



# Mental health care cascade performance and associated factors: longitudinal analyses of routine Ministry of Health services in Mozambique

Morgan Turner <sup>1</sup>, Alberto Muanido,<sup>2</sup> Vasco Cumbe,<sup>3,4</sup> João Nhalimue Jala Jr.,<sup>2</sup> Ernesto Eusébio Armando,<sup>5</sup> Eduarte Mambuque Jr.,<sup>5</sup> Flávia Faduque,<sup>6</sup> Ernesto Rodrigo Xerinda,<sup>3</sup> Kenneth Sherr <sup>1,7,8</sup>, Bryan J Weiner,<sup>1</sup> Brian P Flaherty,<sup>9</sup> Monisha Sharma,<sup>1</sup> Bradley H Wagenaar<sup>1,7</sup>

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For numbered affiliations see end of article.

**Correspondence to**  
Morgan Turner;  
[morgank2@uw.edu](mailto:morgank2@uw.edu)

## ABSTRACT

**Introduction** Mental, neurological and substance use (MNS) disorders are leading causes of disability worldwide. Nevertheless, limited research exists regarding MNS health system performance across the care cascade and associated patient characteristics in low-income and middle-income countries (LMICs) such as Mozambique.

**Methods** We used baseline data from an ongoing randomised controlled trial, collected across 16 outpatient clinics on variables of sex, age, marital status, tuberculosis and HIV status, alcohol and drug use, suicidal ideation, pregnancy and MNS diagnosis. Mixed-effects multivariable regression was used to examine factors associated with patient functional improvement or low functional impairment measured by a standardised disability questionnaire.

**Results** From February to September 2022, there were 4323 patient visits, of which 65.9% (n=2851) were attended on time ( $\pm 5$  days), 41.4% (n=1793) had medication adherence and 30.5% (n=1321) achieved a functional impairment score  $<10$  or 50% improvement from baseline. Patients 15–18 years old had 60% lower odds of demonstrating functional improvement or low functional impairment during a follow-up visit compared with those 26–35 years old (95% CI: 0.19, 0.85). Compared with single persons, those in a domestic union had 3.3 times higher odds of demonstrating functional improvement or low functional impairment (95% CI: 1.8, 6.1). Individuals expressing suicidal ideation had 85% lower odds of demonstrating functional improvement than those without suicidal ideation (95% CI: 0.02, 0.91). For patients new to treatment, each additional visit was associated with a mean reduction in functional impairment of 0.62 points (95% CI: –0.76, –0.47).

**Conclusions** This analysis revealed gaps in patients reaching functional improvement or low functional impairment in outpatient MNS care in Mozambique. Gaps were more pronounced for patients who are  $\leq 18$  years of age, single or expressing suicidal ideation. Implementation strategies to optimise patient outcomes are needed as nascent mental health systems are scaled-up in Mozambique and other similar LMICs.

**Trial registration number** [NCT05103033](https://www.clinicaltrials.gov/ct2/show/study?term=NCT05103033).

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Limited research exists regarding mental, neurological and substance use (MNS) health system performance across the care cascade and associated patient characteristics in low-income and middle-income countries (LMICs) such as Mozambique.

## WHAT THIS STUDY ADDS

⇒ This analysis revealed gaps in patients reaching functional improvement or low functional impairment in outpatient MNS care in Mozambique. Such gaps were more pronounced for patients who are  $\leq 18$  years of age, single, expressing suicidal ideation, or with organic disorders. Notwithstanding the gaps identified, this study also showed that current MNS care in Mozambique is effective at decreasing functional impairment among patients who are retained in care.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our results identify existing gaps between desired outcomes and observed outcomes in the mental health system, helping to clarify the scale of the problem and highlight the pressing need to develop implementation strategies that will inform scale-up of equitable and high-quality MNS services globally.

## INTRODUCTION

Mental, neurological and substance use (MNS) disorders continue to be a leading cause of disability worldwide, cumulatively accounting for up to 16% of global disability-adjusted life years (DALYs).<sup>1</sup> Economic impacts of MNS disorders, including treatment and indirect costs of disability and premature morbidity, are estimated at US\$4.7 trillion per year globally.<sup>1</sup> The 2016 Disease Control Priorities identified MNS disorders as some of the most neglected

health conditions globally despite the existence of cost-effective, evidence-based interventions.<sup>2</sup> Much of global mental health (MH) research has focused on clinical interventions; yet limited implementation research exists regarding strategies to optimise the delivery of evidence-based public mental healthcare.<sup>3</sup> While substantial evidence exists on the MH treatment gap in low-income and middle-income countries (LMICs),<sup>4-6</sup> few studies have evaluated later stages in the MH care continuum, such as the proportion of patients who come back for a follow-up appointment, are adherent to their medication and are demonstrating improvement in daily functioning. Furthermore, fragmented and inconsistent data collection and reporting systems are significant barriers to assessing and comparing MH system performance.<sup>7</sup>

A care cascade identifies linked steps along a treatment pathway that a person would likely pass through from detection to remission. For most MNS care cascades, clinical detection is the first step in the care pathway. Globally, the WHO World Mental Health surveys administered in 21 countries found that 71.1% of respondents who recognised the need for depression treatment attended at least one visit for treatment, but only 41% of those visits met minimal treatment standards.<sup>6</sup> Five of the 21 countries surveyed were designated as low or low-middle income. Among them, results were significantly lower at 52.6% who attended at least one treatment visit and 20.5% of those visits met minimal standards.<sup>6</sup> Additionally, among all individuals diagnosed with depression in the previous 12 months, only 3.7% received minimally adequate treatment in LMICs compared with 22.4% in high-income countries.<sup>6</sup>

To our knowledge, there are few comprehensive assessments of performance across the MNS care cascade in LMICs and fewer examining care cascade performance by sociodemographic factors. A 2020 study conducted in South Africa found no significant association between sociodemographic characteristics and the likelihood of clinical diagnosis or referral to treatment but noted that small sample sizes were a limitation at later steps of the cascade.<sup>8</sup> A 2020 preliminary effectiveness study of Systems Analysis and Improvement Approach for Mental Health (SAIA-MH) which tracked patient outcomes for 3234 patient visits in Sofala Mozambique found that prior to implementation of SAIA-MH only 45.6% of follow-up appointments were attended on time, in 17.0% of visits patients were adherent to medication, and in 26.6% of visits patients demonstrated functional improvement.<sup>9</sup>

The present paper aims to fill these gaps in the literature by analysing real-world Ministry of Healthcare cascade performance for a census of patients attending outpatient MH consultations across a sample of 16 outpatient MH clinics in central Mozambique over 7 months and by examining the association between sociodemographic factors and performance across the MH care cascade. These findings can identify existing gaps in patient care and behaviour, while helping to clarify the scale of the problem. The data highlights the pressing

need to develop implementation strategies that will inform the scale-up of equitable and high-quality MNS services globally.

## MATERIALS AND METHODS

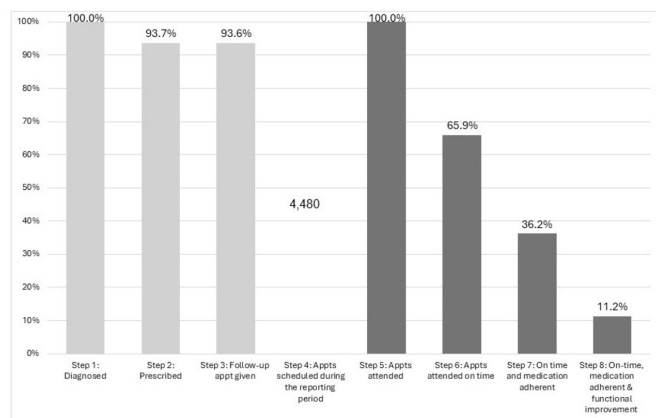
We used baseline data from an ongoing cluster randomised controlled trial (RCT) testing the effectiveness, cost-effectiveness and potential mechanisms of the SAIA-MH care cascade optimisation implementation strategy.<sup>10</sup> SAIA-MH is an intervention at the health system level to improve patient outcomes. Patient data were collected after the introduction of new patient tracking tools and introduction of the WHO Disability Assessment Schedule (WHODAS 2.0) for health facility use but prior to implementation of SAIA-MH. Mental health care cascade performance for follow-up visits is assessed only for patients  $\geq 15$  years because the WHODAS 2.0 is only applied for those older than 14 years.

Data were collected as part of routine care and are analysed in two cohorts. One cohort ( $n=2164$ ) is all patients who participated in treatment during data collection. All patients have a 'first' visit recorded in the new tracking tools but are not necessarily new to MNS treatment; many of them were already participating in mental health services at the time the tools were introduced. Therefore, to capture treatment and symptom progression of new patients, we also analysed a second cohort ( $n=496$ ) of patients that were recorded by psychiatric technicians as being new to MH services and thus having a true baseline WHODAS 2.0 score. WHODAS 2.0 scores were collected for all patients at each visit but mean WHODAS 2.0 scores at baseline were assessed only for those patients in the second cohort who were new to treatment ( $n=496$ ). All data related to HIV status from one facility were recategorised as missing after systematic flaws in data collection were identified.

## Study setting

Mozambique has a population of 32.1 million, 66% of whom live in rural areas.<sup>11</sup> The country has worked hard to reinforce its primary healthcare system in the face of repeated natural disasters and an ongoing violent conflict in the northern region. Mental disorders were the number one cause of years lived with disability (YLD) in 2019, accounting for 15% of YLD,<sup>12</sup> an increase of 1.3% from the previous year despite government efforts to increase access to MH services. Substance use disorders and idiopathic epilepsy, both treated by MNS services in the country, made up an additional 2% and 1.7% of YLD respectively.<sup>12</sup>

Mozambique has 1228 MH professionals including psychiatrists, psychologists, occupational therapists and psychiatric technicians.<sup>5</sup> As little as 0.5% of the country's health budget is dedicated to the provision of MH services.<sup>5</sup> To address the MH treatment gap, Mozambique has prioritised the use of task-shifting to increase access to MH services. Since 1996, the Ministry of Health



**Figure 1** Representation of the mental health care cascade from 6487 patient visits at 16 clinics in Sofala and Manica Provinces, Mozambique.

has trained hundreds of psychiatric technicians who undergo a 2.5-year training programme preparing them to diagnose and treat MNS disorders using psychopharmacology and psychosocial interventions.<sup>5</sup> This nationwide initiative has expanded access to psychiatric care to tens of thousands of individuals. However, there are insufficient data on the reach and performance of these vital health services.

### Defining the mental health care cascade

The psychiatry care cascade has eight steps across two interconnected sections (figure 1). The first three steps are the ‘initiation cascade’ during which a new psychiatric patient is (1) diagnosed with an MNS condition (2) prescribed medication to treat their MNS condition and (3) given a follow-up appointment to continue monitoring and medication management. Thus, the initiation cascade is only relevant for patients diagnosed with an MNS condition who are also prescribed medication and enrolled in follow-up care for their condition. The next five steps represent repeat patient visits whereby a patient will continue to pass through the ‘follow-up care cascade’ numerous times during the management of their MNS condition. This includes (4) having a follow-up appointment scheduled, (5) attending a follow-up appointment, (6) attending a follow-up appointment on time, (7) being medication adherent and (8) achieving functional improvement or demonstrating low functional impairment (online supplemental table 1). Step 8 is measured via administration of the WHODAS 2.0 at each visit which has been validated as a cross cultural, standardised measure of health and disability<sup>13</sup> and was adapted for use in Mozambique.

If data necessary to calculate the cascade were not recorded by the psychiatric technician, such as the patient’s WHODAS score or number of days of medication prescribed, that data were recorded as not having achieved the applicable step. It is not possible to know if the patient truly achieved the step or not, but as a

reflection of MNS health system performance, failing to record patient information was analysed as a failure of that step.

Treatment gaps observed in a care cascade are often due to a complex combination of factors that preclude attribution to a single cause. Recovery in mental health is multifaceted and sometimes spontaneous but identification of gaps within a care cascade at the population level highlights areas of potential intervention within health systems.

### Health facility eligibility

This study was conducted in Sofala and Manica provinces in Central Mozambique. Eligible facilities were public sector Ministry of Health clinics with  $\geq 100$  average annual outpatient mental health consultations from 2019 to 2020 and that had a minimum of one psychiatric technician and one psychologist allocated by the government.<sup>10</sup>

### Data collection and management

This study included a census of all patients presenting for intake or follow-up psychiatric care at 16 health facilities from 4 February 2022 to 19 September 2022, as a part of the baseline data collection period for a cluster RCT study to evaluate an implementation strategy (SAIA-MH) to optimise the MNS care cascade.<sup>10</sup> Primary and secondary MH diagnoses were recorded using the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10), which is the standard practice by the Mozambican Ministry of Health. Psychiatric technicians at all 16 facilities attended a 2-day training on using an enhanced patient registry, patient charting tools and the WHODAS 2.0. More information is available in the clinical trial protocol.<sup>10</sup> Facility staff received monthly supervision visits to answer questions and evaluate compliance with documentation procedures. Hard copy patient charts were completed by psychiatric technicians during routine service delivery and then digitised by study research assistants during monthly clinic visits using CommCare.<sup>14</sup> Data were screened using fixed algorithms for errors in dates and codes on which subsequent calculations were based. Suspected errors were checked against the original patient record; data were then corrected as appropriate.

### Statistical analyses

Mixed-effects univariable and multivariable logistic and linear regression was performed in STATA to calculate the adjusted odds ratios (aOR) examining the relationship between progression to step 8, functional improvement or low functional impairment, and sociodemographic variables. Mixed-effects models included random effects at the patient and health facility level to account for repeated measures and clustered nature of the data.



## RESULTS

### Sociodemographic characteristics

Overall, 2164 patients attended at least one appointment during the study period (table 1), 76.6% (n=1660) were ≤35 years of age and with 30.3% (n=657) ≤18 years old. Approximately half of were men (53.9%, n=1168). Most participants reported being single (69.1%, n=1496), 7% (n=152) married and 16.6% (n=360) in a domestic union.

Overall, 11.1% (n=241) reported having HIV. Notably, 17.4% (n=377) stated that they have never been tested for HIV despite a high prevalence of HIV/AIDS in Mozambique. Similarly, 41.4% (n=897) have never been tested for TB (tuberculosis) and 4.7% (n=102) stated that they have tested positive for TB. A total of 8.3% (n=181) of respondents reported alcohol use in the previous 6 months and 14.7% (n=320) reported a history of alcohol use. Suicidal ideation was reported by 2.4% (n=52) of patients at the first documented visit.

The most common primary diagnosis was epilepsy (ICD-10 code G40-41), 67.9% (n=1471), followed by 11.6% (n=253) with schizophrenia or delusional disorders (ICD codes F20-29). Only 5.9% (n=129) of patients were diagnosed with affective disorders, including depressive disorders or bipolar disorder, or stress-related or somatoform disorders, including generalised anxiety disorder (F30-49).

At the first documented visit, WHODAS scores differed significantly across ICD-10 diagnostic categories. The mean WHODAS score for those diagnosed with epilepsy (G40-41) was 11.2 (n=249, SD: 8.0). However, compared with epilepsy patients, those diagnosed with organic disorders (F00-09), such as dementia, delirium or mental disorders caused by a physiological condition, had a mean WHODAS score of 24.5, which was statistically significantly higher by 13.2 points (95% CI: 1.9, 24.5). Compared with those aged 26–35, the patients aged >65 scored 10.5 points higher on average (95% CI: 0.51, 20.6). Patients reporting current suicidal ideation had a WHODAS of 10.4 points higher (95% CI: 2.3, 18.6) than patients reporting no suicidal ideation (table 1).

### Mental health care cascade performance

Patients attended 4323 follow-up appointments, of which 65.9% (n=2851) were attended on-time (±5 days from scheduled appointment), in 41.4% (n=1793) of appointments, patients demonstrated medication adherence (based on pill counts and patient report), and in 30.5% (n=1321) of appointments, patients demonstrated functional improvement or low functional impairment (50% decrease in WHODAS score from baseline or absolute WHODAS <10) (table 2).

In adjusted models, patients 15–18 years old had 60% lower odds of functional improvement or low functional impairment (aOR: 0.40, CI: 0.18, 0.85), compared with patients 26–35 years old (table 3). Those in a domestic union had threefold higher adjusted odds of reaching functional improvement or low functional impairment

(aOR: 3.3, CI: 1.8, 6.1) compared with those who were single. Those diagnosed with organic disorders (ICD codes: F00-F09) had 84% lower adjusted odds of reaching functional improvement or low functional impairment than those with epilepsy (aOR 0.16, CI: 0.03, 0.89) while patients diagnosed with substance use disorders (ICD codes: F10-F19) had almost fourfold increased adjusted odds of reaching functional improvement or low functional impairment (aOR 3.9, CI: 1.2, 12.3). While the proportion of patients reporting suicidal ideation at follow-up visits was small (<1% of visits), they had much lower adjusted odds of reaching functional improvement or low functional impairment (aOR: 0.15, CI: 0.02, 0.91).

Among patients who are new to treatment (n=496), 43.5% had WHODAS <10 at their intake visit (table 1). Of follow-up visits in which functional improvement or low functional impairment scores were demonstrated, 75.3% of those visits were by patients who already had WHODAS <10 at intake (online supplemental table 2).

### Patient improvement across visits

On average, WHODAS scores progressively decreased with treatment, with larger gains observed in those patients with higher scores at baseline (table 4). For patients new to MNS treatment, who started treatment with WHODAS scores below 10, the average score increased in visit 2 before declining, reaching a mean decrease of 1.9 points by visit 6 (CI: -4.0, 0.24). For those patients with baseline WHODAS scores between 10 and 20, the average decrease in score was more rapid, decreasing by 2.89 points at visit 5 before increasing slightly to a decrease of 2.6 points at visit 6 (CI: -3.75, -1.46). For those patients with WHODAS scores ≥20 at intake, WHODAS 2.0 scores decreased on average by 7.8 points as early as visit 4 before those gains decreased to 3.26 points in visit 6 (CI: -6.46, -0.05). For patients new to MNS treatment, each additional visit was associated with a mean reduction of 0.62 points on the WHODAS 2.0 (CI: -0.76, -0.47).

## DISCUSSION

To our knowledge, this study is among the first to assess primary MH care cascade performance and associated factors across many rural and urban government clinics in an LMIC. Across over 4000 individual patient visits, we found systematic gaps in mental healthcare. At approximately 70% of visits, patients are not showing functional improvement or low functional impairment as measured by the WHODAS 2.0. This study does not attempt to attribute these gaps to a single cause. Gaps may be due to some combination of provider failure to adhere to patient screening or documentation protocols, patient behaviours, or illness or treatment trajectories. Results indicate that gaps within the MNS treatment cascade differed among some patient populations. The gaps in reaching functional improvement or low functional impairment are particularly large for patients who are under 18 years of age, single, who express suicidal

**Table 1** Demographic characteristics and WHODAS scores of all patients and 496 new patients who started routine mental health treatment with a psychiatric technician after baseline data collection began

Characteristic	N, % cohort 1, all patients	N, % cohort 2, new patients	Mean (SD) baseline WHODAS 2.0, new patients	Unadjusted beta values baseline WHODAS, new patients
<b>Total</b>	<b>2164, 100%</b>	<b>496, 100%</b>	<b>12.3 (10.0)</b>	<b>n=496</b>
Sex				
Male	1168, 53.9%	270, 54.4%	12.2 (9.7)	Reference
Female	996, 46.0%	226, 45.5%	12.5 (10.3)	0.26 (–2.01, 2.5)
Missing	0, 0.0%			
Age				
0–14	438, 20.2%	–	–	–
15–18	219, 10.1%	53, 10.6%	11.5 (8.3)	–1.03 (–5.5, 3.4)
19–25	498, 23.0%	142, 28.6%	12.5 (9.9)	–0.97 (–3.8, 1.8)
26–35	505, 23.3%	147, 29.6%	12.5 (9.9)	Reference
36–50	339, 15.6%	98, 19.7%	11.6 (10.7)	–0.93 (–3.4, 1.6)
51–64	111, 5.1%	38, 7.6%	12.7 (11.5)	0.13 (–2.8, 3.07)
65+	52, 2.4%	18, 3.6%	23.1 (14.6)	10.5* (0.51, 20.6)
Missing	2, 0.09%	0, 0.0%	–	–
Median	24	29	–	–
Marital status				
Married	152, 7.02%	50, 10.0%	13.4 (9.6)	1.7 (–3.8, 7.2)
Single	1496, 69.1%	264, 53.2%	11.7 (9.5)	Reference
Domestic union	360, 16.6%	127, 25.6%	11.8 (9.7)	0.05 (–3.8, 3.9)
Divorced/widowed/ separated	152, 7.02%	54, 10.8%	15.8 (12.7)	4.1 (–0.37, 8.6)
Missing	4, 0.18%	1, 0.20%	16 (0)	–
HIV status				
HIV+	241, 11.1%	80, 16.1%	13.6 (10.3)	–0.31 (–3.7, 3.07)
HIV–	1237, 57.1%	285, 57.4%	13.9 (10.5)	Reference
Never tested	377, 17.4%	68, 13.7%	8.8 (8.4)	–5.04* (–9.7 to –0.30)
Missing	309, 14.2%	63, 12.7%	7.6 (5.2)	–6.1* (–11.7, –0.55)
TB status				
TB+	102, 4.7%	35, 7.06%	14.3 (8.8)	0.62 (–2.8, 4.09)
TB–	115, 51.5%	255, 51.4%	13.7 (11.1)	Reference
Never tested	897, 41.4%	200, 40.3%	10.5 (8.2)	–3.1 (–9.9, 3.6)
Missing	50, 2.3%	6, 1.2%	6.3 (10.3)	–
Alcohol use				
Current	181, 8.3%	90, 18.1%	11.6 (9.7)	0.18 (–3.6, 4.0)
Past	320, 14.7%	109, 21.9%	15.0 (10.7)	3.5 (–0.92, 8.01)
No history	1616, 74.6%	292, 58.8%	11.4 (9.5)	Reference
Missing	47, 2.1%	5, 1.01%	21.6 (16.0)	–
Drug use				
Current	94, 4.3%	48, 9.6%	12.2 (9.3)	0.43 (–4.8, 5.7)
Past	166, 7.6%	47, 9.4%	16.2 (12.0)	4.4 (–1.1, 10.1)
No history	1854, 85.6%	396, 79.8%	11.8 (9.6)	Reference
Missing	50, 2.3%	5, 1.01%	21.6 (16.0)	–
Suicidal ideation				
Positive	52, 2.4%	35, 7.06%	22.1 (9.9)	10.4* (2.3, 18.6)
Negative	1997, 92.2%	457, 92.1%	11.6 (9.6)	Reference

Continued

Table 1 Continued

Characteristic	N, % cohort 1, all patients	N, % cohort 2, new patients	Mean (SD) baseline WHODAS 2.0, new patients	Unadjusted beta values baseline WHODAS, new patients
Missing	115, 5.3%	4, 0.81%	13.2 (7.5)	–
Pregnant				
Pregnant	17, 0.79%	5, 1.01%	20.4 (12.3)	8.09 (–0.47, 16.6)
Not pregnant	2025, 93.5%	490, 98.7%	12.3 (10.0)	Reference
Missing	122, 5.6%	1, 0.20%	17 (0)	–
Primary diagnosis (ICD-10 code)				
F00-F09 dementia/delirium/organic disorders	41, 1.8%	14, 2.8%	24.5 (15.7)	13.2* (1.9, 24.5)
F10-F19 substance use-related disorders	83, 3.8%	44, 8.8%	13.6 (9.8)	2.4 (–6.3, 11.2)
F20-F29 schizophrenia/schizotypal/delusional disorders	253, 11.6%	88, 17.7%	13.0 (11.5)	1.8 (–6.3, 11.2)
F30-F39 affective disorders	75, 3.4%	34, 6.8%	16.4 (12.3)	5.1 (–2.2, 12.5)
F40-F49 neurotic/stress-related/somatoform disorders	54, 2.5%	22, 4.4%	8 (6.5)	–3.2 (–7.04, 0.58)
F50-F59 behavioural syndrome	50, 2.3%	36, 7.2%	11.2 (10.3)	0.04 (–6.9, 7.00)
F60-F69 personality disorders	6, 0.28%	2, 0.40%	26.5 (30.4)	15.2 (–18.6, 49.1)
F70-F79 developmental delay	13, 0.60%	2, 0.40%	13.5 (0.70)	2.2 (–1.00, 5.5)
F80-F89 ASD/disorders of psychological development	3, 0.14%	1, 0.20%	4 (0)	Excluded n<2
F90-F98 disorders with onset usually occurring in childhood	17, 0.79%	1, 0.20%	16 (0)	Excluded n<2
G40-G41 epilepsy	1471, 67.9%	249, 50.2%	11.2 (8.0)	Reference
Missing	98, 4.5%	3, 0.60%	4.6 (2.0)	–
Baseline WHODAS 2.0 score				
<10	–	216, 43.5%	3.8 (2.5)	–
10–20	–	191, 38.5%	14.2 (2.9)	–
21–30	–	59, 11.9%	24.8 (2.6)	–
30–48	–	30, 6.05%	38.1 (5.6)	–

Diagnosed from 4 February 2022 to 19 September 2022, across 16 Ministry of Health clinics in Manica and Sofala Province, Mozambique.  
 \*p<0.05.  
 TB, tuberculosis; WHODAS, WHO Disability Assessment Schedule.

ideation and who present with organic disorders. We also found gaps in appointment attendance and patient adherence to medication, with only 41% of visits being attended with patient's adherence to medication and 66% of appointments attended within 5 days of their scheduled appointment. However, even with these large gaps in care, patients appear to be benefiting from outpatient MNS care in Mozambique, with the average new

patient showing relative decreases in functional impairment across health facility care visits.

To address gaps for MNS care provision for youth, many health facilities in Mozambique have youth friendly medical services available within primary care facilities (Os serviços amigos de Adolescentes e Jovens—SAAJ) and there are efforts to integrate HIV care into these programmes. However, to date, care for MNS conditions

**Table 2** Descriptive characteristics and independent care cascade performance of 4323 follow-up visits for patients aged ≥15 under routine government implementation conditions between 4 February and 19 September 2022, across Sofala and Manica Provinces, Mozambique

Characteristic	Total appointments attended n, %	Attended follow-up appt on time	And medication adherent	And with functional improvement
<b>Total</b>	<b>4323, 100%</b>	<b>2851, 65.9%</b>	<b>1793, 41.4%</b>	<b>1321, 30.5%</b>
Sex				
Male	2269, 52.4%	1512, 53.0%	925, 51.5%	693, 52.4%
Female	2054, 47.5%	1339, 46.9%	868, 48.4%	628, 47.5%
Age				
15–18	552, 12.7%	360, 12.6%	230, 12.8%	126, 9.5%
19–25	1300, 30.0%	843, 29.5%	527, 29.3%	386, 29.2%
26–35	1336, 30.9%	865, 30.3%	563, 31.4%	412, 31.9%
36–50	798, 18.4%	555, 19.4%	327, 18.2%	272, 20.5%
51–64	239, 5.5%	172, 6.03%	109, 6.08%	92, 6.9%
65+	93, 2.1%	56, 1.96%	37, 2.06%	33, 2.5%
Missing	5, 0.12%	0, 0.0%	0, 0.0%	0, 0.0%
Marital status				
Married	435, 10.0%	280, 9.8%	177, 9.8%	95, 7.1%
Single	2742, 63.4%	1834, 64.3%	1151, 64.1%	769, 58.2%
Domestic union	789, 18.2%	517, 18.1%	334, 18.6%	343, 25.9%
Divorced/widowed/separated	348, 8.0%	212, 7.4%	121, 7.08%	114, 8.6%
Missing	9, 0.21%	8, 0.28%	4, 0.22%	0, 0.0%
HIV status*				
HIV+	379, 8.7%	213, 7.4%	147, 8.2%	133, 10.07%
HIV–	2485, 57.4%	1524, 53.4%	920, 51.3%	789, 59.7%
Never tested	585, 13.5%	345, 12.1%	217, 12.1%	252, 19.08%
Missing	874, 20.2%	769, 26.9%	509, 28.3%	147, 11.1%
TB status				
TB+	178, 4.1%	114, 4.00%	65, 3.6%	30, 2.2%
TB–	2271, 52.5%	1480, 51.9%	900, 50.2%	634, 47.9%
Never tested	1737, 40.1%	1141, 40.02%	749, 41.7%	608, 46.03%
Missing	137, 3.1%	116, 4.07%	79, 4.4%	49, 3.7%
Alcohol use				
Current	250, 5.7%	158, 5.5%	101, 5.6%	61, 4.6%
Past	700, 16.1%	449, 15.7%	268, 14.9%	261, 19.7%
No history	3242, 74.9%	2135, 74.8%	1344, 74.9%	958, 72.5%
Missing	131, 3.03%	109, 3.8%	80, 4.4%	41, 3.1%
Drug use				
Current	124, 2.8%	79, 2.7%	52, 2.9%	31, 2.3%
Past	367, 8.4%	222, 7.7%	135, 7.5%	155, 11.7%
No history	3697, 85.5%	2439, 85.5%	1525, 85.0%	1094, 82.8%
Missing	135, 3.1%	111, 3.8%	81, 4.5%	41, 3.1%
Suicidal ideation				
Positive	28, 0.65%	18, 0.63%	9, 0.50%	4, 0.30%
Negative	4277, 98.9%	2823, 99.0%	1779, 99.2%	1313, 99.3%
Missing	18, 0.42%	10, 0.35%	5, 0.28%	4, 0.30%

Continued

Table 2 Continued

Characteristic	Total appointments attended n, %	Attended follow-up appt on time	And medication adherent	And with functional improvement
Pregnant				
Pregnant	99, 2.2%	61, 2.1%	44, 2.4%	55, 4.1%
Not pregnant	4199, 97.1%	2776, 97.3%	1744, 97.2%	1260, 95.3%
Missing	25, 0.58%	14, 0.49%	5, 0.28%	6, 0.45%
Primary diagnosis				
F00-F09 dementia/delirium/organic disorders	48, 1.1%	30, 1.05%	21, 1.1%	20, 1.5%
F10-F19 substance use-related disorders	111, 2.5%	67, 2.3%	41, 2.2%	48, 3.6%
F20-F29 schizophrenia/schizotypal/delusional disorders	496, 11.4%	320, 11.2%	189, 10.5%	157, 11.8%
F30-F39 affective disorders	82, 1.9%	62, 2.1%	33, 1.8%	17, 1.2%
F40-F49 neurotic/stress-related/somatoform disorders	77, 1.7%	59, 2.07%	42, 2.3%	27, 2.04%
F50-F59 behavioural syndrome	45, 1.04%	31, 1.09%	18, 1.00%	9, 0.68%
F60-F69 personality disorders	10, 0.23%	6, 0.21%	5, 0.28%	1, 0.08%
F70-F79 developmental delay	12, 0.28%	8, 0.28%	5, 0.28%	3, 0.23%
F80-F89 ASD/disorders of psychological development	0, 0.0%	0, 0.0%	0, 0.0%	0, 0.0%
F90-F98 disorders with onset usually occurring in childhood	3, 0.07%	3, 0.11%	3, 0.17%	0, 0.0%
G40-G41 epilepsy	3433, 79.4%	2264, 79.4%	1435, 80.0%	1038, 78.5%
Missing	6, 0.14%	1, 0.04%	1, 0.06%	1, 0.08%
TB, tuberculosis.				

is not formally integrated into these services. Integrating mental health care into existing services may decrease barriers to care for this population by ensuring that services are acceptable and appropriate for their unique needs.<sup>15</sup> Further implementation research is needed in LMICs to identify techniques to meet the MH needs of youth who are currently treated in adult-oriented systems.

The association between relationship status and reaching functional improvement or low functional impairment is likely multifaceted. The role of family support in the treatment of mental disorders varies widely depending on diagnosis, cultural context and family dynamics.<sup>16 17</sup> In Mozambique, it is common for family members to accompany one another to medical appointments, contribute to medical decision making and assist with medication or appointment reminders. Additionally, acceptance by loved ones can be important for reducing stigma associated with mental disorders.<sup>18 19</sup> It is possible that single patients, if they are not receiving this reinforcement from other family or social supports, lack practical support and suffer disproportionately under the burden of stigma. This population may benefit from the creation of support groups which have been implemented in Mozambique for other

medical conditions. Another possibility is to encourage single patients to identify a friend or trusted community leader who might accompany them to appointments as needed. Additionally, due to the bidirectional relationship between mental health and relationships, it is possible that the formation and maintenance of stable relationships could indicate lower level of illness severity or disability.<sup>20–22</sup>

Many patients in this study were unaware of their HIV and/or TB status. Mental health intersects in complex ways with physical health and untreated conditions in one area can impede recovery in others.<sup>23</sup> The integration of HIV and TB screening into MNS services would provide an opportunity for co-occurring illnesses to be identified and referred to appropriate concurrent or integrated treatment. Unfortunately, MNS stigma can result in medical providers deferring screening of and/or treatment of other conditions until the patient's MNS condition is addressed.<sup>24 25</sup> This practice can delay and or prevent a patient's recovery from mental and physical conditions which are inter-related or exacerbating one another. This may be particularly significant for patients suffering from Organic MH Disorders caused by infections such as HIV, TB or malaria.



**Table 3** Descriptive characteristics and adjusted ORs of achieving functional improvement or low functional impairment in 4323 follow-up visits for patients age  $\geq 15$  under routine government implementation conditions from February to September 2022 across Sofala and Manica Provinces, Mozambique

Characteristic	Functional improvement or low functional impairment
Sex	
Male	Reference
Female	1.3 (0.85, 2.0)
Age	
15–18	0.40* (0.19, 0.85)
19–25	0.92 (0.53, 1.6)
26–35	Reference
36–50	0.70 (0.38, 1.3)
51+	1.04 (0.47, 2.4)
Marital status	
Married	1.3 (0.60, 3.0)
Single	Reference
Domestic union	3.3† (1.8, 6.1)
Divorced/widowed/separated	0.89 (0.39, 2.02)
HIV status	
HIV+	1.7 (0.75, 3.9)
HIV–	Reference
Never tested	0.84 (0.44, 1.6)
Missing	0.11 (0.007, 1.6)
TB status	
TB+	1.2 (0.36, 3.9)
TB–	Reference
Never tested	0.54* (0.33, 0.90)
Suicidal ideation	
Positive	0.15* (0.02, 0.91)
Negative	Reference
Pregnant	
Pregnant	3.3* (1.02, 10.6)
Not pregnant	Reference
Primary diagnosis (ICD-10 code)	
F00–F09 dementia/delirium/organic disorders	0.16* (0.03, 0.89)
F10–F19 substance use-related disorders	3.9* (1.2, 12.3)
F20–F29 schizophrenia/schizotypal/delusional disorders	1.1 (0.61, 2.1)
F30–F39 affective disorders	1.1 (0.28, 4.5)
F40–F49 neurotic/stress-related/somatoform disorders	0.63 (0.16, 2.5)
F50–F59 behavioural syndrome	0.56 (0.08, 4.1)
F60–F79 personality disorders developmental delay, F80–F89 ASD/disorders of psychological development and F90–F98 disorders with onset usually occurring in childhood	0.60 (0.01, 43.8)
G40–G41 epilepsy	Reference
*p<0.05.	
†p<0.01.	
TB, tuberculosis.	

**Table 4** Represents all follow-up visits through visit 6 (n=727) that were attended by a subset of patients (n=496) who started treatment after baseline data collection began and who completed the WHODAS 2.0 questionnaire at their first visit

Baseline WHODAS 2.0 scores	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
<10	Reference n=216	0.81† (0.23, 1.40) n=118	-0.57 (-1.3, 0.20) n=62	-0.96 (-1.99, 0.68) n=32	-1.4* (-2.7, -0.09) n=18	-1.9 (-4.0, 0.24) n=8
10–20	Reference n=191	-0.76* (-1.36, -0.18) n=128	-1.1† (-1.80, -0.42) n=95	-2.6† (-3.52, -1.76) n=59	-2.88† (-3.88, -1.88) n=47	-2.6† (-3.75, -1.46) n=32
21–48	Reference n=89	-3.14† (-4.42, -1.87) n=56	-4.44† (-6.2, -2.69) n=31	-7.8† (-10.52, -5.08) n=19	-6.17† (-10.36, -1.98) n=12	-3.26* (-6.46, -0.05) n=10

\*p<0.01.  
†p<0.05.  
WHODAS, WHO Disability Assessment Schedule.

Patients who endorse suicidality would likely benefit from the creation of protocols specific to this high-risk population. Other studies in Mozambique have reported rates of suicidal thoughts as high as 10.6% in primary care populations<sup>26</sup> and past month prevalence of 18.7% in school going adolescents.<sup>27</sup> This analysis may have been impacted by the small number of patients who reported suicidal ideation, but the results warrant further investigation. It is possible that providers are not asking all patients about suicidal ideation, only asking those cases which they perceive as high risk, or perhaps stigma is contributing to under-reporting by patients.<sup>28</sup> Scaling up the use of standardised screening questionnaires that ask questions specific to suicide has been shown to increase detection of suicidal ideation in high-income countries such as the USA, but studies to assess efficacy in LMICs are still needed.<sup>29–31</sup>

Despite the existing treatment gaps, there is an association between the number of visits attended and a reduction in mean WHODAS scores indicating that MH treatment is associated with gains up to visit 5. Raw mean WHODAS scores increase between visits 5 and 6 which may reflect a limitation of these data since so few patients had visits beyond visit 5, resulting in bias due to attrition. More research is needed to understand the natural course of illness and recovery in the context of MNS treatment in Mozambique and similar LMICs. Groups associated with higher WHODAS scores at baseline include those aged 65 or older, those diagnosed with dementia, delirium or other organic disorders (ICD codes F00–F09), and those with suicidal ideation. Further research is needed in LMICs to optimise long-term patient care. Most RCTs and existing studies follow patients for a short time and during the testing of novel protocols. Limited information exists on MNS across the life course and how to best manage symptoms and function for patients with chronic MNS conditions over extended periods within the healthcare system.

Many patients are not returning for a follow-up appointment prior to running out of medication dispensed by the pharmacy. In Mozambique, supply issues with psychotropic medications mean that many health facilities cannot provide more than a 30–60-day supply of medication regardless of the patient's stability or time on the medication. This is a burden for many patients for whom frequent trips to the health facility are impractical. Transportation to health facilities is a frequent concern, particularly for individuals who live far or in more rural areas. There is limited availability of MNS medications in private pharmacies which may be located closer to the patient's home. To promote medication adherence, there is a need to address the availability of psychotropic medications, including frequent shortages<sup>32</sup> and impacts on visit frequency. Previous studies have found community health worker distribution of medications such as family planning contraceptives and antimalarials to improve patient access.<sup>33 34</sup> Mobile health clinics were also demonstrated to positively improve child health

outcomes in Namibia.<sup>35</sup> Innovative and creative ways to provide MNS services and dispense medications that are more convenient for patients, and which promote adherence, are urgently needed in Mozambique.

The rate of which common mental disorders (CMDs) were diagnosed in this sample is consistent with low rates of diagnosis with anxiety and depression found in previous studies in Mozambique<sup>5 36</sup> but stand in strong contrast to the estimated prevalence of CMDs in primary care attendees which one study found to be 23.9%.<sup>37</sup> Meanwhile, the small number of patients who reported alcohol or drug use is inconsistent with studies that reported higher rates of current alcohol use including 28.9% in a representative sample of adults ages 25–64<sup>38</sup> and 13.8% in adolescents attending school.<sup>39</sup> MNS continue to be strongly stigmatised in Mozambique and these discrepancies could be a product of limited care seeking behaviour and/or inadequate symptom recognition by providers. Public health promotion campaigns to reduce stigma and educate the community on available treatment options could increase patient's willingness to disclose symptoms of CMDs or problematic use of substances.<sup>40</sup> The low rate of diagnosis highlights the need to scale up use of standardised screening tools for CMD and substance use disorders (SUD) which have been validated for use in Mozambique.<sup>41–43</sup> Additionally, the mean WHODAS scores at baseline for CMDs were higher on average than for epilepsy, implying that these MNS services are not reaching a key population with potentially higher levels of disability.

### Strengths and limitations

This study has several notable strengths, including that it includes a census of patients who attended follow-up visits in 16 rural and urban clinics across two provinces in Mozambique. These 16 clinics represent 37% of all clinics in these regions with psychiatric technicians and thus represent a strong picture of MNS service delivery in this region serving over 4 million people. Additionally, our data were collected as part of fully routine government health service delivery and thus our estimates of care cascade outcomes and diagnostic patterns should represent the true picture of health service delivery in these regions of Mozambique.

Some limitations of this study include lack of generalisability to private MNS systems, although only approximately 3.9% of healthcare in Mozambique is accessed in the private sector.<sup>44</sup> It is also possible that the introduction of data tracking tools necessary to follow patients over time and the implementation of regular supervision visits to support their use could have had an indirect impact on the provision of routine service delivery. In the analysis, the number of patients diagnosed within certain ICD diagnostic categories, such as F60–F98, was very small and required them to be combined or excluded in regression analyses. Due to sample size concerns and numerous variables to test, our analysis did not examine interactions among variables and instead prioritised identifying

vulnerable groups that are not adequately being reached by, or responding to, current MNS services. This information could be used to target limited resources and identify areas of potential future research. Examining interactions among variables identified as significantly influencing key care cascade outcomes could be a focus of future analyses. Lastly, we chose to employ logistic regression due to the ability to fit stable models that converged well with two layers of random effects (individual and facility level). However, given that our outcome of functional improvement is relatively common, the ORs estimated in our model may overestimate the true risk ratio.

### CONCLUSION

Currently, in central Mozambique, patients attending government MNS services have gaps in treatment, with 66% of visits attended on time, 41% visits with medication adherence and 31% of visits showing functional improvement or low functional impairment. Further research is needed to identify the specific causes of gaps in treatment and/or outcomes in order to adequately design effective interventions to close these multicausal gaps. Patients under 18 years old, those who are single, those with organic disorders and those expressing suicidal ideation have particularly lower odds of achieving improvement in functioning as measured by the WHODAS 2.0. At present, MNS services primarily serve those with severe mental illness or epilepsy, with very low rates of diagnoses of CMDs such as depression, anxiety or post-traumatic stress disorder. Significant investments are needed to improve the identification of cases of CMDs in the community and within primary care—as well as improved screening and optimised care for those expressing suicidal ideation. Additional efforts are needed to develop differentiated approaches to improve care for youth and young adults with MNS problems alongside increased resources overall for MNS care provision and care cascade optimisation.

### Author affiliations

<sup>1</sup>Global Health, University of Washington, Seattle, Washington, USA

<sup>2</sup>Mozambique Health Committee, Beira, Mozambique

<sup>3</sup>Mental Health Department, Provincial Health Directorate, Ministry of Health, Beira, Mozambique

<sup>4</sup>Centro de Formação e Pesquisa em Saúde, Hospital Central da Beira, MISAU, Beira, Mozambique

<sup>5</sup>Mozambique Health Committee, Chimoio, Mozambique

<sup>6</sup>Mental Health Department, Provincial Health Directorate, Ministry of Health, Chimoio, Mozambique

<sup>7</sup>Epidemiology, University of Washington, Seattle, Washington, USA

<sup>8</sup>Industrial & Systems Engineering, University of Washington, Seattle, Washington, USA

<sup>9</sup>Department of Psychology, University of Washington, Seattle, Washington, USA

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#### ORCID iDs

Morgan Turner <http://orcid.org/0009-0001-9776-8651>

Kenneth Sherr <http://orcid.org/0000-0002-2963-0829>

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