are more open to therapy, comfortable with technology and overall easier to target compared to older generations. As described by one of the mental health researchers, "a majority of DMHIs in Nigeria are focused on

youths, since millennials are more tech savvy using online interventions…older populations may not be as effective, and it would be harder to engage those users." Another global mental health researcher elaborated that "if you look at statistics of use of information technology…it is really high in Nigeria in terms of social media. This is because young people are internet savvy and more open to digital health." A digital health specialist also commented that "DMHIs have a tendency to unconsciously attract young people as [their] audience since university students and younger people in general are more attuned to and attracted to digital solutions." Another clinical psychologist agrees with these perspectives but also emphasized that DMHIs in Nigeria also target other vulnerable populations as well. "DMHIs more so target women and children, also youths and teens, and anyone vulnerable who suffer abuse and domestic violence."

Additionally, respondents found that the majority of DMHIs in Nigeria broadly focus on all mental conditions, but primarily depression, anxiety and suicide. SURPIN for example focuses more on suicide prevention, whereas MANI is for any mental health condition. Correspondingly, one of the social workers stated that "the target of DMHIs were largely depression, suicide cases and attempts, and sometimes anxiety."

One of the psychiatrists further elaborates that "DMHIs tend to target common mental health conditions such as depression and anxiety rather than more serious conditions such as schizophrenia since self-help is involved in DMHIs and it needs personal engagement to work." A public health physician also believed that broad and general target audiences for DMHIs in Nigeria has a beneficial purpose as well. "People using DMHIs sometimes don't even know what they have, just like many doctor appointments, when you don't often go for check-ups, you don't know what is wrong with you." Therefore, being inclusive and broad in terms of mental health conditions for DMHIs, allow for more recruitment and utilization of DMHIs.

On the other hand, certain DMHIs in Nigeria target their interventions based on geographic location. According to an executive from LaFiya Telehealth, LaFiya Telehealth targets "rural communities that live far from cities where clinics and physicians are more prevalent. If there are issues regarding lack of power, LaFiya Telehealth will bring power to the community." The DMHI is not meant to replace a primary care doctor or make consultations in life-threatening emergencies. LaFiya Telehealth targets cases that are common non-emergency medical conditions that one would visit a doctor's office, urgent care clinic, or emergency room to treat. Similarly, LagosLifeline only caters towards residents in Lagos Space.

4.3.3 Reaching out to Target Populations

Social media was most heavily referenced as the primary method for DMHIs to advertise and reach out to their target population. Public health researchers, pharmacists, social workers, digital health specialists and all mental health professionals unanimously cited Facebook, Instagram, Twitter and WhatsApp as the most commonly used social media platforms. According to one of the social workers affiliated with LagosMiND, "social media is used for making posts to provide mental health education, provide accurate information, reach out and make people aware of mental health services and resources…and it has been proven beneficial." A participant affiliated with Oasis of Love also agreed with the fact that social media "creates awareness of abuse, domestic violence, and mental health in general through mostly Instagram, Twitter and Facebook." Another social worker who was interviewed emphasized that "social media was mostly used to reach out to target audiences since most DMHIs don't have much funding for other ways." According to an executive from LaFiya TeleHealth, "social media is also a good way to advertise the intervention…video streaming in local and different languages (such as Hausa) has helped introduce DMHIs in an easy-to-understand manner." Therefore, the common consensus is that social media is one of the primary mediums to educate users about the service, and social media posts and streams have been the vehicles that provide the knowledge of the DMHI to the community, ensuring that everyone is aware of where to access and what to expect using DMHIs.

As mentioned by one of the public health physicians, one of the most prominent DMHIs in Nigeria is MANI, and it is well known for launching online campaigns and "sharing testimonials about mental illness…which expanded into conversation cafes which acted as monthly workshops to discuss different mental health topics." An executive from MANI believed this style of interaction was more accessible and engaging than the normal symposium or lecture-style talks: "The relaxed format of MANI's meetings creates an environment that allows people to open up and talk about their own struggles surrounding mental health."

Similarly, other DMHIs implemented live streaming into their outreach approach. As described by one of the digital health specialists:

> "DMHIs implemented free online programs and events through live streaming (Instagram Live, Facebook Live, Zoom) telephone meetings or physically in person. Other ways of outreach also include weekly podcasts, different channels such as Youtube to reach out to even larger groups."

These social media approaches were documented as a helpful way of introducing DMHIs to the public in a low commitment fashion and help demonstrate the value and use of DMHIs before requiring purchase or payment.

But whether social media was enough to ensure DMHI uptake and awareness was also brought up by one of the occupational therapists:

> "Social media is a great tool, but I don't think it is necessarily enough. There are different contexts of social media within populations, so is it relevant or valued to the targeted populations? Social media has its limitations due to subjectivity when interacting with it and use of algorithms (which optimizes what people are viewing)…these are enough to influence change in perspective or desire to utilize resources (like DMHIs)."

A social worker also commented on the importance of diversifying different modes of outreach to reach other demographics. "Social media is more accessible to young people, but I've also heard DMHIs being advertised on radio stations to try to get people to subscribe. This is because parents of youth often listen to the radio and can relay the info to them." Similarly, a mental health researcher believes that, *"*the ideal medium for reaching out to the target population would be all these approaches applied together." The same mental health researcher therefore concludes that since older demographics are more comfortable with Facebook and radio, it should be implemented alongside Twitter, WhatsApp and other social media platforms.

This perspective is in accordance with other psychiatrists as well, where "social media is most common, but DMHIs have also had to rely on word of mouth, face to face groups and university group gatherings."

Lagos MiND for instance, implements community outreach and intervention programs to target specific populations. According to their webpage, maternal mental health is one of their focuses, and they "go to antenatal clinics to educate women on postpartum depression, anxiety disorder and also give out cards and flyers with contact numbers." Another target audience of Lagos MiND are youth and students. To reach out to that specific population, Lagos MiND goes to schools and universities to talk to students about managing stress and building resilience. Lagos MiND involves teachers, school authorities, and school parents to increase mental health awareness and publicize themselves as a DMHI and resource.

Likewise, other DMHIs such as LaFiya Telehealth also work a lot with the local communities to create mental health awareness and become closer to community leaders.

This approach, according to an executive from LaFiya Telehealth has "helped to be taken more seriously as a mental health intervention to better reach out to remote communities."

4.3.4 Funding

How and where certain DMHIs in Nigeria receive funding is not very transparent on their webpages. Less than half of the respondents felt knowledgeable about the funding aspects of DMHIs in Nigeria. Those who felt comfortable elaborating on this section were usually directly associated or worked under the DMHI. Certain DMHIs are free and rely on volunteers to provide services, some DMHIs require a fee/subscription for their services and pay their staff for the services they provide, and a few are free services provided to the public and their staff are compensated by the government for their services.

For instance, MANI's 24/7 mental health support line for emergencies, advice, counseling, or just someone to talk to is operated using trained counselors and mental health professionals. Most of the counselors and mental health professionals are working pro-bono and volunteering their time, but others are paid on a sliding scale. According to one of the physicians affiliated with MANI, "depending on the specific need of patients, they may need to be referred to a specialist in which case, they have to pay to receive their services. "

The majority of privately owned or app-based DMHIs are not volunteer-based. According to one of the psychiatrists that provided their services through DMHIs, "they recruit you (mental health professional) and tell you how much you get paid per hour because patients are paying to them directly."

On the other hand, DMHIs such as LagosLifeline solely rely on paid mental health professionals working in shifts to manage their hotline. According to one of the social workers affiliated with LagosLifeline, "these mental health professionals all have degrees in either psychology, counseling or social work, but still get trained when they start working with us." However, LagosLifeline is unique as it is one of the few DMHIs funded by Nigeria's Ministry of health hence it also pays mental health professionals for their shift work.

A very widespread theme across interviews was how underfunded and under prioritized mental health is in Nigeria. The vast majority of DMHIs in Nigeria are privately funded startups or rely solely on external funding such as grants and donations.

According to one of the clinical psychologists:

> "Funding is hard to come by in Nigeria, so all startup members contribute money to support it, this includes friends and community support. The DMHI also seeks corporate bodies for sponsorship…sometimes government assists…but the majority of funds come from contributions and donations from friends and family."

As mentioned by one of the psychiatrists, "certain DMHIs also get help from other high-income countries and international organizations...DMHIs with a charismatic leader alongside a donor from the United Kingdom were very good at getting grants from big tech companies (eg: Twitter, Google, Facebook)."

A summary of the DMHIs available in Nigeria and how they operate are included below (Table 4). Overall, the vast majority of DMHIs in Nigeria are private mental health service delivery platforms that connect directly to mental health professionals. The target audience for most DMHIs are broad and encompass all mental health conditions and ages. The primary language of service delivery is English, but a few DMHIs also provide services in other languages and dialects such as Pidgin, Yoruba, and Hausa.

Table 4: Summary of DMHIs available in Nigeria

DMHI	Services	Target Audience	Languages	Organization Type
Mentally Aware Nigerian Initiative (MANI)	Psychological first aid through virtual mental health services and a 24/7 suicide hotline.	Youth-focused, but also helps anyone experiencing a mental health crisis in Nigeria.	English	Non-Governmental Organization (NGO) Non-profit organization
SheWrites Women	24/7 toll-free helpline that provides free and unlimited teletherapy, counselling, psychiatric help, and emergency interventions over the phone,	Survivors of sexual violence and supporting mental health across groups, schools and organizations.	English	Not-for-profit mental health organization

PsyndUp	Free, online database and digital directory service for clinical professionals in Nigeria who can be contacted by end-users that are seeking help using an app and website.	Nigerians who would like to find mental health support close to where they reside.	English	Private
Suicide Research and Prevention Initiative (SURPIN)	24/7 suicide hotline, that also provides online and in-person training. Conducts mental health research, provide education, crisis intervention, and mental health treatment.	Target age 15-50 age but accepts everyone since they operate as a diverse healthcare team that can target anything.		NGO, all volunteer based
LaFiya Telehealth	Video, voice calls or chats via smartphone mobile app, computers and AI-powered medical kiosks to provide mental health services, online prescription, tele-diagnosis and referrals.	Target audience are Nigerians living in remote and rural areas with acute non-emergency medical issues.	English, local languages, French, Swahili, Como, Yoruba, Yibu	Private
Mental Health +	Software/platform where they connect mental health	All Nigerians especially those with family living abroad.	English	Private

	professionals to patients.			
Lagos Mental Health in Development (Lagos MiND)	24/7 hotline managed by counsellors, social workers and psychologists.	Residents in the Lagos Space	English	Public
EmpathySpace	Virtual mental health service delivery platform and consulting service. Provides online therapy, online support groups, and mental health information.	All Nigerians	English	Private
Truthshare	Online Nigerian mental health application that provides a safe place where people can express themselves anonymously and get access to certified counselors for therapy and mental health treatment.	All Nigerians experiencing depression, mental illness, and suicide	English	Private
Nguvu Health	Teletherapy app that provides affordable therapy with licensed therapists	Target population are millennials and Gen Z	English	Private

	(clinical psychologists) which you can communicate via text, audio and video (as in instant messaging) and also schedule live video therapy sessions (in-app video calls).			
The Sanctuary	Confidential mental first aid 24 hours on weekdays through their telephone support line. Online psychotherapy, group and family therapy, support groups, yoga sessions and social and emotional training in schools is also available.	All Nigerians	English	Non-profit NGO
Kira App	App for people to anonymously talk about their problems without feeling embarrassed. Allows for one-on-one interaction if desired and provides mental health services.	Targetted to Nigerians facing mental health stigma and victimization.	English	Private

Happify	Global mental health and wellness app that combines evidence-based approaches from CBT, mindfulness and the game industry. The app provides month-long programs that guide members through goal-based journeys.	Supports the mental health of individuals, organizations, and populations	English, French, Canadian French, Chinese, Japanese, Castilian Spanish, Latin-American Spanish, German, Brazilian Portuguese, and Italian	Private

4.4 ADVANTAGES AND DISADVANTAGES OF DMHIs

It is not only essential to understand the elements that make up DMHIs, but also the factors that impact DMHI uptake and delivery. In the following section, the major categories of advantages and strengths as well as disadvantages and barriers will be discussed. Aspects of how ethical and accessibility issues are taken into consideration will also be analyzed. These themes, as well as the sub- themes provide a collective understanding of how DMHIs are perceived, how well they are understood, and where further efforts need to be made. Specific attention will be brought to the common themes shared among the different respondent groups.

4.4.1 Advantages and Strengths

As described in the respondents' perspectives, several strengths and advantages exist with implementing DMHIs. Within this section the themes that are described include improving the efficiency of mental health services, task sharing, flexibility and reducing the need for travel, providing services to rural and underserved communities, accommodating for various cultures and languages, tackling stigma and providing long-term cost effectiveness.

DMHIs Efficiently Addresses Mental Health Service Gap And Healthcare Overburden

One of the most commonly reported strengths of DMHIs among all respondents was that DMHIs increase the efficiency for receiving mental healthcare. DMHIs were credited to shorten the time spent requesting for a referral and waiting for an appointment as immediate contact occurs through the DMHI. One of the counsellors highlighted that certain DMHIs are also asynchronous meaning, "it doesn't matter when you log on to the DMHI, with AI you can access services without requiring a therapist on at the same time. This means there is less delay and patients can reach out any time if there is an emergency."

As a result, DMHIs were noted for their ability to compensate for the staffing shortage and mental health service gap in Nigeria. As described by one of the consultant psychiatrists:

> "In Nigeria, there is a very high mental health service gap. DMHIs are more efficient than in person referral through a general practitioner. With minimal access to primary and secondary levels of care in certain regions, DMHIs are able to partially fill this void by addressing problems sooner and reducing the burden on tertiary care."

Task Shifting and Spreading Mental Health Knowledge

Apart from increasing efficiency and reducing the burden on the tertiary levels of care, DMHIs also provide the opportunity for increased mental health knowledge sharing and task shifting. One of the DMHI founders also commented:

> "In Nigeria, 50% of doctors have to travel outside of Africa to the UK and US to practice, this is due to lack of funding and limited government budget which does not pay enough of a salary. DMHIs are a solution to this challenge in the industry because it allows for consults and support from anywhere, and allows for task shifting to deliver therapy to people online."

This viewpoint was shared across digital health specialists as well as clinical psychologists, social workers and public health pharmacists. Trained volunteers and counsellors on DMHIs were "effective in providing services through that medium" and overall found to be a "helpful option that connects people to other MH resources that don't have long wait and demand."

Flexibility and Convenience of DMHIs

Another common benefit mentioned across social workers, clinical psychologists, counsellors, occupational therapists, and digital health specialists is that DMHIs makes therapy accessible to people who may not otherwise be able to receive it. Several social workers commented on the fact that convenient and flexible DMHIs were beneficial to both DMHI service providers and service users. "One can comfortably sit in the bedroom, be anywhere, in the comfort of home and access your doctor." This works both ways since neither party has to "commute to a location, volunteers can be anywhere and still provide support."

DMHIs provides MH services to rural and underserved communities

A subtheme that falls under Flexibility and Convenience of DMHIs is that DMHIs have the additional ability to provide MH services to rural and underserved communities. As mentioned by one of the social workers, "DMHIs are helpful for people who live in rural areas, have a tight work schedule, or are housebound to still receive quality mental healthcare." Teletherapy platforms such as Nguvu Health therefore emphasize the convenience and flexibility of their services since users can structure their schedule to suit one's own pace and availability. For example, a clinical psychologist stated: "DMHIs improve accessibility to mental health support since many communities don't have mental health facilities and must travel from rural to urban areas to meet on a weekly basis."

Accommodations for Various Cultures and Languages

English is the most widely spoken language in Nigeria, and it is the official language of the country. As a result, most respondents believed that language barriers haven't been a concern for DMHIs. As described by one of the mental health researchers, "Nigeria is a multicultural nation, we are an English-speaking country so designing DMHI in English first has been accessible." Similarly, one of the clinical psychologists affiliated with one of DMHIs stated that, "we have not experienced any language barriers even when all our services have been in English for the last few years…all have been accessible." This perspective is agreed upon by most other respondents, because as described by one of the social workers, "most people can speak good English, and therapists have been flexible enough and good so far."

However, English is spoken less frequently in rural areas and amongst people with lower education levels. According to respondents there are approximately 300 languages in Nigeria and outside of English, Pidgin English, an English-based creole

dialect is also very prevalent. Some of the key ways DMHIs claimed to enhance communication between service users and providers were through addressing accessibility concerns such as culture and language. Several DMHIs prioritized recruiting counsellors who are ethnically diverse. As described by one of the social workers employed under a DMHI, "Nigeria is filled with diverse ethnic groups and religions…so we also have counsellors who are also diverse…if we get a caller who does not speak English…a counsellor that shares the same dialect is found and transferred."

Likewise, certain DMHIs like SURPIN also stated that:

> "Most of our responders are bilingual (Yoruba and Hausa) …so when people call in…we have responders that can speak the language you need. If no one on shift can speak that language, we ask them to please call back. We are aware of what time caller is available and we find a responder to coordinate times."

One of the psychiatrists affiliated with another DMHI had a similar response. DMHIs that recruit volunteers from across Nigeria have a more diverse selection of mental health professionals to cater to particular preferences and concerns. "Since our helpline is national based, we have volunteers of different languages and genders. People calling in can also choose to speak to a female counsellor if preferred."

Certain DMHIs like LagosMiND also prioritized local and community involvement at the conceptualization stage of DMHIs to make sure their intervention is catering to the proper population. According to one of LagosMiND's executives, "Accessibility issues are addressed quite well in…lots of local involvement, cultural adaptation, we learn to build things from ground up…basic infrastructure and framework are adopted from the local people and community members."

DMHI reduces barriers caused from stigma and shame

All interviewees also unanimously agreed that DMHIs were ideal for addressing issues of mental health stigma in Nigeria. As mentioned by one of the counselors affiliated with MANI, DMHIs has the potential to tackle stigma since "you don't need to walk into a physical space or mental health institution…a phone provides privacy, and you can do what you want."

Another way DMHIs were tackling mental health stigma was through increasing education and awareness. According to one of the digital health specialists, "the average Nigerian's response to mental health problems is to shake it off, go to church or pray. The

use of DMHIs and their advocacy on social media shows that people don't have to hide mental illness, they can use DMHIs that are affordable and available."

Likewise, one of the social workers from LagosMiND elaborated on how DMHIs tackle stigma from within the organization:

> "We advocate against stigma on social media and also provide internal training on stigma to counsellors. We do case reviews within ourselves…since a trigger is sometimes cultural, and if they don't share the same background…provider's own views and perception may get in the way of providing good care…we break down stigma as part of refresher training, no discrimination and stigmatization."

As a result, one of the sub themes is that some people prefer digital over in-person MH services. A few mental health researchers commented that certain demographics "seek help more with digital than physical face to face counselling." For certain young people, they are "much more comfortable talking about stuff like that virtually, rather than with people they know/know their family, choosing to have a therapist very far away geographically."

Service Fee and Long-Term Cost Effectiveness

As mentioned earlier, DMHIs can provide their services for free or for a specified cost. One of the most commonly mentioned benefits across respondents for free DMHIs, is how accessible the services are for individuals who cannot afford to pay for counselling or therapy out of pocket.

As described by one of the social workers affiliated with LagosMiND, "even though our phone hotline is not toll free (due to limited funds), we do have a call back policy…when the call hits the maximum number of minutes before costing money, we call them back immediately, so it doesn't take up airtime. We also have most calls in the evening since at that time it is free, and no one is around to interrupt."

For individuals who are willing to pay for DMHI services, certain DMHIs such as Nguvu Health also allow the patient to choose among different therapy formats such as text therapy or video therapy, in addition to choosing the payment frequency (paid weekly, monthly, quarterly, or yearly).

Additionally, the cost effectiveness of DMHIs were also noted to stem from streamlining healthcare services, reducing management costs and reducing renting physician spaces for providing care. According to one of the global mental health

researchers, “DMHIs was proven to be useful in reducing health management costs associated with mental healthcare, there is also no more need to rent physical spaces to see patients.”

There were some discrepancies among respondents on whether the long-term costs would be cheaper or more expensive in the long run, but physicians and digital health specialists agreed that DMHIs are cheaper in the long run due to the combination of factors listed above.

4.4.2 SUMMARY OF THE ADVANTAGES AND STRENGTHS

It is apparent from this section that there are many advantages and strengths of implementing DMHIs in Nigeria. In terms of efficiency, DMHIs were credited for shortening the time between requesting a referral and receiving an appointment as well as compensating for the staffing shortage and mental health service gap in Nigeria. This conclusion also goes hand in hand with DMHIs having been noted for increasing mental health knowledge sharing and task shifting. Moreover, DMHIs also played a role in increasing accessibility, by making therapy more accessible to people who cannot afford to pay for counselling or therapy out of pocket. Cost effectiveness of DMHIs stems from streamlining healthcare services, reducing management costs and reducing renting physician spaces for providing care. Lastly, DMHIs were ideal for addressing issues of mental health stigma in Nigeria due to the privacy and judgement free regard for users. The table below provides a tabular display of all of the advantages and strengths of DMHIs from above into themes and subthemes (Table 5).

Table 5: Thematic Classification of Advantages and Strengths of DMHIs

Theme: DMHIs efficiently addresses MH service gap and healthcare overburden	**Theme: Task shifting and spreading mental health knowledge**	**Theme: DMHI reduces barriers caused from stigma and shame**
Provide solution to big challenge to industry...doctors go on strike since they are not paying paid enough by hospital/government, DMHIs is another resource to be used DMHIs significantly shortens the time spent	In Nigeria, 50% of doctors have to travel outside of Africa to the UK and US to practice, this is due to lack of funding and limited government budget which does not pay enough of a salary. DMHIs are a solution to this challenge in the industry because it allows for consults and support from anywhere and allows	You don’t need to walk into a physical space or mental health institution…a phone provides privacy, and you can do what you want The use of DMHIs and their advocacy on social media shows that people don’t have to hide mental illness, they can use

requesting for a referral and waiting for an appointment as you can jump on immediately and be in contact with doctor. In Nigeria, there is a very high mental health service gap. DMHIs are more efficient than in person referral through a general practitioner. With minimal access to primary and secondary levels of care in certain regions, DMHIs can partially fill this void by addressing problems sooner and reducing the burden on tertiary care. ***Subtheme: 24/7 access and asynchronous services*** Can seek help myself, don't have to give a call to practitioner that gives counselling, I can just seek help by going to whatever medium to access initiative, and follow procedure rather than drive and call initiative. It doesn't matter when you log on to the DMHI, with AI you can access services without requiring a therapist at the same time. This means there is less delay and patients can reach out any time if there is an emergency.	for task shifting to deliver therapy to people online. DMHIs task shifting has reached a large number of people and they are able to refer them if necessary to see psychiatrists if they need face to face counselling Trained volunteers on DMHIs are effective in providing services through that medium, touches lives and impact people, Digitized 600 healthcare professionals and other volunteers, DMHIs allow them to see doctors and other volunteer providers across continents. Helpful to have digital options that connects people to other MH resources that don't have long wait and demand.	DMHIs that are affordable and available. We advocate against stigma on social media and also provide internal training on stigma to counsellors. We do case reviews within ourselves…since a trigger is sometimes cultural, and if they don't share same background…provider's own views and perception may get in the way of providing good care…we break down stigma as part of refresher training, no discrimination and stigmatization. Platforms through social media and twitter, don't have to hide mental illness, affordable and available, can access it easier. DMHIs help normalizes what they are going through, provide language, advocacy for MH care within the country. Sometimes people don't want to talk because they are worried how this person perceives me after this, would they use this info against me, would this person keep it to themselves or share it to another. DMHIs provide confidentiality and it makes people more willing to share and open up. Encourages more people to

Asynchronous, log-on to side of services, AI you can access services without getting a therapist on at same time. Also, synchronous (1-1 talking at same time)		speak up. Some people feel more comfortable, anonymity, confidentiality, they open up to a stranger better. ***Subtheme: People prefer digital over in person MH services*** Anonymous media, even the doctor doesn't know the patient, just connect the person's signs and symptoms. People like anonymous way of doing things, would mean more usage. People seek help more with digital than physical face to face counselling. It is good for young people, who prefer digital over face to face, much more comfortable talking about stuff like that virtually, rather than with people they know/know their family, choose to have therapist very far away geographically
Theme: Flexibility and Convenience One can comfortably sit in the bedroom, be anywhere, in the comfort of home and access your doctor. Flexible and convenient methods to support MH Don't need to commute	**Theme: Accommodations for Various Cultures and Languages** Most of our responders are bilingual (Yoruba and Hausa) …so when people call in…we have responders that can speak the language you need. If no one on shift can speak that language, we ask them to please call back. We are aware of what time	**Theme: Service Fee and Long-Term Cost Effectiveness** Relatively affordable, cheaper and engaging service Accessible, affordable, catered to Nigerian market (average citizen can afford) Cost-effective, don't need

to location, volunteers can be anywhere and still providing support. Being able to provide services nationally, volunteers don't have to travel. DMHI is a resource where no one is tied to a region, can access to anywhere with phone and laptop. ***Subtheme: DMHIs provides MH services to rural and underserved communities*** DMHIs are helpful for people who live in rural areas, have a tight work schedule, or are housebound to still receive quality mental healthcare. DMHIs let rural communities have access to MH interventions/services. Able to manage MH conditions and access early diagnosis/treatment through tech and apps. Urban to rural travel is long and difficult, DMHIs can help with that accessibility. DMHIs improve accessibility to mental health support since many communities don't	caller is available and we find a responder to coordinate times. Language (largely English, almost all platforms in English) Since our helpline is national based, we have volunteers of different languages and genders. People calling in can also choose to speak to a female counsellor if preferred. Pigeon English (slang), volunteers would speak it back. language and description is considered quite well Nigeria is filled with diverse ethnic groups and religions…so we also have counsellors who are also diverse…if we get a caller who does not speak English…a counsellor that shares the same dialect is found and transferred. We have not experienced any language barriers even when all our services have been in English for the last few years…all have been accessible. 20 counsellors can cover many dialects and reach out to person who speaks it Most people can speak good English, and therapists have	to spend physical space, don't need to pay, DMHIs are fast and more reliable. Cost is covered on Zoom, cost-effective solution. Even though our phone hotline is not toll free (due to limited funds), we do have a call back policy…when the call hits the maximum number of minutes before costing money, we call them back immediately, so it doesn't take up air time. We also have most calls in the evening since at that time it is free and no one is around to interrupt DMHIs have proven to be useful in reducing health management costs associated with mental healthcare, there is also no more need to rent physical spaces to see patients

have mental health facilities and must travel from rural to urban areas to meet on a weekly basis Make MH services accessible to hard-to-reach spaces (rural areas), far from MH treatment centre	been flexible enough and good so far Nigeria is a multicultural nation; we are an English-speaking country so designing DMHI in English first has been accessible. Accessibility issues are addressed quite well in…lots of local involvement, cultural adaptation, we learn to build things from ground up…basic infrastructure and framework are adopted from the local people and community members	

4.4.3 DISADVANTAGES AND BARRIERS

Any innovation has challenges and barriers for those involved with the service. Capturing these challenges allows for further improvements and developments. As described in the respondents' perspectives, several possible disadvantages exist. The most common themes include skepticism and lack of confidence and trust in DMHIs, limitations of applicability, lack of accessibility to internet and technology, lack of sustainability and follow-up, and lack of infrastructure.

Personal barriers

One of the disadvantages commonly shared across all respondents was that personal barriers can influence how consumers relate to and accept DMHIs. Personal barriers encompass cognitive, motivational, accessibility, level of education, and trust-related barriers.

Skepticism and Lack of confidence/trust in DMHI

As explained by one of the public health researchers, DMHIs are a "novel and unconventional intervention…which could lead to a lack of confidence in service delivery (counselling) and skepticism." Another global mental health researcher agreed with this viewpoint by commenting that a "lack of awareness and knowledge about the

interventions may constitute a barrier to adoption and use. Any concerns regarding the effectiveness and usability of DMHIs would impact uptake."

Other respondents believe these concerns are understandable and valid because as stated by a social worker affiliated with LagosMiND, "there is a lot of mental health misinformation online…bloggers have many followers on social media and it is a disadvantage for how easily people believe and assimilate what they see on media without verifying credibility on their own."

Moreover, DMHIs are, as a digital health specialist cautioned, "more prone to running into fake and unprofessional people which may lead people into places they don't want to be." Since DMHIs and services are not strictly regulated by the government, some individuals that may not have the skill/knowledge to provide mental health support might take advantage of this and provide services that do more harm than good. According to one of the social workers, "Most people don't even have time or interest to check the background and training of service providers when they just find them advertising on social media." As a result, most interviewees recommend potential clients to always check for credibility online, as well as checking stars and reviews beforehand.

Limitations of Applicability

Another limitation referenced by respondents was that DMHIs may not be ideal for diagnosing mental health disorders or useful for patients with more severe mental health issues. This reservation against using DMHIs to diagnose mental health disorders is summarized in the following quote by one of the clinical psychologists:

> "Apps have been effective, touched the lives and impacted many people. It allowed people to get to know about services, self-assessment, to connect to healthcare providers for mental health treatment and counselling. But not sure it is ideal for actual diagnosis…I still think people should come in for proper assessment."

Subtheme: DMHIs lack physical body language and non-verbal cues

One of the primary reasons for this concern stemmed from the fact that video calls are limited in terms of the information you can acquire from the patient. This subtheme stems from the lack of non-verbal communication being a potential limitation to diagnosing and treating mental disorders was a concern held by several respondents. As described by one of the mental health researchers:

> "With DMHIs we are unable to tell through body language if they mean what they say… body language can say something else than what they said verbally. Patients also sometimes get tired of questions and engagement can be hard…building a rapport can be difficult at the initial stage for clients if they are not able to express themselves very well. Typically, this is where body language would have covered the gap."

Similarly, one of the psychiatrists commented that, "there is only so much you can do through video/call/text platforms… one has to actually see the person to get a full understanding…but these are things that can be improved in DMHIs." Another digital health specialist also pointed out that "physical body language like posture, hands shaking, moving the body a type of way are symptoms that are unable to be conveyed to therapists across digital solutions."

Subtheme: DMHIs are not applicable to patients with more severe mental health disorders

On the other hand, concerns with the usefulness of DMHIs for those with more severe mental health disorders was also commonly shared among respondents. As described by one of the occupational therapists:

> "Certain mental health disorders need more intensive care resources…for some people an app would be sufficient, but others also need inpatient care or medication. For those with acute manifestations and psychotic episodes they need a safe setting where they can be cared for, not just through an app."

One of the psychiatrists also shared this concern:

> "Online therapy may not be useful for every patient or practitioner. Clients with more serious mental disorders or addictions likely need more treatment than digital therapy can provide. However, it serves as a nice first step in treatment for those that need more intensive therapy."

Lack of accessibility to Internet and Technology

Numerous costs are involved with the implementation of DMHIs. With the novelty of the intervention, these costs can act as challenges for the DMHI provider and user.

From the perspective of the DMHI providers, these cost concerns involve the initial investment, the maintenance of employees and the platform, and the lack of infrastructure. As observed through the participants, DMHIs that specialize in rural areas and provide access to the internet to access the intervention, lack of original infrastructure to rely on tends to result in a very expensive deployment. As described by one of the executives from LaFiya Telehealth, "we had to build the solar kiosk, internet broadband, and satellite all ourselves…it is a hard place to penetrate and is labour intensive. We have found that it takes much more time, energy and cost to create this niche."

When asked about ways to minimize these concerns, one of the executives from LaFiya Telehealth responded that:

> "We require more funding, patience, collaboration with rural hospitals to check what they already have…we often have to connect AI, internet and medical equipment ourselves for real time data generated. We also need to do a lot of marketing and awareness training in the communities to help with trust and uptake of the DMHI."

On the other hand, DMHIs that require a fee to access their services, will always exclude a group that cannot afford their cost. According to one of the psychiatrists, "Less than 5% of Nigerians are connected to the internet…so you can imagine the number cut out from services. Only wealthy people with a steady job that pays well can access DMHIs. Those who cannot subscribe to the internet or buy data are left out."

Similarly, another psychiatrist mentioned that few DMHIs are very accessible to anyone outside of the elites: "They are mostly for the very fortunate and educated, not much is done to specifically address cultural differences and disadvantages that are ethnic, cultural or religious differences."

Lack of Sustainability and Follow-up

DMHIs were also viewed as a potential short-term fix to the mental health crisis, but respondents emphasized that proper counselling and mental health care also require time and sustainability. As stated by one of the occupational therapists:

> "Mental health treatment is not just a doctor visit…sometimes we need long term care…we often see patients get to a place where they are stable but then something will trigger them again…we need a resource that is long standing too, not just a quick fix."

The concerns surrounding the financial sustainability of DMHIs are also shared by other social workers: “Once the current funding is used up, we have to think about reaching out to the community and government to get them to agree to support the DMHI since income is not constant.”

DMHIs were also noted by respondents that it can be hard to ensure proper follow-up. According to one of the social workers affiliated with MANI, “sometimes we can’t reach them…this doesn’t give room for accountability…if a patient presents with a very serious condition, if we can’t trace it, we can’t follow-up.” Therefore, the issues regarding contact tracing and follow-up of DMHIs patients seem to not only involve time restrictions and limited resource allocation, but also limitations in the technology and infrastructure.

Organizational barriers

Organizational barriers include a lack of infrastructure, lack of government funding, and lack of legislation and national policies on the implementation of DMHIs.

Lack of Infrastructure

To elaborate on a few points mentioned above, many respondents believe that due to lack of infrastructure and limited budgets for healthcare services, this has resulted in “internet access issues, disconnection during counselling sessions where you have to call back in…this needs to be tweaked but the whole infrastructure needs to change and catch up.”

It is worth noting, however, that much of this is due to unreliable power for the Internet and for related network services. If power were reliable many of these issues would disappear. Unfortunately, the disconnections and calls being dropped could be of greater concern since some counselors and psychologists also stated that “unstable internet and issues loading can increase anxiety in patients…we need to find a better solution and way to navigate this.”

Only one of the respondents believed that infrastructure barriers are not a primary cause for concern. According to one of the AI engineers, internet issues can be worked around when DMHIs implemented chat functions: “There is a decent amount of smartphone coverage in Nigeria, so I don’t believe it is that much of an issue…since video calls are sometimes unstable due to the internet, we’ve tailored apps to overcome this using the chat functionality.”

The lack of mental health laws and policy as well as budgeting for mental health services has been commented on by almost every interviewee. As emphasized by one of the public health pharmacists, "If we don't improve the policy surrounding digital health…such as data inscription, safety and security…we cannot continue to advance and move forward." These concerns are shared by other social workers, as DMHIs also require continuous IT support for when things inevitably require fixing and troubleshooting. Without a consistent budget, these DMHIs may not be able to sustain themselves and their workers.

This concern with legislature and policy goes hand in hand with concerns regarding the sustainability and ability for DMHIs to transition after a funding grant is eventually used up. As described by one of the policymakers, "The transition is hard…we must switch to another way of funding intervention…maybe continue by tax sharing...because when funding is all used up, our government doesn't take accountability and this causes an issue with sustainability in DMHIs."

4.4.4 SUMMARY OF THE CHALLENGES AND BARRIERS

Overall, the section demonstrates the variety of challenges and barriers found within DMHI services. According to the respondents, the themes include skepticism and lack of confidence and trust in DMHIs, limitations of applicability, lack of accessibility to internet and technology, lack of sustainability and follow-up, lack of infrastructure (Table 6). The novel and unconventional nature of DMHIs in Nigeria could lead to a lack of confidence in service delivery and skepticism. Moreover, the amount of misinformation and unregulated DMHI services has led to hesitancy and a lack of awareness/knowledge about the uptake of DMHIs. Another barrier mentioned was that DMHIs may not be ideal for diagnosing mental health disorders or for patients with more severe mental health issues. The lack of non-verbal communication could limit a healthcare professional's ability to diagnose mental disorders. For certain individuals, an app would be sufficient, but others also need inpatient care or medication. For those with acute manifestations and psychotic episodes they need a safe setting where they can be cared for as well. Moreover, few DMHIs are very accessible to anyone outside of the elites. Additionally, DMHIs were also viewed as a potential short-term fix to the mental health crisis, but respondents emphasized that proper counselling and mental health care are still required to ensure sustainability. Lastly, the lack of infrastructure, lack of government funding, and lack of legislation and national policies on the implementation of DMHIs lead to questions surrounding the sustainability and long-term potential of DMHIs in Nigeria.

Table 6: Thematic Classification of Challenges and Barriers to DMHIs

Theme: Skepticism and Lack of confidence/trust in DMHI	**Theme: Limitations of Applicability**	**Theme: Lack of accessibility to Internet and Technology**
DMHIs are a novel and unconventional intervention…which could lead to a lack of confidence in service delivery (counselling) and skepticism Lack of awareness and knowledge about the interventions may constitute a barrier to adoption and use. Any concerns regarding the effectiveness and usability of DMHIs would impact uptake There is a lot of mental health misinformation online…bloggers have many followers on social media and it is a disadvantage for how easily people believe and assimilate what they see on media without verifying credibility on their own More prone to running into fake and unprofessional people which may lead people into places they don't want to be Most people don't even have time or interest to check the background and training of service providers when they just	Apps have been effective, touched the lives and impacted many people. It allowed people to get to know about services, self-assessment, to connect to healthcare providers for mental health treatment and counselling. But not sure it is ideal for actual diagnosis…I still think people should come in for proper assessment ***Subtheme: DMHIs lack physical body language and non-verbal cues*** Digital solutions don't give therapist to notice body postures/movements Can't access physical response (if I'm having intervention, can't get all info in terms of body response (since need both mind and body), don't know what hands and feet are doing (since can't see physically), non-verbal communication Unable to tell through body language if they mean what they say… body language can say something else than what they said verbally. Patients also sometimes get tired of questions and engagement can be	We had to build the solar kiosk, internet broadband, and satellite all ourselves…it is a hard place to penetrate and is labour intensive. We have found that it takes much more time, energy and cost to create this niche Internet connectivity is not across all regions. Difficulties supplying electricity…must charge device using a different device Almost everyone has mobile phone but not everyone has android or advanced mobile phone to connect to DMHI Broad digital divide, many vulnerable people can't use technology for DMHI (affordability, no network) Internet only 40% connected, video calls is not going to reach whole population due to poverty Issue is cost (many people in rural, don't have capacity to have access to internet, without internet can't use social media), cost of internet and data expensive. In Nigeria need

find them advertising on social media	hard…building a rapport can be difficult at the initial stage for clients if they are not able to express themselves very well. There is only so much you can do through video/call/text platforms… one has to actually see the person to get a full understanding…but these are things that can be improved in DMHIs ***Subtheme: DMHIs are not applicable to patients with more severe mental health disorders*** Certain mental health disorders need more intensive care resources…for some people an app would be sufficient, but others also need inpatient care or medication. For those with acute manifestations and psychotic episodes they need a safe setting where they can be cared for, not just through an app DMHIs are more for individuals with depression or anxiety rather than serious conditions like schizophrenia…DMHIs is based on self-help..more severe disorders need more personal engagement Online therapy may not be useful for every patient or practitioner. Clients with	to buy (not unlimited) We require more funding, patience, collaboration with rural hospitals to check what they already have…we often have to connect AI, internet and medical equipment ourselves for real time data generated Less than 5% of Nigerians are connected to the internet…so you can imagine the number cut out from services. Only wealthy people with a steady job that pays well can access DMHIs. Those who cannot subscribe to the internet or buy data are left out DMHIs mostly for the very fortunate and educated Issue of internet penetration, cost of internet is very high in Africa and Nigeria in particular. Despite advantages, we should not overlook MH patients who are not employed and can't afford phones, laptops, internet, texting. Need to be more affordable, if not free (thanks to developed country, US and UK, digital platform like TalkSpace, First Aid US/UK to take free assessment, where you can

	more serious mental disorders or addictions likely need more treatment than digital therapy can provide. However, it serves as a nice first step in treatment for those that need more intensive therapy	reach out for interventions) Deployment is expensive (child kiosk solar, and internet broadband, satellite), make everything themselves, hard place to penetrate (labour intensive), more funding needed.
Theme: Lack of Sustainability and Follow-up Mental health treatment is not just a doctor visit…sometimes we need long term care…we often see patients get to a place where they are stable but then something will trigger them again…we need a resource that is long standing too, not just a quick fix Hard for proper follow-up, can't reach them (doesn't give room for accountability, even when presented with a very serious MH condition, can't follow-up, can't trace it. Must take their word for everything even if not congruent with physical appearance. Limitation of what is going on. Sometimes we can't reach them…this doesn't give room for accountability…if a patient presents with a very	**Theme: Lack of Infrastructure** Disconnection issues when providing counselling…call back in when disconnect, need to tweak, infrastructure problem and we have no control over that Unstable internet and issues loading can increase anxiety in patients…we need to find a better solution and way to navigate this Poor internet connectivity, video consultations, impedes and effects that If we don't improve the policy surrounding digital health…such as data inscription, safety and security…we cannot continue to advance and move forward The transition is hard…we must switch to another way of funding intervention…maybe continue by tax sharing...because when	

serious condition, if we can't trace it, we can't follow-up Once the current funding is used up, we have to think about reaching out to the community and government to get them to agree to support the DMHI since income is not constant Lack of infrastructure, low budget in industry is problem, budget is low to healthcare services, even if they like they may not be able to implement	funding is all used up, our government doesn't take accountability and this causes an issue with sustainability in DMHIs Policy in the way (MH management and policies, how to deal with MH does not recognize patient getting help from primary healthcare professionals) Don't have policy (how has data has been digital health (data inscription, safety)	

4.5 ETHICAL CONSIDERATIONS

Many DMHIs have also taken ethical issues such as safety, privacy and confidentiality and accountability into consideration. Due to the varied backgrounds of the respondents, only the respondents who were directly affiliated with the DMHIs felt comfortable enough to comment on the ethical considerations of DMHIs in Nigeria. Across those select respondents, the most commonly focused aspects of DMHI ethics were privacy and confidentiality, followed by the importance of follow-up and accountability and then safety and data protection. The table at the end of this section provides a tabular display of all of the ethical considerations of DMHIs organized into themes (Table 7).

Privacy and Confidentiality

The most common response among respondents was that the largest benefits of DMHIs over in-person services is their privacy and confidentiality. As described by one of the social workers: "Many Nigerians are much more comfortable talking about sensitive stuff virtually…rather than in front of people that know you already." This strongly indicates that users prefer DMHIs since it doesn't have to be face-to-face and can easily maintain anonymity if desired.

Another mental health counsellor agreed with the statement that "digital counselling is equally common as in-person due to fear of judgement and shame…with online interventions they don't know therapists and the therapists don't know you. People are more likely to seek help and engage more online than through physical face to face counselling. Digital counselling is very adaptive and effective."

Respondents also indicated that this mindset is also shared among youths and adolescents. According to one of the psychiatrists, "Young people sometimes do not trust a therapist they know who also knows their family…they would rather talk to a therapist very far away geographically." Since several DMHIs recruit volunteer mental health professionals practicing in the US and UK, this would make DMHIs much more attractive. Moreover, mental health stigma is still very widespread in Nigeria, and DMHIs have been considered to be a good alternative to in-person mental health care to protect one's identity.

Moreover, to enforce privacy and confidentiality practices, the majority of DMHIs make it a requirement to sign confidentiality agreements and provide related staff training. As described by one of the clinical psychologists affiliated with SURPIN, "we all sign confidentiality documents and go through training…even though we mostly recruit members from Nigeria with a background in medicine, social work, counselling…we still provide training new members for a month before allowing them to man the hotline." Additionally, a mental health researcher also commented that certain DMHIs that come in the form of apps have passwords to add an increased layer of privacy and security.

However, a few respondents also pointed out that any association with social media and digital platforms always has a risk of privacy concerns. As described by another clinical psychologist, "DMHIs still have a lot of issues with privacy…anything online has a chance of other people accessing it…people managing the app or website platform of DMHIs need to create more security, so privacy is protected."

A public health psychiatrist believed a reason for this level of caution is that DMHIs may have been too eager and overly zealous when launching the intervention before privacy and confidentiality was fully prioritized:

> "DMHIs have been very 'gung-ho' when they aren't completely assured in terms of legal or getting consent. The legal framework is still weak…going ahead without sufficient understanding. It seems like a benign intervention going ahead but it could also cause harm…we can't extrapolate that."

Similarly, a legal practitioner also believed the rules and laws regarding digital privacy are not enforced enough in Nigeria: “Anyone can have access to private recordings if they work in that area. Security of digital services and the control over who has access to that info is very loose. A way to improve this situation is for the government to enact stricter laws and make examples of people who evade private storage and punish people who share this info to the disadvantage of the patient.”

The importance of Follow-up and Accountability

Certain DMHIs also hold volunteer counsellors accountable for the calls and follow-ups required. From the initial call to referral and treatment, they will call the patient to make sure they reached the next step of their treatment process. As described by one of the social workers affiliated with LagosMiND, “We are accountable for calls and follow-up…from start to exit strategy, to reach goal or referral…they are accountable for each step…they check-in to make sure they went to their follow-up too.”

Other DMHIs also sought to reduce mistakes and improve the quality of care provided by reviewing critical cases for training purposes. According to one of the clinical psychologists:

> “Every other week we do critical case reviews to discuss what could have been done, what could be done better, when you have to transfer cases to the next agent. This is the only time to communicate cases as we emphasize not communicating about patients and cases even with their parents to ensure confidentiality.”

This training feature was only discussed among DMHIs that rely on volunteers or are publicly funded. This may be due to the assumption that certified healthcare providers are already aware of the privacy, confidentiality, and ethical practices in digital mental healthcare as well as additional funding to provide time for feedback sessions and continuous training.

Safety and Data Protection

A few digital health specialists commented that DMHIs are prone to unprofessional people online, just like any other online intervention: “DMHIs are at a major disadvantage in regard to licensing… since a lot of people provide this service but there are no standards or regulations, unfortunately the government is not even cracking down on it.” They highlighted the importance of checking for credibility online, reviews, and comments beforehand.

However, certain DMHIs have made a conscious effort to increase their safety practices. Certain DMHI members commented that they only provide services to those 18 and older for safety and consent reasons. Additionally, DMHIs that allow practitioners to prescribe medications if they find the need to do so also have certain restrictions in place to prevent any drug seeking behaviour. One of the social workers commented that, "prescriptions can be conveniently forwarded to the pharmacy of your choice. However, our policies forbid practitioners to prescribe any controlled drugs on a list of specific medications."

In terms of data protection, other DMHIs also use highly secure platforms to provide a higher level of security. As described by the one of the executives from LaFiya Telehealth "we use HIPPA compliant and NDPR (Nigeria passed) platforms...highly protected to prevent data breach…we've had none of the practitioners or patients complain…very good testimonials and happy with services." Similarly, DMHIs that implement helplines also exercise caution with storing patient data by using an "electronic health record system built for this purpose…not easily hacked…each counsellor also has their own login details in order to see their client info."

Table 7: Thematic Classification of Ethical Considerations of DMHIs

Theme: Privacy and Confidentiality	**Theme: The importance of Follow-up and Accountability**	**Theme: Safety and Data Protection**
Keeping in mind confidentiality…employees avoid taking calls in public We all sign confidentiality documents and go through training…even though we mostly recruit members from Nigeria with a background in medicine, social work, counselling…we still provide training for new members for a month before allowing them to man the hotline Hotline workers all signs	We are accountable for calls and follow-up…from start to exit strategy, to reach goal or referral…they are accountable for each step…they check-in to make sure they went to their follow-up too. Every other week we do critical case reviews to discuss what could have been done, what could be done better, when you have to transfer cases to the next agent. This is the only time to communicate cases as we emphasize not communicating about patients	Safety and consent reasons…doesn't provide services below 18 (minor) Prescriptions can be conveniently forwarded to the pharmacy of your choice. However, our policies forbid practitioners to prescribe any controlled drugs on a list of specific medications We use HIPPA compliant and NDPR (Nigeria passed) platforms...highly protected to prevent data breach…we've had none of the practitioners or patients complain…very

confidentiality document App has passwords to access so no one knows their activity unless they share…can't see outside of the backend care team. DMHIs have been very "gung- ho" when they aren't completely assured in terms of legal or getting consent. The legal framework is still weak…going ahead without sufficient understanding. It seems like a benign intervention going ahead but it could also cause harm…we can't extrapolate that DMHIs still have a lot of issues with privacy…anything online has a chance of other people accessing it…people managing the app or website platform of DMHIs need to create more security so privacy is protected Discussed at great lengths, addressed a little bit. Legislation is wild west, gung ho, when they aren't completed assured, in terms of legal or getting consent, or understanding implementation Legal framework is weak, going through with not sufficient understanding	and cases even with their parents to ensure confidentiality	good testimonials and happy with services Electronic health record system built for this purpose…not easily hacked…each counsellor also has their own login details in order to see their client info

6.1. LESSONS LEARNED

Uptake of DMHIs

One of the key takeaways from the interviews was that the uptake of DMHIs has been better than anticipated. Several social workers affiliated with a DMHI commented that "more people than we thought need these services, people call us all the time requesting services, we didn't expect such a huge demand." Moreover, certain organizations also reached out to DMHIs to provide mental health training or speak about their services and where to access them to their clientele, "I didn't realize how much MH training was desired, requests from churches and other organizations for training, services, and giving talks to organizations."

One of the interviewed counselors also estimated that DMHIs were used as often as in-person mental health interventions: "DMHI access is good…telehealth is used just as much as physical interventions, if not more."

The few respondents who were more tentative about the accessibility and uptake of DMHIs still agree that considering how limited the current mental health services are in Nigeria, DMHIs are still worth supporting. As described by one of the occupational therapists,"anything to help address the mental health crisis in Nigeria is worth supporting…having another option such as DMHIs is beneficial…it helps normalize what they are going through and to help advocate for mental health care within the country."

Effectiveness of DMHIs

The effectiveness of DMHIs has been a common speculation among respondents. Primary healthcare professionals seem to hold a stronger stance regarding the effectiveness of DMHIs, whereas mental health specialists seem to have a more contrasting opinion. It should be noted however, that only one of the three psychiatrists held this concern, and it was not mentioned among other healthcare providers and respondents.

According to one of the social workers affiliated with LagosMiND, "We've reached over 10,000 people and referred them to see a psychiatrist if they need face to face counselling. So yes, it has been effective. We've received positive feedback on social media, too."

Additionally, during the COVID-19 lockdown period, many DMHI helplines experienced a drastic increase in usage and seem to be effective in terms of efficiency:

> "When I personally volunteered at a helpline during the COVID period, we helped a lot of people with mental health issues during lockdown…those that required referrals we quickly linked to a hospital…overall it was a cost effective and efficient system."

Other physicians also highlighted that anonymity on social media and use of different platforms has led to DMHIs being very effective among young people: "It helps people speak about issues, when they know these organizations exist, they call up these organizations, they learn what can you do, how you can help. We're beginning to see more and more young people seek care."

On the other hand, one of the psychiatrists states that DMHIs were not effective thus far. A primary reason for this perspective was due to the financial difficulties of managing active mental health cases due to lack of funding and accessibility. As quoted by the psychiatrist:

> "Recently, an NGO came to my department to collaborate in addiction treatment digital intervention (substance use is a big problem in society), but the problem is that these…services are very expensive… the NGO can't raise funds to sponsor rehabilitation, and at the end of day the NGO can do preventive interventions (go to secondary schools, church, community, universities to talk about ills of substance use), but active cases are difficult for them to manage due to lack of finances."

Importance and Incorporation of Feedback

Feedback on the performance of DMHIs has also been noted to drastically help improve their interventions. Other DMHIs such as MANI implemented a feedback system, where according to one of the social workers, "users can fill out a form to give negative or positive feedback…if it was negative we will reach out to learn how to improve, do better and fix it."

The feedback most commonly provided involved concerns regarding the length of helpline calls, such as needing more sessions or extending the duration of the sessions. Certain DMHIs only provide psychological first aid which is not meant to be of long duration or to involve long term plans. According to the same social worker, "people want to extend or hold on sessions since timing depends on the counsellor/service provider. We try not to have sessions longer than 2 hours, but the length is dependent on the severity of the case."

As of now, the remaining DMHIs discussed have not implemented a feedback system, but hope to do so in the future once they acquire more funding and staff members. Therefore, this feedback from users of MANI's services may not be representative of all users of DMHIs in Nigeria.

Technology Learning Curve

Due to the novelty of DMHIs in Nigeria, several respondents mentioned the developer learning curve associated with new technology and interventions. As described by one of the social workers affiliated with SURPIN, "We didn't realize just how much training was needed. All of us have healthcare backgrounds so we had to learn the technology side of the intervention as we go. It was a learning curve."

Likewise, one of the social workers affiliated with LagosMiND agreed with this viewpoint: "It takes a lot in terms of human resources for mental health, task sharing…it is very time consuming to begin the process of collecting calls and providing these services to local communities."

The table below provides the thematic classifications of the findings from above (Table 8).

Table 8: Thematic Classification of Lessons Learned

Theme: Uptake of DMHIs	**Theme: Effectiveness of DMHIs**	**Theme: Importance and Incorporation of Feedback**
DMHI access is good…telehealth is used just as much as physical interventions, if not more More people than we thought need these services, people call us all the time requesting services, we didn't expect such a huge demand Didn't realize how much training was desired (requests in terms of churches, can you come	We've reached over 10,000 people and have referred them to see a psychiatrist if they need face to face counselling. So yes, it has been effective. We've received positive feedback on social media, too It helps people speak about issues, when they know these organizations exist, they call up these organizations, they learn what can you do, how you can help. We're beginning to	Users can fill out a form to give negative or positive feedback…if it was negative we will reach out to learn how to improve, do better and fix Feedback has shown that most people want to extend or hold on sessions since timing depends on the counsellor/service provider. We try not to have sessions longer than 2 hours, but the length is

talk and what can we do as an organization) Anything to help address the mental health crisis in Nigeria is worth supporting…having another option such as DMHIs is beneficial…it helps normalize what they are going through and to help advocate for mental health care within the country	see more and more young people seek care When I personally volunteered at a helpline during the COVID period, we helped a lot of people with mental health issues during lockdown…those that required referrals we quickly linked to a hospital…overall it was a cost effective and efficient system Recently, an NGO came to my department to collaborate in addiction treatment digital intervention (substance use is a big problem in society), but the problem is that these…services are very expensive… the NGO can't raise funds to sponsor rehabilitation, and at the end of day the NGO can do preventive interventions (go to secondary schools, church, community, universities to talk about ills of substance use), but active cases are difficult for them to manage due to lack of finances	dependent on the severity of the case Every other week we do critical case reviews to discuss what could have been done, what could be done better, when you have to transfer cases to the next agent
Theme: Technology Learning Curve Takes a lot (in terms of human resources in MH, task sharing), not just professionals provide services in hospitals (can't go because means, far away, make it more community approach), every local community should have a way to		

collect calls All of us have health backgrounds, we are learning the tech side as we go (learning curve) It takes a lot in terms of human resources for mental health, task sharing…it is very time consuming to begin the process of collecting calls and providing these services to local communities		

4.5.3 CURRENT GAPS IN THE LITERATURE AND RECOMMENDATIONS FOR FUTURE RESEARCH DIRECTIONS

As described in the previous section, with the implementation of DMHIs, there will continue to be challenges and barriers, but the recognition of these problems can contribute to improvements. This section will broadly explore research participants' perspectives on current gaps in the literature and recommendations for future research directions. Covering these topics provides a comprehensive understanding of where the DMHIs intend to be, and what users can anticipate in the future. The table at the end of this section provides a tabular display of all of the current gaps in the literature and recommendations for the future organized into themes (Table 9).

Need for more research on DMHIs

The majority of current studies on DMHIs centre on the Global North, and there are gaps in knowledge about how technology can be used to support adolescents in LMICs. Previous studies also highlighted the importance that a range of actors are included when designing, implementing and evaluating digital approaches to young people's mental health, and that inequalities of access (mediated by factors such as gender, age, socioeconomic background and location) are addressed (Rost et al., 2020). In our study, the most commonly reported gap in the literature was the lack of research and data published on mental health trends and statistics among Nigerians and the effectiveness of DMHIs.

One of the social workers stated:

> "Nigeria doesn't have data on the mental health service gap, or really on the healthcare system in general. There is a lack of data collection and reporting across the country. The data we do have might not be accurate or show the true reach of mental health services, or even the volume of mental health disorders experienced (age group affected, most commonly reported mental health disorders, rate of suicide per year). We need more academic institutes to do more research and document the strategies and interventions implemented to inform future research."

Similarly, one of the occupational therapists stated that there was limited consistent research in mental health in Nigeria: "We need more surveillance, concrete data of the population, what is going on within the country and their needs…no strong institutions are producing the literature needed for this. Any mental health research in any direction will add to the knowledge."

Another digital mental health expert agreed that we need more research comparing DMHIs to physical in-person mental health interventions to better analyze effectiveness: "To understand just how effective the DMHIs are compared we need more studies to directly compare them to physical in person ones in Nigeria."

Additionally, one of the psychiatrists pointed out that most NGOs were focusing more on mental health awareness but more should be focused on evidence-based studies but this is difficult due to limited funding. "There is limited funding right now, and we need to be able to determine which specific DMHIs are most effective. We cannot know for certain until we have more evidence."

To build on that, the same psychiatrist also stated that more research is needed to understand the experience of those providing the DMHI support. "More research is needed so we can learn about the experiences of those providing the support…if they are facing any challenges…is it better or worse than face-to-face…do most providers even have similar experiences?"

Need for more pilot projects and DMHIs to be launched

As mentioned by one of the mental health researchers, "Nigeria needs more DMHIs to be launched, and more work should begin by launching initiatives to test its effectiveness and really find the holes to fill. We need more research in academia to focus on what additional mental health services need to be provided and work best. Only then do we begin to see the need and effectiveness of DMHIs that bring in grants and investors."

Other respondents agree with that opinion and emphasize that because DMHIs in Nigeria have only launched in more recent years, we need to try to collect more data regarding service utilization. As described by one of the social workers, "Since utilization is still quite low, if there is something that can be done to improve DMHI utilization…it will be more helpful."

Additionally, one of the legal practitioners also brought up a fair concern of how DMHIs are even measuring their effectiveness. As a legal practitioner described, "DMHIs in the form of apps sometimes measure effectiveness based on number of downloads…which isn't reliable for measuring feedback or collecting data for analysis for effectiveness." Therefore, it is crucial to evaluate implementation processes and outcomes of DMHIs to see if they adequately address population mental health needs.

Being Mindful of Regional and Cultural Differences

A few respondents also reported the importance of viewing mental health with a cultural relativism lens. Cultural relativism is defined as "judging cultural elements relative to their cultural context" (Carnegie Council for Ethics in International Affairs, 2023). Global health metrics and initiatives focused on Western approaches to health tend to exclude such factors and intrinsic cultural nuances and perspectives. As one of the respondents noted, "Each culture has its beauty and richness, and I believe sustainability is dependent on systems being organically built from within, rather than being implanted by external entities that have no regard for or poor understanding of the local cultures and context."

One respondent also requested that future research studies emphasize the geographic differences between populations:"More research on regional differences which would link culture would help address regional specificities. Settings impacting the intervention and knowing more would help provide ultimate intervention to mental health issues."

Table 9: Thematic Classification of Current Gaps in the Literature and Recommendations For Future Research Directions

Theme: Need for more research on DMHIs	**Theme: Need for more pilot projects and DMHIs to be launched**	**Theme: Being Mindful of Regional and Cultural Differences**
Nigeria doesn't have data on the mental health service gap, or really on	Nigeria needs more DMHIs to be launched, and more work	Each culture has its beauty and richness, and

the healthcare system in general. There is a lack of data collection and reporting across the country. The data we do have might not be accurate or show the true reach of mental health services, or even the volume of mental health disorders experienced We need more academic institutes to do more research and document the strategies and interventions implemented to inform future research Lots of gaps in DMHI research (ex: literature on how it can be used, who can access and advantages, very few people write about this). Future of DMHIs are very bright just nothing being done about it Researchers need to do more, cannot grow or see in the right direction until more DMHI research (a lot of gaps), academia to do more, begin to see the need and effectiveness of DMHI Have to still do research for effectiveness, since utilization is still quite low, if there is something that can be done to improve utilization, will be more helpful Huge gap in	should begin by launching initiatives to test its effectiveness and really find the holes to fill. We need more research in academia to focus on what additional mental health services need to be provided and work best. Only then do we begin to see the need and effectiveness of DMHIs that bring in grants and investors. Since utilization is still quite low, if there is something that can be done to improve DMHI utilization…it will be more helpful We should be launching more DMHIs to test it out and find what additional services need to be provided. Not enough initiatives being launched, this will help find the MH holes we need to fill DMHIs in the form of apps sometimes measure effectiveness based on number of downloads…which isn't reliable for measuring feedback or collecting data for analysis for effectiveness	I believe sustainability is dependent on systems being organically built from within, rather than being implanted by external entities that have no regard for or poor understanding of the local cultures and context More research on regional differences which would link culture would help address regional specificities. Settings impacting the intervention and knowing more would help provide ultimate intervention to mental health issues

research/funding, couldn't get much literature, poorly underfunded We need more surveillance, concrete data of the population, what is going on within the country and their needs…no strong institutions are producing the literature needed for this. Any mental health research in any direction will add to the knowledge To understand just how effective the DMHIs are compared we need more studies to directly compare them to physical in person ones in Nigeria		

CHAPTER 5: DISCUSSION

The analysis of the study findings identified what DMHIs have been developed in Nigeria to address mental health and wellbeing; advantages and disadvantages of using such DMHIs; and lessons learned regarding DMHIs that can potentially be applied to other contexts. This chapter discusses themes from the results section to answer the research questions; discusses what to expect when implementing DMHIs; analyzes how those involved with the service perceive the DMHIs; and, finally identifies current gaps in the literature and recommendations for future research.

5.1 ADVANTAGES OF DMHIS

To answer the first part of *RQ2: "What are the advantages of using DMHIs?"* this study found that DMHIs improved the efficiency of mental health services, task sharing, flexibility and reducing the need for travel, providing services to rural and underserved communities, accommodating for various cultures and languages, tackling stigma, and providing long-term cost effectiveness. Most advantages described in the data findings are consistent with the existing literature. As identified in recent systematic reviews and the grey literature, there are five different areas in which DMHIs could improve the delivery of mental health services in Nigeria: addressing medical professional shortage by reducing in-person visits; increasing efficiency via task sharing and referral systems; broadening the scope to rural and remote areas; overcoming mental health stigma; and paving the way for new technologies (Fu et al., 2022; Monaghesh and Hajizadeh, 2020).

As mentioned in the previous chapters, Nigeria is facing a significant brain drain and medical professional shortage. Given the extensive training psychiatrists and other mental health professionals must undertake, it may take decades to address this shortfall. Therefore, many respondents commented that DMHIs represent a viable resource in overcoming the significant mental health gap in LMICs. In a systematic review on the role of telehealth during COVID-19 outbreak, DMHIs are highly recommended in the field of psychiatry as it does not require in-person visits (Monaghesh and Hajizadeh, 2020). With the introduction of DMHIs, patients now have access to healthcare at their fingertips allowing them to overcome issues involving travelling to medical facilities and acquiring any additional costs. Therefore, to answer RQ3 "*What are some lessons learned regarding DMHIs that can potentially be applied to other contexts?"* we can take away from these findings that the introduction of DMHIs is an important component that can affect the overall healthcare system. Rather than having patients visit tertiary levels of care, such as hospitals and doctors in-person, other trained individuals can use DMHIs to provide remote medical assistance and services, and if required, certain DMHIs also implemented a referral system to provide the patients with higher levels of medical attention that is safe and cost-effective.

Our findings also go hand in hand with the systematic review conducted by Fu et al. (2022), where DMHIs were recommended to be considered for regions where usual care for mental health problems is minimal or absent. Given access to DMHIs, people from remote regions would be provided the option to communicate with specialists from any part of the world which they otherwise might not have (Rathod et al. 2017). Moreover, another article reviewing the opportunities and challenges for professionals in Psychiatry and Mental Health Care Using DMHIs during pandemic mentioned how DMHIs also helped with access to health care for people living in isolated areas (Kane et al., 2022). The use of live video conferencing or a mobile call is also not a new phenomenon or approach, and it has allowed health care professionals to ask essential questions and conduct consultations, as well as check-in with patients while they are recovering (Kane et al., 2022). Our study findings coincide with these findings as many experts believe that the advancement of DMHIs are very promising, since technology such as mobile phones and tablets are increasingly affordable for people in LMICs and in rural Nigeria in particular. These conclusions can also help answer RQ3, since it may be beneficial that the Nigerian government invest in DMHIs to better maximize the health-care benefits for rural and remote populations using smartphones and computers. Since the Nigerian federal government formulates and coordinates national guidelines and policies, and states and local governments implement these health policies to focus on local needs and priorities, the concerted effort and coordination with all three levels of government is essential for strengthening the national health system, improving the quality of management and the availability and management of financial, human, and infrastructure health resources (Nnebe, 2006).

According to Sheikh (2021), the expansion of DMHIs will also pave the way for new technologies such as the incorporation of sensors that are able to collect clinical data related to physical activity, stress, or sleep. The next wave of DMHIs may be able to detect changes in individual behavior and then analyze this data to assist in screening and monitoring mental illnesses (Sheikh et al., 2021). Not only do such technologies open up new possibilities in the field of DMHIs, but they might also bring about decisive changes to enhance the overall efficiency of mental health services. Future research should focus in this direction, which helps to address RQ4: "*What are the current gaps and recommendations for future research?"*

As described by several respondents, DMHIs were also beneficial for overcoming barriers surrounding mental health stigma by offering privacy and anonymity. This finding is in accordance with the grey literature published on DMHIs as DMHIs were found to help individuals discuss their mental health challenges openly, without fear of being ashamed or humiliated (Soroye et al., 2021). Smartphone technology and mobile

apps, in particular, are providing support. Therefore, policymakers must act now, both to reduce the stigma surrounding mental health—especially by correcting misconceptions about mental illness—and to provide adequate mental health care and support for those who need it today.

According to the literature, the benefits of DMHIs in an LMIC such as Nigeria may outweigh the investments necessary for its implementation and sustainability (Mbunge et al., 2022). Experts believe that the investment in digitizing healthcare will eventually lead to increased data quality and usage (Makinde et al., 2011). In Nigeria, private sector telecommunication companies are majority funded by international investment, and these private companies are constructing infrastructure for mobile internet access. Therefore, in accordance with the respondents in this study, regulatory support by the Nigerian federal government is encouraged as well as necessary for its improvement in not only urban areas but also expansion into rural and remote parts of the country, which simultaneously answers RQ4.

5.2 THE STATE OF CURRENT MENTAL HEALTH POLICY

However, as mentioned by several respondents, the current Nigerian healthcare policies do not address current issues. For example, the 2007 National Strategic Health Investment Plan (NSHIP) was a development agenda aimed to achieve the Millennium Development Goals (MDGs), improve efficiency in health systems and serve as a reference document for all stakeholders to ensure transparency and mutual accountability in the health sector (Federal Ministry of Health, 2009). However, the NSHIP did not guide health programming in the Nigerian states and local government councils as well as expected. For instance, the NSHIP states that improving the health and well-being of Nigerians requires scaling up and strengthening the health systems including additional financing for health and improving the delivery of primary healthcare services (WHO, 2008). However, the framework only covers the organization of health services at the local level, and very little is written on state-level organization, which provides oversight for the healthcare services administered at the local level. As a result, Nigeria continues to face many obstacles with healthcare financing, resource allocation and delivering efficient healthcare services in the regions they promised.

In response to the systemic deficiencies in the national health system's planning, development, and management of available healthcare personnel, the 2014 National Health Act was developed. This framework however led to healthcare institution funding being largely determined by their revenue capacity. As a result, the federal government often pays higher salaries to healthcare workers in comparison to state and local governments. This unintentionally contributed to the imbalance in the distribution of

human resources for health. As a result, several strikes occurred among health workers as the ones working at state and local tiers fight for the same salary levels as the ones at the federal level. These strikes exacerbate the human resources for health crisis in Nigeria, with widespread personnel shortages at all levels.

Additionally, the 2017 National Health Policy (NHP) aims at achieving universal health coverage and delivering health care services to all (especially in underserved communities) at an affordable price. Despite significant investments in this policy, geographical, physical, financial, and sociocultural barriers continue to limit access to equitable healthcare. With 70% of health expenditures still out of pocket, financial access to affordable health services remains a major challenge (Marchildon and Bossert, 2018). Presently, the policy is implemented with little regard to Nigerians' ability to pay, which is particularly concerning in the context of widespread poverty. Fu et al. (2022) highlighted the importance of policy makers and clinicians in LMICs to work together to use DMHIs to bridge the mental health gap and strengthen local health-care systems. Involving health professionals was noted to have three main advantages. One, healthcare professionals can contribute to the development and approval of DMHIs and other digital tools. This can address concerns about a lack of quality and adherence to evidence-based practices of mental health apps (Uhlhaas and Torous, 2019). Two, the collaboration between policy makers and clinicians can help to address the needs and concerns of healthcare professionals and improve their knowledge and understanding of DMHIs, which can ultimately improve the administration of mental health services (Huang et al., 2019). Three, building on the expertise of healthcare professionals can also increase acceptability of DMHIs among users, who may be reassured that the technology is based on reliable professional knowledge (Uhlhaas and Torous, 2019). By introducing autonomy, prioritizing training, and offering financial incentives to centres that carry out pre-agreed health services, we can reduce the obstacles associated with accessing equitable digital as well as in-person mental health services in Nigeria.

5.3 CHALLENGES AND BARRIERS OF DMHI

To answer the second part of *RQ2: What are the disadvantages of using DMHIs?,* this study found that skepticism and lack of confidence and trust in DMHIs, limitations of applicability, lack of accessibility to internet and technology, lack of sustainability and follow-up, and lack of infrastructure were all barriers to DMHI uptake. The limitations and barriers to the adoption and full-scale implementation of DMHIs mentioned in this study also overlapped with the current literature. The perceived usefulness of DMHIs, overall lack of experience using DMHIs, as well as stigma have a profound impact on the intention and desire of the general public to adopt DMHIs. Similarly, several experts also commented that without the right motivation, trust, attitude and accessibility to digital

health technologies by their intended users, there can be no adoption nor full scale implementation of DMHIs in routine mental health services.

One of the DMHIs experts commented on a potential way to overcome this barrier. Since many Nigerians already trust mobile devices to send and receive money, where a digital system is already used for managing finances, this can also be a "selling point" to Nigerians to also have faith and to trust in DMHIs to provide healthcare. Another way to overcome the personal barriers associated with DMHIs, may be to establish a middle ground. Certain mental health providers emphasized that DMHIs are still helpful in terms of connecting and referring people to other resources and could incorporate in-person services when necessary for a hybrid format. One respondent commented on perceived usability as another barrier to uptake of DMHIs due to interventions feeling "boring" as a result of a lack of human interaction and personalized feedback. This finding is consistent with previous research, including a study that showed that boredom while using digital interventions to manage health negatively impacts user engagement (Anderson et al., 2016). To solve concerns about the lack of feedback, the integration of human support in interventions is a potentially valuable strategy and may assist in eliminating the robotic feeling and perception of ineffectiveness, which answers RQ3. Other studies showed DMHIs that incorporate human guidance or coaching appear to yield better results and user engagement than unguided interventions in HICs; however, a significant obstacle to this approach in LMICs may be the absence of support or resources. These include experts in the field, support from medical officers and appropriate associations with other facilities. As mentioned by participants, many of these resources are unavailable. To tackle this lack of resources, more research and investments need to be made, which is a suggestion for RQ4 (Carolan and de Visser, 2018; Stiles-Shields et al., 2017).

However, even if there were sufficient live user support for DMHIs, would it be sufficient enough to guide users who have not been exposed or educated on DMHI or technology platforms? Respondents from this study suggested that DMHIs should be given adequate publicity on media platforms such as radio and television to disseminate information through radio jingles and television commercials; however, no research has been conducted to support the validity of these tactics. Unfortunately, many of these personal barriers mentioned above are also interconnected with the stigma surrounding mental health in Nigeria. Digital media has perpetuated the spread of misinformation and exacerbate concerns pertaining to mental health stigma in Nigeria. Moreover, the lack of adequate information concerning the modalities and scope of telepsychiatry results in prevailing stigma associated with the use of mental healthcare facilities and the general unwillingness to seek mental healthcare. These are all gaps in the literature that should be addressed, to answer RQ4.

As noted in this study, despite the benefits, DMHIs still present risks to client privacy, which may inhibit or discourage DMHI use. Security of digital services and the control over who has access to that information is very loose, which is exacerbated by a weak legal framework where rules and laws regarding digital privacy are not enforced in Nigeria. To address these concerns, experts recommend that DMHI developers safeguard client confidentiality using encryption, software, and any other protections against adware, malware, and firewalls (Barnett, 2019). Moreover, in the event of a lost or stolen device, utilizing remote data wipe tools may be useful as well. In terms of adhering to privacy best practices from the healthcare provider's end, providers should acknowledge limits of confidentiality. Sude (2013) also recommends beginning live sessions with an assessment of the patient's location, the presence of others in a shared space, and the volume of any transmitted audio to prevent any unintentional overhearing by outside parties. Moreover, notification settings should also be adjusted to prevent the contents from DMHI apps being shown when the device is locked.

Similar to the findings of the literature, this study also found that one of the major organizational barriers to DMHI uptake is the issue of finance and lack of adequate funding for the health sector in Nigeria (Schreiweis et al., 2019). Nigeria's yearly budget for the health sector is highly below the recommendation and benchmark of the WHO, which recommends all countries to allocate 13% of their annual budget to the health sector (Muanya, 2020). In 2020, even with the impact of the pandemic, Nigeria budgeted only 4.14% of her annual national budget for the health sector, which is grossly inadequate in comparison with other developing countries (Muanya, 2020). This finding goes hand in hand with the common perspective of respondents that the Nigerian government does not assist the mental health crisis. As a result, "pilotitis" of DMHIs have been a cause for concern for implementation and sustainability. To avoid the consequences caused by "pilotitis", funding for DMHIs should steer clear from dependency on international donor financing when trying to fund the development of more DMHIs, which is another point to answer RQ3.

Challenges with regard to mental health services also include that of policy development and legislation, financing, research, training, and integration of mental health care into primary health care. For Nigeria to have an efficient and effective integration of mental health services in public health, there is need for reform of the outdated laws and formulation of new policies that will see the establishment of commission for mental health with a mission to protect and support persons with mental health needs in Nigeria. To answer RQ4, there remains an urgent need for more investment from the Nigerian government and NGOs on research, and development as well as an information center on current trends, areas of need and unmet need on mental

health services to help make informed decisions on policy directions and to monitor progress. Once changes can be made at a local or domestic level, will we only see changes at the international level and actually make a lasting difference. States like Lagos and Ekiti in Nigeria are already implementing promising laws; however, issues with voluntary mental health treatment remain still a problem in those areas. Therefore, communities must be involved in disseminating information on mental health. Families, caregivers, and guardians of mental health patients undergo great strain as well as substantial financial implications of providing mental healthcare. Traditional healers and spiritual leaders also need to be recognised as assets to get involved in the healing process through mental health outreach and training.

In rare instances where DMHIs may be available in healthcare facilities, they may still not be properly utilized due to lack of expertise of the technologies or limited power supply, which brings us to the next category of the barriers to DMHI implementation. As discussed before, access to DMHIs is unfortunately not equitably distributed. Several respondents discussed the issue of cost, as well as internet penetration in Africa and Nigeria in particular. Most DMHI apps require a web-based connection, especially in cases of linked services, such as listening to meditation music or watching videos. Therefore, it would be necessary that designers include a download button, to enable downloading real-time services such as meditation music or e-coach sessions over a wireless network, which can be followed when a user is no longer connected to wireless access. This is especially important in low-resource settings such as Nigeria, where wireless connectivity can be highly variable. Settings with restricted phone, electricity, or wifi access cannot engage in these services. To answer RQ4, designers should address these barriers in future digital interventions designed for the Nigerian context, as this would help ensure sustained engagement with DMHIs toward reaching the desired health goal and the promotion of improved mental health.

Another respondent noted that patients with mental health conditions are sometimes unemployed and cannot afford the technology such as a phone and laptop to access the internet and texting for DMHI usage. Even though DMHIs circumvent distance, they do come with an additional cost that is often even higher than the cost of travelling. According to a few mental healthcare professionals, this has prevented current professionals from implementing DMHIs since it is not accessible in local areas and communities due to severe poverty. Other studies found that a tiered system could provide more accessible services; however, one thing to be cautious of is that extra (secondary) features can differ between subscription packages, but the primary features necessary for effective mental health management should be the same and meet the required standard through DMHIs. Therefore, designers should ensure that efficiency and effectiveness of DMHIs are maintained while meeting affordability.

Several respondents also mentioned that DMHI that focuses on a wide variety of mental health illnesses could broaden the range of users. However, another study showed that certain DMHIs have the capability to extend the reach of mental health care, especially for patients with depression or substance misuse (Scholten and Granic, 2019). This same study cautioned on the use of one-size-fits-all approach, which makes digital interventions less flexible and personalized (Scholten and Granic, 2019). Since this was only noted in one study, to answer RQ4, future DMHIs in lower-middle-income settings such as Nigeria could benefit from ensuring that the gold standard for validation, such as a randomized controlled trial, is followed to ensure efficacy.

5.4 LIMITATIONS

Conducting semi-structured interviews can have limitations such as the adequacy of the sample to gain a full understanding of the case in Nigeria, biases due to verbal reports, and transferability. Due to the vulnerability of this population, the decision was made to focus on the perspectives and experiences of experts and mental health care providers. Certain perspectives such as those of DMHI users and patients were therefore not included, and the study sample may be unbalanced due to the affiliation with the DMHIs in Nigeria themselves. Further research is therefore necessary to better understand the experiences of patients and DMHI users. Moreover, only a small number of participants from each discipline were represented in the study, and their statements and experiences are not necessarily fully representative of the entire situation in Nigeria.

Moreover, according to Yin (2003) the content provided by interviewees in semi-structured interviews are verbal reports. Therefore, they are vulnerable to weaknesses as they could include recall bias and response bias. When subjects respond with what the interviewer wants to hear; these are socially desirable responses, as opposed to truthful accounts. In order to prevent these biases from transpiring and to ensure the trustworthiness of the findings, this study used the triangulation approach by which information is gathered from a range of independent sources (Mays & Pope, 1995). Another limitation is that interviewers may be susceptible to interviewer bias, which is when any prejudice or opinion of the interviewer is reflected in the interview process, therefore influencing the data (Harrell & Bradley, 2009). As recommended by Harrell & Bradley (2009) to avert this bias, this case study was constructed using interview guidelines that maintain neutrality, by asking questions to participants in the same manner and covering the same topics.

In terms of transferability, one of the aims of this study was to provide a “thick description” of the study context and research process, to allow the reader to assess

whether the findings are transferable to their own setting (Lincoln and Guba, 1985). The study did provide a rich account of descriptive data by detailing the research methods, study setting and research context, study sample and sampling strategy, inclusion and exclusion criteria, interview procedure and topics, and excerpts from the interview guide. However, to preserve the anonymity of the study participants, certain identifiable qualities such demographic, educational background, and other characteristics were not described. Moreover, since the reader makes the transferability judgment, and a case study approach means the findings are specific to a small number of environments and people, it is difficult to demonstrate that the conclusions and findings can be applied to other LMIC contexts and populations.

5.5 CONCLUSION

This study examined the level of awareness, knowledge, and current state of DMHIs among a variety of respondents from professional disciplines and health care organizations in Nigeria. The study reported on what DMHIs have been developed in Nigeria to address mental health and wellbeing, how DMHIs operate and are understood, who are the target audience and how they are reaching out to them, and how DMHIs are funded. This study also offers a first step toward identifying some of the advantages and disadvantages of using such DMHIs in LMICs. Although most of the findings are consistent with previous findings on digital health interventions, this study has extended the body of knowledge on DMHIs in Nigeria. The findings from this study suggest that attending to these advantages and disadvantages will assist in the long term management and sustainability of DMHIs in Nigeria. The results of this study could assist in the design of new DMHIs and improve existing interventions. This review of the evidence along with semi-structured interviews with expert researchers and practitioners, aims to provide stakeholders with the information necessary to make decisions about which types of places and spaces to focus on and what approaches to use for the best possible results. Our analysis provides data on the effect of DMHIs in LMICs that can help researchers to compare results with those from studies done in HICs and can facilitate communication between various regions. Our study could help with the future planning of research in LMIC populations, in terms of mental health outcomes and DMHIs.

Therefore, there is a need to leverage DMHIs within the Nigerian population for mental health promotion. Future research should examine feedback from users and providers of DMHIs to inform on design and implementation and evaluate the satisfaction of patients and providers with the DMHIs. The next step would be to conduct quantitative surveys based on the findings of this study, which will then allow for comparative analysis and more conclusive and replicable results to inform the field of research. If Nigeria confronts its toughest challenges—a complex political structure,

weak governance, poor accountability, inefficiency, and corruption—it has the potential to vastly improve population mental health using DMHIs. The lessons learned in the Nigerian context can inform the delivery of mental health services in low-resource settings with access to Internet and digital technologies. The responses from this DMHI study can be a model for other LMICs, which are suffering from fragmented mental health responses, minimal financial investment, and scarce outreach to the most vulnerable populations.

CHAPTER 6: REFERENCES

Abdulmalik, J., Kola, L., & Gureje, O. (2016). Mental health system governance in Nigeria: Challenges, opportunities and strategies for improvement. *Global Mental Health*, *3*, e9. https://doi.org/10.1017/gmh.2016.2

Abubakar, I., Dalglish, S. L., Angell, B., Sanuade, O., Abimbola, S., Adamu, A. L., Adetifa, I. M. O., Colbourn, T., Ogunlesi, A. O., Onwujekwe, O., Owoaje, E. T., Okeke, I. N., Adeyemo, A., Aliyu, G., Aliyu, M. H., Aliyu, S. H., Ameh, E. A., Archibong, B., Ezeh, A., … Zanna, F. H. (2022). The Lancet Nigeria Commission: Investing in health and the future of the nation. *The Lancet*, *399*(10330), 1155–1200. https://doi.org/10.1016/S0140-6736(21)02488-0

Acharibasam, J. W., & Wynn, R. (2018). Telemental Health in Low- and Middle-Income Countries: A Systematic Review. *International Journal of Telemedicine and Applications*, *2018*, 1–10. https://doi.org/10.1155/2018/9602821

Adepoju, P. (2020). Africa turns to telemedicine to close mental health gap. *The Lancet Digital Health*, *2*(11), e571–e572. https://doi.org/10.1016/S2589-7500(20)30252-1

Adewuya, A. O., Momodu, O., Olibamoyo, O., Adegbaju, A., Adesoji, O., & Adegbokun, A. (2019). The effectiveness and acceptability of mobile telephone adherence support for management of depression in the Mental Health in Primary Care (MeHPriC) project, Lagos, Nigeria: A pilot cluster randomised controlled trial. *Journal of Affective Disorders*, *253*, 118–125. https://doi.org/10.1016/j.jad.2019.04.025

Adiukwu, F., Ojeahere, M., Adesokun, O., & Babalola, G. (2022). Mental health distress during the COVID-19 pandemic in Nigeria: Need for psychological intervention. *South African Journal of Psychiatry*, *28*. https://doi.org/10.4102/sajpsychiatry.v28i0.1550

African Union. (2020). The Digital Transformation Strategy for Africa (2020-2030). https://au.int/sites/default/files/documents/38507-doc-dts-english.pdf

Afolabi, A. (2021). Fayemi signs mental health service bill into law. The Guardian. https://guardian.ng/news/fayemi-signs-mental-health-service-bill-into-law/

Agape, C. (2021). Nigeria at 61- The Digital Health Journey https://medium.com/@ChrisAgape/nigeria-at-61-the-digital-health-journey-3a199a67e597

Ahmed, S. A. K. S., Ajisola, M., Azeem, K., Bakibinga, P., Chen, Y.-F., Choudhury, N. N., Fayehun, O., Griffiths, F., Harris, B., Kibe, P., Lilford, R. J., Omigbodun, A., Rizvi, N., Sartori, J., Smith, S., Watson, S. I., Wilson, R., Yeboah, G., Aujla, N., … Yusuf, R. (2020). Impact of the societal response to COVID-19 on access to healthcare for non-COVID-19 health issues in slum communities of Bangladesh, Kenya, Nigeria and Pakistan: Results of pre-COVID and COVID-19 lockdown stakeholder engagements. *BMJ Global Health*, *5*(8), e003042. https://doi.org/10.1136/bmjgh-2020-003042

Alubo, O., & Hunduh, V. (2017). Medical Dominance and Resistance in Nigeria's Health Care System. *International Journal of Health Services*, *47*(4), 778–794. https://doi.org/10.1177/0020731416675981

Anderson, K., Burford, O., & Emmerton, L. (2016). Mobile Health Apps to Facilitate Self-Care: A Qualitative Study of User Experiences. *PLOS ONE*, *11*(5), e0156164. https://doi.org/10.1371/journal.pone.0156164

Arjadi, R., Nauta, M. H., Scholte, W. F., Hollon, S. D., Chowdhary, N., Suryani, A. O., Uiterwaal, C. S. P. M., & Bockting, C. L. H. (2018). Internet-based behavioural activation with lay counsellor support versus online minimal psychoeducation without support for treatment of depression: A randomised controlled trial in Indonesia. *The Lancet Psychiatry*, *5*(9), 707–716. https://doi.org/10.1016/S2215-0366(18)30223-2

Ayande, O. (2021). The role of Nigeria's faith-based organisations in tackling health crises like COVID-19. Africa Portal https://www.africaportal.org/features/role-nigerias-faith-based-organisations-tackling-health-crises-covid-19/

Ayeni, O. *E-Conomy Africa 2020 : Africa's One Hundred and Eighty Billion Dollars Internet Economy Future : Main Report (English).* Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/490801613545693757/Main-Report

Bakker, D., Kazantzis, N., Rickwood, D., & Rickard, N. (2016). Mental Health Smartphone Apps: Review and Evidence-Based Recommendations for Future Developments. *JMIR Mental Health*, *3*(1), e7. https://doi.org/10.2196/mental.4984

Barnett, J. E. (2019). The ethical practice of psychotherapy: Clearly within our reach. *Psychotherapy*, *56*(4), 431–440. https://doi.org/10.1037/pst0000272

Baumel, A., Muench, F., Edan, S., & Kane, J. M. (2019). Objective User Engagement With Mental Health Apps: Systematic Search and Panel-Based Usage Analysis. *Journal of Medical Internet Research*, *21*(9), e14567. https://doi.org/10.2196/14567

Becker, A. E., & Kleinman, A. (2013). Mental Health and the Global Agenda. *New England Journal of Medicine*, *369*(1), 66–73. https://doi.org/10.1056/NEJMra1110827

Benjet, C., Kessler, R. C., Kazdin, A. E., Cuijpers, P., Albor, Y., Carrasco Tapias, N., Contreras-Ibáñez, C. C., Durán González, M. S., Gildea, S. M., González, N., Guerrero López, J. B., Luedtke, A., Medina-Mora, M. E., Palacios, J., Richards, D., Salamanca-Sanabria, A., & Sampson, N. A. (2022). Study protocol for pragmatic trials of Internet-delivered guided and unguided cognitive behavior therapy for treating depression and anxiety in university students of two Latin American countries: The Yo Puedo Sentirme Bien study. *Trials*, *23*(1), 450. https://doi.org/10.1186/s13063-022-06255-3

Bergin, A. D., Vallejos, E. P., Davies, E. B., Daley, D., Ford, T., Harold, G., Hetrick, S., Kidner, M., Long, Y., Merry, S., Morriss, R., Sayal, K., Sonuga-Barke, E., Robinson, J., Torous, J., & Hollis, C. (2020). Preventive digital mental health interventions for children and young people: A review of the design and reporting of research. *Npj Digital Medicine*, *3*(1), 133. https://doi.org/10.1038/s41746-020-00339-7

Bevan Jones, R., Hussain, F., Agha, S. S., Weavers, B., Lucassen, M., Merry, S., Stallard, P., Simpson, S. A., & Rice, F. (2022). Digital technologies to support adolescents with depression and anxiety: Review. *BJPsych Advances*, 1–15. https://doi.org/10.1192/bja.2022.3

Bhardwaj, A., Subba, P., Rai, S., Bhat, C., Ghimire, R., Jordans, M. J. D., Green, E., Vasudevan, L., & Kohrt, B. A. (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. https://doi.org/10.1186/s13104-020-05148-5

Bhaskar, S., Nurtazina, A., Mittoo, S., Banach, M., & Weissert, R. (2021). Editorial: Telemedicine During and Beyond COVID-19. *Frontiers in Public Health*, *9*, 662617. https://doi.org/10.3389/fpubh.2021.662617

Boucher, E. M., Harake, N. R., Ward, H. E., Stoeckl, S. E., Vargas, J., Minkel, J., Parks, A. C., & Zilca, R. (2021). Artificially intelligent chatbots in digital mental health interventions: A review. *Expert Review of Medical Devices*, *18*(sup1), 37–49. https://doi.org/10.1080/17434440.2021.2013200

Boydell, K. M., Hodgins, M., Pignatiello, A., Teshima, J., Edwards, H., & Willis, D. (2014a). Using technology to deliver mental health services to children and youth: A scoping review. *Journal of the Canadian Academy of Child and Adolescent Psychiatry = Journal De l'Academie Canadienne De Psychiatrie De L'enfant Et De L'adolescent*, *23*(2), 87–99.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*, *395*(10227), 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Calvo-Valderrama, M. G., Marroquín-Rivera, A., Burn, E., Ospina-Pinillos, L., Bird, V., & Gómez-Restrepo, C. (2021). Adapting a Mental Health Intervention for Adolescents During the COVID-19 Pandemic: Web-Based Synchronous Focus Group Study. *JMIR Formative Research*, *5*(11), e30293. https://doi.org/10.2196/30293

Caplan, S., Sosa Lovera, A., & Reyna Liberato, P. (2018). A feasibility study of a mental health mobile app in the Dominican Republic: The untold story. *International Journal of Mental Health*, *47*(4), 311–345. https://doi.org/10.1080/00207411.2018.1553486

Carnegie Council for Ethics in International Affairs. (2023). *Cultural relativism*. Cultural relativism | Carnegie Council for Ethics in International Affairs. Retrieved from https://www.carnegiecouncil.org/explore-engage/key-terms/cultural-relativism

Carolan, S., & de Visser, R. O. (2018). Employees' Perspectives on the Facilitators and Barriers to Engaging With Digital Mental Health Interventions in the Workplace: Qualitative Study. *JMIR Mental Health*, *5*(1), e8. https://doi.org/10.2196/mental.9146

Carswell, K., Harper-Shehadeh, M., Watts, S., van't Hof, E., Abi Ramia, J., Heim, E., Wenger, A., & van Ommeren, M. (2018). Step-by-Step: A new WHO digital mental health intervention for depression. *MHealth*, *4*, 34–34. https://doi.org/10.21037/mhealth.2018.08.01

Carter, H., Araya, R., Anjur, K., Deng, D., & Naslund, J. A. (2021). The emergence of digital mental health in low-income and middle-income countries: A review of recent advances and implications for the treatment and prevention of mental disorders. *Journal of Psychiatric Research*, *133*, 223–246. https://doi.org/10.1016/j.jpsychires.2020.12.016

Centre for Health Economics and Development National health accounts 2010–2016, 2017 (CHECOD, FMoH and NBS). https://www.checod.org/national-health-account-2010-and-2016-checod-fmoh-and-nbs

Chan, K. L., Leung, W. C., Tiwari, A., Or, K. L., & Ip, P. (2019). Using Smartphone-Based Psychoeducation to Reduce Postnatal Depression Among First-Time Mothers: Randomized Controlled Trial. *JMIR MHealth and UHealth*, *7*(5), e12794. https://doi.org/10.2196/12794

Chandra, P. S., Parameshwaran, S., Satyanarayana, V. A., Varghese, M., Liberti, L., Duggal, M., Singh, P., Jeon, S., & Reynolds, N. R. (2018). I have no peace of mind—Psychosocial distress expressed by rural women living with HIV in India as part of a mobile health intervention—A qualitative study. *Archives of Women's Mental Health*, *21*(5), 525–531. https://doi.org/10.1007/s00737-018-0827-0

Chen L, Li Z, Chen Y. Comparative study of relapse prevention in schizophrenia by network. *J ClinPsychol Med*. 2007;17:234–36

Chory, A., Callen, G., Nyandiko, W., Njoroge, T., Ashimosi, C., Aluoch, J., Scanlon, M., McAteer, C., Apondi, E., & Vreeman, R. (2022). A Pilot Study of a Mobile Intervention to Support Mental Health and Adherence Among Adolescents Living with HIV in Western Kenya. *AIDS and Behavior*, *26*(1), 232–242. https://doi.org/10.1007/s10461-021-03376-9

Cleaver, S., Magalhaes, L., Bond, V., Polatajko, H., & Nixon, S. (2016). *Research principles and research experiences: critical reflection on conducting a PhD dissertation on global health and disability.* Disability and the Global South. https://disabilityglobalsouth.files.wordpress.com/2012/06/dgs-03-02-04.pdf

Cohen, D. J., & Crabtree, B. F. (2008). Evaluative Criteria for Qualitative Research in Health Care: Controversies and Recommendations. *The Annals of Family Medicine*, *6*(4), 331–339. https://doi.org/10.1370/afm.818

Constantinou, C. S., Georgiou, M., & Perdikogianni, M. (2017). A comparative method for themes saturation (CoMeTS) in qualitative interviews. *Qualitative Research*, *17*(5), 571–588. https://doi.org/10.1177/1468794116686650

Corrigan, P. W., & Rüsch, N. (2002). Mental Illness Stereotypes and Clinical Care: Do People Avoid Treatment Because of Stigma? Psychiatric Rehabilitation Skills, 6(3), 312–334. https://doi.org/10.1080/10973430208408441

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*, *11*(1), 100. https://doi.org/10.1186/1471-2288-11-100

Cuijpers, P., Heim, E., Abi Ramia, J., Burchert, S., Carswell, K., Cornelisz, I., Knaevelsrud, C., Noun, P., van Klaveren, C., van't Hof, E., Zoghbi, E., van Ommeren, M., & El Chammay, R. (2022). Effects of a WHO-guided digital health intervention for depression in Syrian refugees in Lebanon: A randomized

controlled trial. *PLOS Medicine*, *19*(6), e1004025. https://doi.org/10.1371/journal.pmed.1004025

Daley, K., Hungerbuehler, I., Cavanagh, K., Claro, H. G., Swinton, P. A., & Kapps, M. (2020). Preliminary Evaluation of the Engagement and Effectiveness of a Mental Health Chatbot. *Frontiers in Digital Health*, *2*, 576361. https://doi.org/10.3389/fdgth.2020.576361

de Feydeau, A., Menski, M., & Perry, S. (2022). White & Case LLP. https://www.whitecase.com/insight-our-thinking/africas-digital-infrastructure-transformation

Dick, S., O'Connor, Y., Thompson, M. J., O'Donoghue, J., Hardy, V., Wu, T.-S. J., O'Sullivan, T., Chirambo, G. B., & Heavin, C. (2020). Considerations for Improved Mobile Health Evaluation: Retrospective Qualitative Investigation. *JMIR MHealth and UHealth*, *8*(1), e12424. https://doi.org/10.2196/12424

Dosani, A., Arora, H., & Mazmudar, S. (2020). mHealth and Perinatal Depression in Low-and Middle-Income Countries: A Scoping Review of the Literature. *International Journal of Environmental Research and Public Health*, *17*(20), 7679. https://doi.org/10.3390/ijerph17207679

Elmendorf, A. E. (1999). Meredith Turshen, *Privatizing Health Services in Africa* . New Brunswick, N.J.: Rutgers University Press, 1999. *Journal of Public Policy*, *19*(3), 313–320. https://doi.org/10.1017/S0143814X99360724

Emmanuel, E. (2021). Assessing the Level of E-Health in Africa Using Nigeria as a Model; Barriers and Innovations. Health Sys Policy Res Vol.8 No.S3: 10.

EpiAFRIC and the Africa Polling Institute (API). (2020). The Mental Health in Nigeria Survey Report. https://africapolling.org/2020/01/13/mental-health-in-nigeria-survey-report-2020/

Fairburn, C. G., & Patel, V. (2017). The impact of digital technology on psychological treatments and their dissemination. *Behaviour Research and Therapy*, *88*, 19–25. https://doi.org/10.1016/j.brat.2016.08.012

Fang, C., Ye, M., Yang, Y., & Chen, S. (2011). Effects of Daily Short Message Reminder For Preventing Schizophrenia Recrudescence. *Nursing Journal of Chinese People's Liberation Army*. 2011;7:74–76.

Federal Ministry of Health. (2009). National Strategic Health Development Plan framework (2009–2015).

Firth, J., Torous, J., Nicholas, J., Carney, R., Pratap, A., Rosenbaum, S., & Sarris, J. (2017). The efficacy of smartphone-based mental health interventions for

depressive symptoms: A meta-analysis of randomized controlled trials. *World Psychiatry*, *16*(3), 287–298. https://doi.org/10.1002/wps.20472

Franz-Vasdeki, J., Pratt, B. A., Newsome, M., & Germann, S. (2015). Taking mHealth Solutions to Scale: Enabling Environments and Successful Implementation. *Journal of Mobile Technology in Medicine*, *4*(1), 35–38. https://doi.org/10.7309/jmtm.4.1.8

Fu, Z., Burger, H., Arjadi, R., & Bockting, C. L. H. (2020). Effectiveness of digital psychological interventions for mental health problems in low-income and middle-income countries: A systematic review and meta-analysis. *The Lancet Psychiatry*, *7*(10), 851–864. https://doi.org/10.1016/S2215-0366(20)30256-X

Gire, N., Farooq, S., Naeem, F., Duxbury, J., McKeown, M., Kundi, P. S., Chaudhry, I. B., & Husain, N. (2017). mHealth based interventions for the assessment and treatment of psychotic disorders: A systematic review. *MHealth*, *3*, 33–33. https://doi.org/10.21037/mhealth.2017.07.03

Goodman, L. A. (1961). Snowball Sampling. *The Annals of Mathematical Statistics*, *32*(1), 148–170. https://doi.org/10.1214/aoms/1177705148

Green, E. P., Lai, Y., Pearson, N., Rajasekharan, S., Rauws, M., Joerin, A., Kwobah, E., Musyimi, C., Jones, R. M., Bhat, C., Mulinge, A., & Puffer, E. S. (2020). Expanding Access to Perinatal Depression Treatment in Kenya Through Automated Psychological Support: Development and Usability Study. *JMIR Formative Research*, *4*(10), e17895. https://doi.org/10.2196/17895

Griffin, M. J. (2011). *Health belief model, social support, and intent to screen for colorectal cancer in older African American men*. The University of North Carolina at Greensboro.

Guo, Y., Hong, Y. A., Qiao, J., Xu, Z., Zhang, H., Zeng, C., Cai, W., Li, L., Liu, C., Li, Y., Zhu, M., Harris, N. A., & Yang, C. (2018). Run4Love, a mHealth (WeChat-based) intervention to improve mental health of people living with HIV: A randomized controlled trial protocol. *BMC Public Health*, *18*(1), 793. https://doi.org/10.1186/s12889-018-5693-1

Harrell, M. C., & Bradley, M. (2009). *Data collection methods: Semi-structured interviews and focus groups*. RAND.

Holmes, E. A., O'Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christensen, H., Cohen Silver, R., Everall, I., Ford, T., John, A., Kabir, T., King, K., Madan, I., Michie, S., Przybylski, A. K., Shafran, R., Sweeney, A., … Bullmore, E. (2020). Multidisciplinary research priorities for the COVID-19 pandemic: A call for action for mental health science. *The*

Lancet Psychiatry, *7*(6), 547–560. https://doi.org/10.1016/S2215-0366(20)30168-1

Huang, F., Blaschke, S., & Lucas, H. (2017). Beyond pilotitis: Taking digital health interventions to the national level in China and Uganda. *Globalization and Health*, *13*(1), 49. https://doi.org/10.1186/s12992-017-0275-z

Huang, K.-Y., Lee, D., Nakigudde, J., Cheng, S., Gouley, K. K., Mann, D., Schoenthaler, A., Chokshi, S., Kisakye, E. N., Tusiime, C., & Mendelsohn, A. (2019). Use of Technology to Promote Child Behavioral Health in the Context of Pediatric Care: A Scoping Review and Applications to Low- and Middle-Income Countries. *Frontiers in Psychiatry*, *10*, 806. https://doi.org/10.3389/fpsyt.2019.00806

Huckvale, K., Prieto, J. T., Tilney, M., Benghozi, P.-J., & Car, J. (2015). Unaddressed privacy risks in accredited health and wellness apps: A cross-sectional systematic assessment. *BMC Medicine*, *13*(1), 214. https://doi.org/10.1186/s12916-015-0444-y

Ilozumba, O., Dieleman, M., Kraamwinkel, N., Van Belle, S., Chaudoury, M., & Broerse, J. E. W. (2018). "I am not telling. The mobile is telling": Factors influencing the outcomes of a community health worker mHealth intervention in India. *PLOS ONE*, *13*(3), e0194927. https://doi.org/10.1371/journal.pone.0194927

Jadnanansing, R., Dekker, J., Etwaroo, K., Dwarkasing, R., Lumsden, V., Bipat, R., & Blankers, M. (2022). General Demographics and Behavioral Patterns of Visitors Using a Self-help Website for Identification of and Intervention in Alcoholism and Common Mental Disorders in Suriname: Descriptive Study. *JMIR Formative Research*, *6*(6), e33793. https://doi.org/10.2196/33793

Jannati, N., Mazhari, S., Ahmadian, L., & Mirzaee, M. (2020). Effectiveness of an app-based cognitive behavioral therapy program for postpartum depression in primary care: A randomized controlled trial. *International Journal of Medical Informatics*, *141*, 104145. https://doi.org/10.1016/j.ijmedinf.2020.104145

Jiménez-Molina, Á., Franco, P., Martínez, V., Martínez, P., Rojas, G., & Araya, R. (2019). Internet-Based Interventions for the Prevention and Treatment of Mental Disorders in Latin America: A Scoping Review. *Frontiers in Psychiatry*, *10*, 664. https://doi.org/10.3389/fpsyt.2019.00664

Johnson, J. (2022). Internet penetration in Nigeria. Statista. https://www.statista.com/statistics/183849/internet-users-nigeria/

Kane, H., Gourret Baumgart, J., El-Hage, W., Deloyer, J., Maes, C., Lebas, M.-C., Marazziti, D., Thome, J., Fond-Harmant, L., & Denis, F. (2022). Opportunities

and Challenges for Professionals in Psychiatry and Mental Health Care Using Digital Technologies During the COVID-19 Pandemic: Systematic Review. *JMIR Human Factors*, *9*(1), e30359. https://doi.org/10.2196/30359

Kanuri, N., Newman, M. G., Ruzek, J. I., Kuhn, E., Manjula, M., Jones, M., Thomas, N., Abbott, J.-A. M., Sharma, S., & Taylor, C. B. (2015). The Feasibility, Acceptability, and Efficacy of Delivering Internet-Based Self-Help and Guided Self-Help Interventions for Generalized Anxiety Disorder to Indian University Students: Design of a Randomized Controlled Trial. *JMIR Research Protocols*, *4*(4), e136. https://doi.org/10.2196/resprot.4783

Kaonga, N. N., & Morgan, J. (2019). Common themes and emerging trends for the use of technology to support mental health and psychosocial well-being in limited resource settings: A review of the literature. *Psychiatry Research*, *281*, 112594. https://doi.org/10.1016/j.psychres.2019.112594

Kenny, E. (2016). "Phones mean lies": Secrets, sexuality, and the subjectivity of mobile phones in Tanzania. *Economic Anthropology*, *3*(2), 254–265. https://doi.org/10.1002/sea2.12062

Kenny, R., Dooley, B., & Fitzgerald, A. (2016). Developing mental health mobile apps: Exploring adolescents' perspectives. *Health Informatics Journal*, *22*(2), 265–275. https://doi.org/10.1177/1460458214555041

Koch, T. (1994). Establishing rigour in qualitative research: The decision trail. *Journal of Advanced Nursing*, *19*(5), 976–986. https://doi.org/10.1111/j.1365-2648.1994.tb01177.x

Kruse, C., Betancourt, J., Ortiz, S., Valdes Luna, S. M., Bamrah, I. K., & Segovia, N. (2019). Barriers to the Use of Mobile Health in Improving Health Outcomes in Developing Countries: Systematic Review. *Journal of Medical Internet Research*, *21*(10), e13263. https://doi.org/10.2196/13263

Kuzel, A.J. (1999). Sampling in Qualitative Inquiry. In: Crabtrree, B.F. and Miller, W.L., Eds., Doing Qualitative Research, 2nd Edition, Sage Publications, Thousand Oaks, 33-45.

Kvale, S. (1996). *Interviews: An introduction to qualitative research interviewing*. Sage Publications.

Labinjo, T., Serrant, L., Ashmore, R., & Turner, J. (2020). Perceptions, attitudes and cultural understandings of mental health in Nigeria: A scoping review of published literature. *Mental Health, Religion & Culture*, *23*(7), 606–624. https://doi.org/10.1080/13674676.2020.1726883

LaDonna, K. A., Artino, A. R., & Balmer, D. F. (2021). Beyond the Guise of Saturation: Rigor and Qualitative Interview Data. *Journal of Graduate Medical Education*, *13*(5), 607–611. https://doi.org/10.4300/JGME-D-21-00752.1

Lahti, M., Groen, G., Mwape, L., Korhonen, J., Breet, E., Chapima, F., Coetzee, M., Ellilä, H., Jansen, R., Jonker, D., Jörns-Presentati, A., Mbanga, I., Mukwato, P., Mundenda, J., Mutagubya, J., Janse van Rensburg-Bonthuyzen, E., Seedat, S., Stein, D. J., Suliman, S., … Grobler, G. (2020). Design and Development Process of a Youth Depression Screening m-Health Application for Primary Health Care Workers in South Africa and Zambia: An Overview of the MEGA Project. *Issues in Mental Health Nursing*, *41*(1), 24–30. https://doi.org/10.1080/01612840.2019.1604919

Lakshminarayanan, M., Kathuria, N., & Mehra, S. (2020). Delivery of perinatal mental health services by training lay counselors using digital platforms. *Asian Journal of Psychiatry*, *54*, 102277. https://doi.org/10.1016/j.ajp.2020.102277

Lange, K. W. (2021). Coronavirus disease 2019 (COVID-19) and global mental health. *Global Health Journal*, *5*(1), 31–36. https://doi.org/10.1016/j.glohj.2021.02.004

Latif, M., Awan, F., Gul, M., Husain, M. O., Husain, M. I., Sayyed, K., Magsi, T., Naz, S., Aylem, O., Phiri, P., Irfan, M., Ayub, M., & Naeem, F. (2021). Preliminary evaluation of a culturally adapted CBT-based online programme for depression and anxiety from a lower middle-income country. *The Cognitive Behaviour Therapist*, *14*, e36. https://doi.org/10.1017/S1754470X21000313

Le, P. D., Eschliman, E. L., Grivel, M. M., Tang, J., Cho, Y. G., Yang, X., Tay, C., Li, T., Bass, J., & Yang, L. H. (2022). Barriers and facilitators to implementation of evidence-based task-sharing mental health interventions in low- and middle-income countries: A systematic review using implementation science frameworks. *Implementation Science*, *17*(1), 4. https://doi.org/10.1186/s13012-021-01179-z

Li, Y., Zhao, Q., Cross, W. M., Chen, J., Qin, C., & Sun, M. (2020). Assessing the quality of mobile applications targeting postpartum depression in China. *International Journal of Mental Health Nursing*, *29*(5), 772–785. https://doi.org/10.1111/inm.12713

Lincoln, Y. & Guba, E. (1985). Naturalistic Inquiry. Newbury Park, Ca: Sage Publications.

Liu, Z., Peach, R. L., Lawrance, E. L., Noble, A., Ungless, M. A., & Barahona, M. (2021). Listening to Mental Health Crisis Needs at Scale: Using Natural Language Processing to Understand and Evaluate a Mental Health Crisis Text Messaging Service. *Frontiers in Digital Health*, *3*, 779091. https://doi.org/10.3389/fdgth.2021.779091

Livingstone, S., Nandi, A., Banaji, S. and Stoilova, M. (2017). Young adolescents and digital media: uses, risks and opportunities in low- and middle-income countries: a rapid evidence review. London: GAGE www.gage.odi.org/publication/digital-media-risks-opportunities

Maiga, D. D. (2011). Intérêt de l'utilisation du téléphone mobile dans la réponse aux rendez-vous des patients atteints de psychoses aiguës fonctionnelles au service de psychiatrie de l'Hôpital national de Niamey. *L'information psychiatrique*, *87*(2), 127. https://doi.org/10.3917/inpsy.8702.0127

Makinde, O. A., Ezomike, C. F., Lehmann, H. P., & Ibanga, I. J. (2011). Lessons learned in the deployment of a HIV counseling and testing management information system on a new project. *AIDS*, *25*(18), 2289–2293. https://doi.org/10.1097/QAD.0b013e32834d6ad2

Malhotra, S., & Shah, R. (2015). Women and mental health in India: An overview. *Indian Journal of Psychiatry*, *57*(6), 205. https://doi.org/10.4103/0019-5545.161479

Malterud, K., Siersma, V. D., & Guassora, A. D. (2016a). Sample Size in Qualitative Interview Studies: Guided by Information Power. *Qualitative Health Research*, *26*(13), 1753–1760. https://doi.org/10.1177/1049732315617444

Marchildon, G., & Bossert, T. J. (Eds.). (2018). Chapter One. An Introduction to Federalism and Decentralization in Health Care. In *Federalism and Decentralization in Health Care* (pp. 3–15). University of Toronto Press. https://doi.org/10.3138/9781487513566-004

Marcolino, M. S., Oliveira, J. A. Q., D'Agostino, M., Ribeiro, A. L., Alkmim, M. B. M., & Novillo-Ortiz, D. (2018). The Impact of mHealth Interventions: Systematic Review of Systematic Reviews. *JMIR MHealth and UHealth*, *6*(1), e23. https://doi.org/10.2196/mhealth.8873

Marshall, M. N. (1996). Sampling for qualitative research. *Family Practice*, *13*(6), 522–526. https://doi.org/10.1093/fampra/13.6.522

Martínez, V., Espinosa-Duque, D., Jiménez-Molina, Á., Rojas, G., Vöhringer, P. A., Fernández-Arcila, M., Luttges, C., Irarrázaval, M., Bauer, S., & Moessner, M. (2021). Feasibility and Acceptability of "Cuida tu Ánimo" (Take Care of Your Mood): An Internet-Based Program for Prevention and Early Intervention of Adolescent Depression in Chile and Colombia. *International Journal of Environmental Research and Public Health*, *18*(18), 9628. https://doi.org/10.3390/ijerph18189628

Maulik, P. K., Kallakuri, S., Devarapalli, S., Vadlamani, V. K., Jha, V., & Patel, A. (2017). Increasing use of mental health services in remote areas using mobile technology: A pre–post evaluation of the SMART Mental Health project in rural

India. *Journal of Global Health*, *7*(1), 010408. https://doi.org/10.7189/jogh.07.010408

Mays, N., & Pope, C. (1995). Qualitative Research: Rigour and qualitative research. *BMJ*, *311*(6997), 109–112. https://doi.org/10.1136/bmj.311.6997.109

Mbamalu, S. (2019). Nigeria has a mental health problem. Al Jazeera. https://www.aljazeera.com/economy/2019/10/2/nigeria-has-a-mental-health-problem

Mbunge, E., Muchemwa, B., & Batani, J. (2022). Are we there yet? Unbundling the potential adoption and integration of telemedicine to improve virtual healthcare services in African health systems. *Sensors International*, *3*, 100152. https://doi.org/10.1016/j.sintl.2021.100152

Mehrotra, K., Chand, P., Bandawar, M., Rao Sagi, M., Kaur, S., G, A., Raj, A., Jain, S., Komaromy, M., Murthy, P., & Arora, S. (2018). Effectiveness of NIMHANS ECHO blended tele-mentoring model on Integrated Mental Health and Addiction for counsellors in rural and underserved districts of Chhattisgarh, India. *Asian Journal of Psychiatry*, *36*, 123–127. https://doi.org/10.1016/j.ajp.2018.07.010

Mental Health Innovation Network. (2022). PsyndUp. https://www.mhinnovation.net/organisations/psyndup

Merchant, R., Torous, J., Rodriguez-Villa, E., & Naslund, J. A. (2020). Digital technology for management of severe mental disorders in low-income and middle-income countries. *Current Opinion in Psychiatry*, *Publish Ahead of Print*. https://doi.org/10.1097/YCO.0000000000000626

Moeini, B., Bashirian, S., Soltanian, A. R., Ghaleiha, A., & Taheri, M. (2019). Examining the Effectiveness of a Web-Based Intervention for Depressive Symptoms in Female Adolescents: Applying Social Cognitive Theory. *Journal of Research in Health Sciences*, *19*(3), e00454.

Monaghesh, E., & Hajizadeh, A. (2020). The role of telehealth during COVID-19 outbreak: A systematic review based on current evidence. *BMC Public Health*, *20*(1), 1193. https://doi.org/10.1186/s12889-020-09301-4

Morse, J. M. (2000). Determining Sample Size. *Qualitative Health Research*, *10*(1), 3–5. https://doi.org/10.1177/104973200129118183

Muanya, C. (2020). Why 15% budget allocation to health is tall order. The Guardian. https://guardian.ng/features/why-15-budget-allocation-to-health-is-tall-order-by-fg/

Muhorakeye, O., & Biracyaza, E. (2021). Exploring Barriers to Mental Health Services Utilization at Kabutare District Hospital of Rwanda: Perspectives From Patients. *Frontiers in Psychology*, *12*, 638377. https://doi.org/10.3389/fpsyg.2021.638377

Muke, S. S., Shrivastava, R. D., Mitchell, L., Khan, A., Murhar, V., Tugnawat, D., Shidhaye, R., Patel, V., & Naslund, J. A. (2019). Acceptability and feasibility of digital technology for training community health workers to deliver brief psychological treatment for depression in rural India. *Asian Journal of Psychiatry*, *45*, 99–106. https://doi.org/10.1016/j.ajp.2019.09.006

Mustapha, B., Utulu, S. & Tyndall, J., (2022). Philosophical Dimensions of Research in M-Health-Based Disease Surveillance in Sub-Saharan Africa: A Systematic Literature Review. *UK Academy for Information Systems Conference Proceedings 2022*. 2. https://aisel.aisnet.org/ukais2022/2

Naslund, J. A., Aschbrenner, K. A., Kim, S. J., McHugo, G. J., Unützer, J., Bartels, S. J., & Marsch, L. A. (2017). Health behavior models for informing digital technology interventions for individuals with mental illness. *Psychiatric Rehabilitation Journal*, *40*(3), 325–335. https://doi.org/10.1037/prj0000246

Naslund, J. A., Aschbrenner, K. A., Marsch, L. A., & Bartels, S. J. (2016). The future of mental health care: Peer-to-peer support and social media. *Epidemiology and Psychiatric Sciences*, *25*(2), 113–122. https://doi.org/10.1017/S2045796015001067

Naslund, J. A., & Deng, D. (2021). Addressing mental health stigma in low-income and middle-income countries: A new frontier for digital mental health. *Ethics, Medicine and Public Health*, *19*, 100719. https://doi.org/10.1016/j.jemep.2021.100719

Naslund, J. A., Marsch, L. A., McHugo, G. J., & Bartels, S. J. (2015). Emerging mHealth and eHealth interventions for serious mental illness: A review of the literature. *Journal of Mental Health*, *24*(5), 321–332. https://doi.org/10.3109/09638237.2015.1019054

Nigerian Communications Commission. (2020). Statistics and reports. https://www.ncc.gov.ng/contact-ncc/13-statistics-reports

Nnebe, H. (2006). *National Health Policy P219–274: Policies of the Federal Republic of Nigeria 1999–2007*. Kaduna, Nigeria: Joyce Graphics.

Nwaogu, J. M., Chan, A. P. C., Naslund, J. A., Hon, C. K. H., Belonwu, C., & Yang, J. (2021). Exploring the Barriers to and Motivators for Using Digital Mental Health Interventions Among Construction Personnel in Nigeria: Qualitative Study. *JMIR Formative Research*, *5*(11), e18969. https://doi.org/10.2196/18969

Ofoegbu, T. O., Asogwa, U., Otu, M. S., Ibenegbu, C., Muhammed, A., & Eze, B. (2020). Efficacy of guided internet-assisted intervention on depression reduction among educational technology students of Nigerian universities. *Medicine*, *99*(6), e18774. https://doi.org/10.1097/MD.0000000000018774

Ogden, J., & Cornwell, D. (2010). The role of topic, interviewee and question in predicting rich interview data in the field of health research: Topic, interviewee and question in predicting rich data. *Sociology of Health & Illness*, *32*(7), 1059–1071. https://doi.org/10.1111/j.1467-9566.2010.01272.x

Ogunlesi, A. O., & Ogunwale, A. (2012). Mental health legislation in Nigeria: Current leanings and future yearnings. *International Psychiatry: Bulletin of the Board of International Affairs of the Royal College of Psychiatrists*, *9*(3), 62–64.

Okafor, I. P., Oyewale, D. V., Ohazurike, C., & Ogunyemi, A. O. (2022). Role of traditional beliefs in the knowledge and perceptions of mental health and illness amongst rural-dwelling women in western Nigeria. *African Journal of Primary Health Care & Family Medicine*, *14*(1). https://doi.org/10.4102/phcfm.v14i1.3547

Okyere, E. (2022). Can digital innovation be helpful to counselling and psychotherapy in low‐ and middle‐income countries? The case of Ghana. *Counselling and Psychotherapy Research*, *22*(2), 357–366. https://doi.org/10.1002/capr.12451

Ornell, F., Schuch, J. B., Sordi, A. O., & Kessler, F. H. P. (2020). "Pandemic fear" and COVID-19: Mental health burden and strategies. *Brazilian Journal of Psychiatry*, *42*(3), 232–235. https://doi.org/10.1590/1516-4446-2020-0008

Osborn, T. L., Rodriguez, M., Wasil, A. R., Venturo-Conerly, K. E., Gan, J., Alemu, R. G., Roe, E., Arango G., S., Otieno, B. H., Wasanga, C. M., Shingleton, R., & Weisz, J. R. (2020). Single-session digital intervention for adolescent depression, anxiety, and well-being: Outcomes of a randomized controlled trial with Kenyan adolescents. *Journal of Consulting and Clinical Psychology*, *88*(7), 657–668. https://doi.org/10.1037/ccp0000505

Osei, E., Kuupiel, D., Vezi, P. N., & Mashamba-Thompson, T. P. (2021). Mapping evidence of mobile health technologies for disease diagnosis and treatment support by health workers in sub-Saharan Africa: A scoping review. *BMC Medical Informatics and Decision Making*, *21*(1), 11. https://doi.org/10.1186/s12911-020-01381-x

Otto, M., & van Roekel, E. (2022). Struggling Along in Nigeria: Depression, Treatment, and Morality. *Ethos*, *50*(2), 184–207. https://doi.org/10.1111/etho.12345

Oyekale, A. S. (2017). Assessment of primary health care facilities' service readiness in Nigeria. *BMC Health Services Research*, *17*(1), 172. https://doi.org/10.1186/s12913-017-2112-8

Patel, V., Araya, R., Chatterjee, S., Chisholm, D., Cohen, A., De Silva, M., Hosman, C., McGuire, H., Rojas, G., & van Ommeren, M. (2007). Treatment and prevention of mental disorders in low-income and middle-income countries. *The Lancet*, *370*(9591), 991–1005. https://doi.org/10.1016/S0140-6736(07)61240-9

Patton, Q. (1990). *Qualitative evaluation and research methods*. SAGE Publications, inc.

Paul, E. (2021). Nigerian healthtech startup funding grew 404%, eCommerce almost hit 5900% in 2020. Techpoint. https://techpoint.africa/2021/02/22/nigerias-healthtech-startup-funding-grew-404-ecommerce-almost-hit-5900-in-2020/

Petersen, I., Marais, D., Abdulmalik, J., Ahuja, S., Alem, A., Chisholm, D., Egbe, C., Gureje, O., Hanlon, C., Lund, C., Shidhaye, R., Jordans, M., Kigozi, F., Mugisha, J., Upadhaya, N., & Thornicroft, G. (2017). Strengthening mental health system governance in six low- and middle-income countries in Africa and South Asia: Challenges, needs and potential strategies. *Health Policy and Planning*, *32*(5), 699–709. https://doi.org/10.1093/heapol/czx014

Pfeiffer, C., Kleeb, M., Mbelwa, A., & Ahorlu, C. (2014). The use of social media among adolescents in Dar es Salaam and Mtwara, Tanzania. *Reproductive Health Matters*, *22*(43), 178–186. https://doi.org/10.1016/S0968-8080(14)43756-X

Poudyal, A., van Heerden, A., Hagaman, A., Maharjan, S. M., Byanjankar, P., Subba, P., & Kohrt, B. A. (2019). Wearable Digital Sensors to Identify Risks of Postpartum Depression and Personalize Psychological Treatment for Adolescent Mothers: Protocol for a Mixed Methods Exploratory Study in Rural Nepal. *JMIR Research Protocols*, *8*(8), e14734. https://doi.org/10.2196/14734

Prince, M., Patel, V., Saxena, S., Maj, M., Maselko, J., Phillips, M. R., & Rahman, A. (2007). No health without mental health. *The Lancet*, *370*(9590), 859–877. https://doi.org/10.1016/S0140-6736(07)61238-0

Ragesh, G., Ganjekar, S., Thippeswamy, H., Desai, G., Hamza, A., & Chandra, P. S. (2020). Feasibility, Acceptability and Usage Patterns of a 24-Hour Mobile Phone Helpline Service for Women Discharged from a Mother-Baby Psychiatry Unit (MBU) in India. *Indian Journal of Psychological Medicine*, *42*(6), 530–534. https://doi.org/10.1177/0253717620954148

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*, 117863291769435. https://doi.org/10.1177/1178632917694350

Rauschenberg, C., Schick, A., Goetzl, C., Roehr, S., Riedel-Heller, S. G., Koppe, G., Durstewitz, D., Krumm, S., & Reininghaus, U. (2021). Social isolation, mental health, and use of digital interventions in youth during the COVID-19

pandemic: A nationally representative survey. *European Psychiatry*, *64*(1), e20. https://doi.org/10.1192/j.eurpsy.2021.17

Rodante, D. E., Kaplan, M. I., Olivera Fedi, R., Gagliesi, P., Pascali, A., José Quintero, P. S., Compte, E. J., Perez, A. I., Weinstein, M., Chiapella, L. C., & Daray, F. M. (2022). CALMA, a Mobile Health Application, as an Accessory to Therapy for Reduction of Suicidal and Non-Suicidal Self-Injured Behaviors: A Pilot Cluster Randomized Controlled Trial. *Archives of Suicide Research*, *26*(2), 801–818. https://doi.org/10.1080/13811118.2020.1834476

Rojas, G., Martínez, V., Martínez, P., Franco, P., & Jiménez-Molina, Á. (2019). Improving Mental Health Care in Developing Countries Through Digital Technologies: A Mini Narrative Review of the Chilean Case. *Frontiers in Public Health*, *7*, 391. https://doi.org/10.3389/fpubh.2019.00391

Roland, J., Lawrance, E., Insel, T. & Christensen, H. (2020). The digital mental health revolution: Transforming care through innovation and scale-up. Doha, Qatar: World Innovation Summit for Health. https://2020.wish.org.qa/app/uploads/2020/09/IMPJ7849-03-Digital-Mental-Health-WISH2020-201103-WEB.pdf

Rootes-Murdy, K., Glazer, K. L., Van Wert, M. J., Mondimore, F. M., & Zandi, P. P. (2018). Mobile technology for medication adherence in people with mood disorders: A systematic review. *Journal of Affective Disorders*, *227*, 613–617. https://doi.org/10.1016/j.jad.2017.11.022

Ross, J., Stevenson, F., Dack, C., Pal, K., May, C., Michie, S., Barnard, M., & Murray, E. (2018). Developing an implementation strategy for a digital health intervention: An example in routine healthcare. *BMC Health Services Research*, *18*(1), 794. https://doi.org/10.1186/s12913-018-3615-7

Rost, L., Samuels, C. & Marcus, R. (2020). Digital approaches to adolescent mental health. A review of the literature. *Fondation Botnar.* https://cdn.odi.org/media/documents/odi_digitalapproachesmentalhealth_final.pdf

Salamanca-Sanabria, A., Richards, D., Timulak, L., Connell, S., Mojica Perilla, M., Parra-Villa, Y., & Castro-Camacho, L. (2020). A Culturally Adapted Cognitive Behavioral Internet-Delivered Intervention for Depressive Symptoms: Randomized Controlled Trial. *JMIR Mental Health*, *7*(1), e13392. https://doi.org/10.2196/13392

Sarikhani, Y., Bastani, P., Rafiee, M., Kavosi, Z., & Ravangard, R. (2021). Key Barriers to the Provision and Utilization of Mental Health Services in Low-and Middle-Income Countries: A Scope Study. *Community Mental Health Journal*, *57*(5), 836–852. https://doi.org/10.1007/s10597-020-00619-2

Schreiweis, B., Pobiruchin, M., Strotbaum, V., Suleder, J., Wiesner, M., & Bergh, B. (2019). Barriers and Facilitators to the Implementation of eHealth Services: Systematic Literature Analysis. *Journal of Medical Internet Research*, *21*(11), e14197. https://doi.org/10.2196/14197

Scholten, H., & Granic, I. (2019). Use of the Principles of Design Thinking to Address Limitations of Digital Mental Health Interventions for Youth: Viewpoint. *Journal of Medical Internet Research*, *21*(1), e11528. https://doi.org/10.2196/11528

Seidman, G., & Atun, R. (2017). Does task shifting yield cost savings and improve efficiency for health systems? A systematic review of evidence from low-income and middle-income countries. *Human Resources for Health*, *15*(1), 29. https://doi.org/10.1186/s12960-017-0200-9

Semrau, M., Evans-Lacko, S., Alem, A., Ayuso-Mateos, J. L., Chisholm, D., Gureje, O., Hanlon, C., Jordans, M., Kigozi, F., Lempp, H., Lund, C., Petersen, I., Shidhaye, R., & Thornicroft, G. (2015). Strengthening mental health systems in low- and middle-income countries: The Emerald programme. *BMC Medicine*, *13*(1), 79. https://doi.org/10.1186/s12916-015-0309-4

Sheikh, A., Anderson, M., Albala, S., Casadei, B., Franklin, B. D., Richards, M., Taylor, D., Tibble, H., & Mossialos, E. (2021). Health information technology and digital innovation for national learning health and care systems. *The Lancet Digital Health*, *3*(6), e383–e396. https://doi.org/10.1016/S2589-7500(21)00005-4

Shore, J. H., Yellowlees, P., Caudill, R., Johnston, B., Turvey, C., Mishkind, M., Krupinski, E., Myers, K., Shore, P., Kaftarian, E., & Hilty, D. (2018). Best Practices in Videoconferencing-Based Telemental Health April 2018. *Telemedicine and E-Health*, *24*(11), 827–832. https://doi.org/10.1089/tmj.2018.0237

Sibeko, G., Temmingh, H., Mall, S., Williams-Ashman, P., Thornicroft, G., Susser, E. S., Lund, C., Stein, D. J., & Milligan, P. D. (2017). Improving adherence in mental health service users with severe mental illness in South Africa: A pilot randomized controlled trial of a treatment partner and text message intervention vs. treatment as usual. *BMC Research Notes*, *10*(1), 584. https://doi.org/10.1186/s13104-017-2915-z

Simblett, S., Greer, B., Matcham, F., Curtis, H., Polhemus, A., Ferrão, J., Gamble, P., & Wykes, T. (2018). Barriers to and Facilitators of Engagement With Remote Measurement Technology for Managing Health: Systematic Review and Content Analysis of Findings. *Journal of Medical Internet Research*, *20*(7), e10480. https://doi.org/10.2196/10480

Sobowale, K., Nguyen, M., Weiss, B., Van, T. T. H., & Trung, L. T. (2016). Acceptability of internet interventions for youth mental health in Vietnam. *Global Mental Health*, *3*, e22. https://doi.org/10.1017/gmh.2016.18

Soron, T. R., Shariful Islam, S. M., Ahmed, H. U., & Ahmed, S. I. (2020). The hope and hype of telepsychiatry during the COVID-19 pandemic. *The Lancet Psychiatry*, *7*(8), e50. https://doi.org/10.1016/S2215-0366(20)30260-1

Soroye, M. O., Oleribe, O. O., & Taylor-Robinson, S. D. (2021). Community Psychiatry Care: An Urgent Need in Nigeria. *Journal of Multidisciplinary Healthcare*, *Volume 14*, 1145–1148. https://doi.org/10.2147/JMDH.S309517

Srivastava, P., Mehta, M., Sagar, R., & Ambekar, A. (2020). Smartteen- a computer assisted cognitive behavior therapy for Indian adolescents with depression- a pilot study. *Asian Journal of Psychiatry*, *50*, 101970. https://doi.org/10.1016/j.ajp.2020.101970

Stake, R. E. (1995). *The art of case study research*. Sage Publications.

Stiles-Shields, C., Montague, E., Lattie, E. G., Kwasny, M. J., & Mohr, D. C. (2017a). What might get in the way: Barriers to the use of apps for depression. *DIGITAL HEALTH*, *3*, 205520761771382. https://doi.org/10.1177/2055207617713827

Stiles-Shields, C., Montague, E., Lattie, E. G., Kwasny, M. J., & Mohr, D. C. (2017b). What might get in the way: Barriers to the use of apps for depression. *DIGITAL HEALTH*, *3*, 205520761771382. https://doi.org/10.1177/2055207617713827

Sude, M. (2013). Text Messaging and Private Practice: Ethical Challenges and Guidelines for Developing Personal Best Practices. *Journal of Mental Health Counseling*, *35*(3), 211–227. https://doi.org/10.17744/mehc.35.3.q37l2236up62l713

Sun, M., Tang, S., Chen, J., Li, Y., Bai, W., Plummer, V., Lam, L., Qin, C., & Cross, W. M. (2019). A study protocol of mobile phone app-based cognitive behaviour training for the prevention of postpartum depression among high-risk mothers. *BMC Public Health*, *19*(1), 710. https://doi.org/10.1186/s12889-019-6941-8

Thomas, I. F., Lawani, A. O., & James, B. O. (2017). Effect of Short Message Service Reminders on Clinic Attendance Among Outpatients With Psychosis at a Psychiatric Hospital in Nigeria. *Psychiatric Services*, *68*(1), 75–80. https://doi.org/10.1176/appi.ps.201500514

Tobin, G. A., & Begley, C. M. (2004). Methodological rigour within a qualitative framework. *Journal of Advanced Nursing*, *48*(4), 388–396. https://doi.org/10.1111/j.1365-2648.2004.03207.x

Tomita, A., Kandolo, K. M., Susser, E., & Burns, J. K. (2016). Use of short messaging services to assess depressive symptoms among refugees in South Africa: Implications for social services providing mental health care in resource-poor settings. *Journal of Telemedicine and Telecare*, *22*(6), 369–377. https://doi.org/10.1177/1357633X15605406

Torrey, W. C., Cepeda, M., Castro, S., Bartels, S. M., Cubillos, L., Obando, F. S., Camblor, P. M., Uribe-Restrepo, J. M., Williams, M., Gómez-Restrepo, C., & Marsch, L. A. (2020). Implementing Technology-Supported Care for Depression and Alcohol Use Disorder in Primary Care in Colombia: Preliminary Findings. *Psychiatric Services*, *71*(7), 678–683. https://doi.org/10.1176/appi.ps.201900457

Triplett, N. S., Munson, S., Mbwayo, A., Mutavi, T., Weiner, B. J., 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. https://doi.org/10.1186/s43058-020-00102-9

Udo, R., Kenrick , Kirk-Greene, A., Falola, T. and Ajayi, JF. (2023). Nigeria. Encyclopedia Britannica. https://www.britannica.com/place/Nigeria

Ugochukwu, O., Mbaezue, N., Lawal, S. A., Azubogu, C., Sheikh, T. L., & Vallières, F. (2020). The time is now: Reforming Nigeria's outdated mental health laws. *The Lancet Global Health*, *8*(8), e989–e990. https://doi.org/10.1016/S2214-109X(20)30302-8

Uhlhaas, P., & Torous, J. (2019). Digital tools for youth mental health. *Npj Digital Medicine*, *2*(1), 104, s41746-019-0181–0182. https://doi.org/10.1038/s41746-019-0181-2

United Nations. (2020). Policy brief: COVID-19 and the need for action on mental health. https://unsdg.un.org/sites/default/files/2020-05/UN-Policy-Brief-COVID-19-and-mental-health.pdf

United Nations Department For Economic And Social Affairs. (2021). *Sustainable Development Goals Report 2021*. United Nations.

Välimäki, M., Anttila, K., Anttila, M., & Lahti, M. (2017). Web-Based Interventions Supporting Adolescents and Young People With Depressive Symptoms: Systematic Review and Meta-Analysis. *JMIR MHealth and UHealth*, *5*(12), e180. https://doi.org/10.2196/mhealth.8624

van 't Hof, E., Heim, E., Abi Ramia, J., Burchert, S., Cornelisz, I., Cuijpers, P., El Chammay, R., Harper Shehadeh, M., Noun, P., Smit, F., van Klaveren, C., van Ommeren, M., Zoghbi, E., & Carswell, K. (2021). Evaluating the Effectiveness of an E-Mental Health Intervention for People Living in Lebanon: Protocol for Two Randomized Controlled Trials. *JMIR Research Protocols*, *10*(1), e21585. https://doi.org/10.2196/21585

Wang, Z., Wang, J., & Maercker, A. (2013). Chinese My Trauma Recovery, A Web-Based Intervention for Traumatized Persons in Two Parallel Samples: Randomized Controlled Trial. *Journal of Medical Internet Research*, *15*(9), e213. https://doi.org/10.2196/jmir.2690

Watt, D. (2007). On Becoming a Qualitative Researcher: The Value of Reflexivity. Qualitative Report, 12(1), 82-101. Retrieved from http://go.unimelb.edu.au/dm56

Weinmann, S., & Koesters, M. (2016). Mental health service provision in low and middle-income countries: Recent developments. *Current Opinion in Psychiatry*, *29*(4), 270–275. https://doi.org/10.1097/YCO.0000000000000256

Westbrook, A. (2011).Mental Health Legislation and Involuntary Commitment in Nigeria: A Call for Reform, 10 Wash. U. Global Stud. L. Rev. 397, https://openscholarship.wustl.edu/law_globalstudies/vol10/iss2/7

The World Bank. (2022). *Nigeria poverty assessment 2022*. Nigeria Poverty Assessment 2022: A Better Future for All Nigerians. Retrieved from https://www.worldbank.org/en/news/infographic/2022/03/21/afw-nigeria-poverty-assessment-2022-a-better-future-for-all-nigerians

World Health Organization. (2007). Joint WHO/OGAC technical consultation on task shifting: key elements of a regulatory framework in support of in-country implementation of task shifting. Geneva: The Organization.

World Health Organization. (2008). Ouagadougou Declaration on Primary Health Care and Health Systems in Africa: Achieving better health for Africa in the new millennium. http://ahm.afro.who.int/issue12/pdf/AHM12Pages10to21.pdf.

World Health Organization. (2019). *WHO guideline: Recommendations on digital interventions for health system strengthening*. World Health Organization. https://apps.who.int/iris/handle/10665/311941

World Health Organization. (2021). Mental health atlas 2020. World Health Organization. https://apps.who.int/iris/handle/10665/345946.

World Health Organization. (2022). Mental Health. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response

World Health Organization, PEPFAR, & UNAIDS. (2007). *Task shifting: Rational redistribution of tasks among health workforce teams : global recommendations and guidelines*. 88.

Xiang, Y.-T., Jin, Y., & Cheung, T. (2020). Joint International Collaboration to Combat Mental Health Challenges During the Coronavirus Disease 2019 Pandemic. *JAMA Psychiatry*, *77*(10), 989. https://doi.org/10.1001/jamapsychiatry.2020.1057

Xu, D. (Roman), Xiao, S., He, H., Caine, E. D., Gloyd, S., Simoni, J., Hughes, J. P., Nie, J., Lin, M., He, W., Yuan, Y., & Gong, W. (2019). Lay health supporters aided by mobile text messaging to improve adherence, symptoms, and

functioning among people with schizophrenia in a resource-poor community in rural China (LEAN): A randomized controlled trial. *PLOS Medicine*, *16*(4), e1002785. https://doi.org/10.1371/journal.pmed.1002785

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed). Sage Publications.

Zuccolo, P. F., Xavier, M. O., Matijasevich, A., Polanczyk, G., & Fatori, D. (2021). A smartphone-assisted brief online cognitive-behavioral intervention for pregnant women with depression: A study protocol of a randomized controlled trial. *Trials*, *22*(1), 227. https://doi.org/10.1186/s13063-021-05179-8

APPENDIX A. RESEARCH ETHICS MATERIALS

HiREB
Hamilton Integrated Research Ethics Board

Jun-30-2022

Project Number: 14941

Project Title: Digital Mental Health Initiatives (DMHIs) Available In Nigeria – A Qualitative Interview Study

Student Principal Investigator:

Local Principal Investigator: Dr. Christy Gombay

We have completed our review of your study and are pleased to issue our final approval. You may now begin your study.

The following documents have been approved on both ethical and scientific grounds:

Document Name	Document Date	Document Version
Sample Recruitment Email_Telephone Script 2.0	Jun-22-2022	2.0
Thesis Protocol Final Submission (2)	Jun-22-2022	2.0
Data Collection Form- Interview Questions 2.0	Jun-22-2022	2.0
Study Key V2.0	Jun-22-2022	2.0
Consent Form V2 (3)	Jun-22-2022	2.0

The following documents have been acknowledged:

Document Name	Document Date	Document Version
tcps2_core_certificate	May-26-2022	1
Cover Letter (1)	Jun-22-2022	2.0

In light of the current COVID-19 pandemic, while HiREB has reviewed and approved this application, the research must be conducted in accordance with institutional and/or public health requirements.

Any changes to this study must be submitted with an Amendment Request Form before they can be implemented.

This approval is effective for 12 months from the date of this letter. Upon completion of your study please submit a **Study Completion Form**.

If you require more time to complete your study, you must request an extension in writing before this approval expires. Please submit an **Annual Review Form** with your request.

PLEASE QUOTE THE ABOVE REFERENCED PROJECT NUMBER ON ALL FUTURE CORRESPONDENCE

Good luck with your research,

Kristina Trim, PhD, RSW
Chair, HiREB Student Research Committee
McMaster University

Sample Recruitment Email

To:
Subject: Request to Participate as a Key Informant Interview for Master's Thesis

Dear [name],

My name is Tiffany Chen, and I am an MSc. in Global Health student at McMaster University in Hamilton, Canada. I would like to invite you to participate as a key informant in a 30 minute interview for a thesis on digital mental health interventions (DMHIs) in Nigeria. My thesis aims to map the current state of DMHIs available in Nigeria, and illustrate its progress, limitations, and challenges. Your experience in [role/research field] would help to inform the understanding of DMHI usage in low-resource settings and contribute to the development and implementation of evidence-based DMHIs to address health system gaps and global health inequalities.

I have attached to this email the study's consent form and letter of information. Please review these and feel free to contact me by email at chent59@mcmaster.ca or by phone at 613-407-9925 if you have any questions or concerns. If you are interested in participating, please respond to this email with some possible dates and times when an interview could be scheduled.

Thank you so much for your time and consideration,
Tiffany Chen

Sample Recruitment Phone Script

Hello. My name is Tiffany Chen, and I am an MSc. in Global Health student at McMaster University in Hamilton, Canada. I am currently conducting interviews on digital mental health interventions (DMHIs) in Nigeria. I'm conducting these interviews as part of my Master's thesis in Global Health at McMaster University. This thesis project is being conducted under the guidance of Dr. Christy Gombay, Assistant Director of McMaster's Global Health program.

I'm inviting you to participate in a one-on-one 30 minute interview over Zoom. I will ask you questions about the types of digital mental health interventions available in Nigeria, the advantages and disadvantages of such DMHIs, lessons learned from these digital approaches, and future research directions. Your experience in [role/research field] would help to inform the understanding of DMHI usage in low-resource settings and contribute to the development and implementation of evidence-based DMHIs to address health system gaps and global health inequalities.

With your consent, I will audio record your responses so I don't miss anything said. You do not have to answer any questions that make you feel uncomfortable or that you do not want to answer. The interview will be confidential and no one except for the primary researcher (that is, myself) will have access to the information documented.

Would you be interested in participating in this study?

If Yes:
When would be a convenient time for the interview?
Date: _____

Time: _____

May I have your email address? Your email will be used to share with you the study's consent form. Do you have any questions or concerns?

If you have any additional questions after this call or would like more information you can contact me at chent59@mcmaster.ca or 613-407-9925. I look forward to speaking to you soon. Thank you and have a great day.

If No:
Thank you for your time and consideration.

Informed Consent Form

Project title: Digital Mental Health Initiatives Available In Nigeria – A Qualitative Interview Study
Principal Investigator: Dr. Christy Gombay PhD (gombayc@mcmaster.ca)
Primary Researcher: Tiffany Chen (chent59@mcmaster.ca)
Organization: McMaster University

This Informed Consent Form has two parts:

- **Information Sheet (to share information about the study with you)**
- **Certificate of Consent (for signatures if you choose to participate)**

You will be given a copy of the full Informed Consent Form

PART 1: INFORMATION SHEET

Introduction

As access to smartphones and the internet become more accessible and affordable in low- and middle-income-countries (LMICs), digital mental health interventions (DMHIs) have grown in popularity. DMHIs can be delivered in many ways (e.g. websites, telephone support, smartphone apps, and text messaging) and come in many forms. Types of mental health interventions include information and education, reflection and self-care, online therapies, individual or group-based digital support and professional mental health services. Since most DMHIs are developed in high income countries, we still don't know much about their use in LMICs. This study focuses on Nigeria since it has the largest population in Africa and 25% of Nigerians are reported to suffer from a mental illness. By doing key informant interviews, this thesis aims to answer four questions. What types of DMHIs are available in Nigeria? What are the advantages of DMHIs? What are some disadvantages of DMHIs? What are some lessons learned from DMHIs? What are the future research directions of DMHI?

What Is The Purpose Of This Study?

The research evidence to support the usage of DMHIs has not kept pace with the rapid growth of the digital mental health field. Therefore, this research paper aims to map the current state of DMHIs available in Nigeria, and illustrate its progress, limitations, and challenges. The lessons learned in the Nigerian context will help us better understand DMHIs usage and implementation in low resource settings. The study findings can also provide further insight towards the development and implementation of safe, effective and evidence-based DMHIs in LMICs.

This study is also being conducted for academic purposes for a Master's Thesis in Global Health at McMaster University under the supervision of Dr. Christy Gombay. You can email the primary researcher (Tiffany Chen) at chent59@mcmaster.ca if you have questions. This consent form

may have words you do not understand. Please email chent59@mcmaster.ca if you have trouble understanding this form.

Why Am I Being Asked To Participate In The Study?

You have been invited to participate in this research project because you are an individual who plays a prominent role in the fields of mental health in Nigeria. This study aims to expand upon the findings of recent studies on LMICs by incorporating the perspectives of clinical and research experts, social workers, occupational therapists, digital health experts, community leaders, spiritual leaders and people who work for or have used or heard of DMHIs in Nigeria.

What Are the Expectations If I Take Part In The Study?

This research will involve your participation in an online interview over Zoom or Skype.

Voluntary Participation

Participation in this survey is entirely voluntary. There is no impact on you or anyone else if you choose not to participate. If you participate and then change your mind during the interview,you may stop participating at any point in time.

Procedures

During the interview you may be asked about your current role in the mental health field in Nigeria, what you know of the types of DMHIs that are available in Nigeria, your knowledge about how are these DMHIs operated and funded, what are the advantages/disadvantages of DMHIs, what are some lessons learned from DMHIs and what are the future research directions of DMHIs. If you wish to skip any question, you may do so. If you have any questions or concerns, please email chent59@mcmaster.ca.

You will be interviewed by the primary researcher, Tiffany Chen (TC) in English. You will need access to a device and internet connectivity. A Zoom or Skype link hosted by McMaster University will be used to contact you. You will access this online interview via a link sent to the email you share with us during participant recruitment. Your interviewer will be in private locations and will be wearing headphones. No one else will be present with the interviewers unless you choose otherwise. You may choose to attend the virtual interview from wherever you feel comfortable. If you do not wish to answer a specific question, you can tell the interviewer and the interviewer will move on to the next question. The entire interview will be recorded, but no one will be identified by name on the recording. Please do not make any recordings of the interview yourself. You may change your display name to an agreed upon pseudonym if preferred. The recording will be stored on a password protected computer and the individual files will also be password protected. All data will also be stored on McMaster University's One Drive server. The computer will be scanned using anti-virus and anti-malware software regularly, use secure browser plugins, and always be updated to the latest security updates. The computer will also be stored in a locked room with only the primary researcher (TC) having access to it. The recordings will be destroyed after 2 years.

What is the Study Duration?

This research takes place over an estimated 30 minutes for the online interview. The interviews will be conducted over the months of June 2022 to September 2022.

What Are The Risks Involved In This Study?

This study will use the platforms Zoom and Skype to collect data, which are externally hosted cloud-based services. Links to their privacy policy are available here (https://explore.zoom.us/en/privacy/) and (https://support.skype.com/en/skype/all/privacy-security/). While the Hamilton Integrated Research Ethics Board (HiREB) has approved using these platforms to collect data for this study, there is a small risk of a privacy breach for data collected on external servers. Moreover, since online communication will be conducted over email, there are also associated privacy risks. These risks exist with all emails and are not unique to Outlook 365. The primary researcher (TC) will do their best to safeguard your confidentiality but cannot guarantee any faults of the software, platforms, or tools which are outside our direct control.

If you are concerned about this, we would be happy to make alternative arrangements for you to participate, perhaps via telephone. Please contact the primary researcher (TC) through phone 613-407-9925 or email chent59@mcmaster.ca if you have any concerns.

Benefits

While there may not be any direct benefits to you, your participation in this study will contribute to the emerging scientific knowledge of DMHIs usage in Nigeria and provide insight towards implementing DMHIs in LMICs.

Reimbursements

You will not be provided any incentive to take part in the research.

Sharing the Results

Names and personal identifiers will be removed from the data and the data will be aggregated (grouped) for the final report. If direct quotes will be used from the interviews, names and personal identifiers will be removed. We will publish the results so that other interested people may learn from the research. When responding to the interview questions, please keep in mind that despite the removal of personal identifiers, you may still be identifiable by the stories and experiences shared.

Can I Stop Participating In This Study?

You do not have to take part in this research if you do not wish to do so, and choosing to participate will not affect you in any way. You can decide to withdraw at any time, even after signing the consent form or part-way through the study by emailing chent59@mcmaster.ca. You have an opportunity at the end of the interview/discussion to review your remarks, and you can ask to modify or remove portions of your provided information up until analysis is completed (October 1st, 2022).

If I have Any Questions, Whom Can I Contact?

If you have any questions, you may contact Tiffany Chen (chent59@mcmaster.ca).

This study has been reviewed by the Hamilton Integrated Research Ethics Board (HiREB). The HiREB is responsible for ensuring that participants are informed of the risks associated with the research, and that participants are free to decide if participation is right for them. If you have any questions about your rights as a research participant, please call the Office of the Chair, HiREB, at 905.521.2100 x 42013.

For the purposes of ensuring proper monitoring of the research study, it is possible that representatives of the Hamilton Integrated REB (HiREB), this institution, and affiliated sites or regulatory authorities may consult your original (identifiable) research data to check that the information collected for the study is correct and follows proper laws and guidelines. By participating in this study, you authorize such access.

Part II: Certificate of Consent
I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study. By participating in this study you do not waive any rights to which you may be entitled under the law.

☐ I agree to be contacted by the primary researcher via email services during the study period.

☐ I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.

☐ I agree to complete the interview, and consent to my interview being audio-recorded.

☐ I consent to the 2 year storage of this information.

☐ I agree to allow the primary researcher access to my collected data for research purposes.

☐ I agree to allow the primary researcher to publish my collected data for research purposes.

_____
Name

_____ _____
Signature of Participant Date (yyyy/mm/dd)

Consent form explained by:

_____
Name

_____ _____

Signature Date (yyyy/mm/dd)

APPENDIX B. DATA COLLECTION MATERIALS

Interview Script

Hello, thank you for agreeing to be interviewed for this research project. The research paper I am preparing aims to map the current state of digital mental health interventions (DMHIs) available in Nigeria, and illustrate its progress, limitations, and challenges. This project will expand upon the findings of recent quantitative and qualitative studies in low- and middle-income countries (LMICs) by incorporating the perspectives of individuals like yourself, who play a prominent role in the fields of digital mental health interventions and global mental health.

My name is Tiffany Chen. I am an MSc in Global Health thesis student at McMaster University in Canada and your interviewer for today. In this 30-minute semi-structured interview, I will ask you about the types of digital mental health interventions available in Nigeria, the advantages and disadvantages of such digital mental health interventions, lessons learned from these digital approaches, and future research directions in this field.

Does this time still work for you? Are you in a comfortable location for this interview? (If concerns, reschedule interview).

The types of questions asked will require some recollection so feel free to take a few moments prior to answering to organize your thoughts. If you would like us to repeat or rephrase a question or would like to skip a question and come back to it at the end of the interview, please just let us know.

The interview will be confidential and no one except for the primary researcher (that is, myself) will have access to the information documented. The entire interview will be recorded for later reference and analysis, but no one will be identified by name on the tape. Do you have any questions before we begin?

Questions

1. Can you tell me a little bit about your research/work and what your current role is in the mental health field in Nigeria?
2. How do you define mental health and wellbeing?
3. How would you define digital mental health?
4. Are you aware of any digital mental health initiatives in Nigeria that address the mental health and wellbeing of individuals?
    1. What is the digital mental health interventions' target audience?
        1. Is it a specific mental illness?
        2. Is it a specific age or demographic?

2. How are they reaching out to this target population?
    1. How has social media played a role in advertising existing digital mental health interventions?
3. How does the intervention operate?
4. How is it funded?
5. Do you think this digital mental health intervention is effective?
    1. How are ethical issues taken into consideration?
        1. Safety
        2. Accountability
        3. Privacy and Confidentiality
        4. Data Protection
        5. Transparency
        6. Bias and Fairness
    2. How are accessibility issues taken into consideration?
        1. Culture
        2. Language
        3. Stigma
5. What are the advantages of using such digital mental health interventions to address the mental health and wellbeing of individuals?
6. What are the disadvantages of using such digital mental health interventions to address the mental health and wellbeing of individuals?
7. How do you think digital mental health interventions should be funded in Nigeria?
8. What are some lessons learned regarding digital mental health initiatives to address the mental health and wellbeing of individuals with digital approaches?
    1. Do you think other LMICs could implement this type of digital mental health intervention?
9. What are the current gaps in the literature and recommendations for future research directions?
10. Is there anything I might have missed in this interview you would like to cover?

Conclusion

That will conclude the end of the interview. Thank you so much for participating and taking the time to share your opinions and expertise with me. Please feel free to contact me if you have any questions or concerns that may arise. You can reach me at any time at chent59@mcmaster.ca or 613-407-9925.