Participant Profiles and Symptom Response in the Initial Stages of a South African Mental Health Managed Care Programme

By

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DECLARATION

I, Leandri Hattingh, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Abstract

Introduction

Continuously rising health care and workplace costs associated with mental illness is demanding attention from health care funders in South Africa's private health care sector. The majority of mental health care costs are generated by in-hospital care, whilst funded access to ambulatory care is limited in this sector. The Medscheme Mental Health Programme (MMHP) is a collaborative care project which aims to promote the integration of good quality mental health care into the primary care setting. In a "treatment-to-target" approach, symptom score trackers are used to systematically monitor response to treatment in order to help identify and modify suboptimal treatment plans timeously (Hattingh 2017b).

Aims

This study describes the MMHP participants and pathways into and through the MMHP, and its initial clinical outcomes.

Methods

Principal members and dependant beneficiaries of two participating medical schemes screened for enrolment on the MMHP between 1 August 2016 and 28 February 2018 were included in the study. Persons younger than 18 years were excluded.

Symptoms of major depressive disorder (MDD), generalised anxiety disorder (GAD), post-traumatic stress disorder (PTSD) and alcohol abuse were screened for by using the Patient Health Questionnaire-9 (PHQ-9) (Spitzer, Williams, and Kroenke 2002-2015; Kroenke and Spitzer 2002), the Generalised Anxiety Disorder Questionnaire-7 (GAD-7) (Spitzer, Williams, and Kroenke 2002-2015; Spitzer and Kroenke 2006), the Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD) US Department of Veteran Affairs (2015); (Prins, Ouimette, and Kimerling 2003) and the Alcohol Use Disorders Identification Test (AUDIT) (Babor et al. 2001). The Medscheme Care Manager administered these questionnaires telephonically to screen candidates for enrolment on the Programme and communicated regularly with the associated clinical practitioner regarding treatment response. A specialist psychiatrist reviewed and provided recommendations on problematic cases at set intervals.

Using logistic regression, the association between demographic characteristics and scheme type and the presence of moderate or severe symptoms of 1) depression, 2) generalised anxiety disorder, and 3) post-traumatic stress disorder, was assessed. Percentages of the sample with a single condition, one, two and three comorbidities were also analysed, as well as the proportions of co-occurrence per various combinations of conditions.

Wilcoxon signed rank tests were used to determine the change in symptom severity between baseline and 10 weeks in those receiving intervention through the MMHP. Linear regression models were created to analyse the predictors of change in clinical scores.

Results

In the screened group, 48.6% were found to have moderate to severe symptoms of anxiety on the GAD-7, 53.2% of depression on the PHQ-9, and 33.2% of PTSD on the PC-PTSD. Relatively high rates of possible comorbidity were found in this study, especially between depression and anxiety: of those screening positive for any one condition, 73.8% screened positive on the combination of PHQ-9 and GAD-7. Screening positive on the PHQ-9 was found to be a very strong predictor of concomitant positive screening on the GAD-7 (OR = 36.4, CI = 25.3 – 52.2), and *vice versa* - screening positively on the GAD-7 strongly predicted positive screening on the PHQ-9 (OR = 36.6, CI = 25.4 – 52.6). Strong associations were demonstrated with females and potential depression (OR = 1.51, CI = 1.03 – 2.21) and/or PTSD (OR = 1.65, CI = 1.18 – 2.31), while younger age was significantly associated with higher likelihood of screening positive for potential depression (OR: 0.99, CI= 0.98 – 1.00), PTSD (OR = 0.97, CI 0.96 – 0.98) and/or generalised anxiety disorder (OR = 0.97, CI = 0.96 – 0.98). There were statistically and clinically significant improvements in clinical scores for all four conditions at Week 10 after enrolment on the MMHP, compared to baseline: 21% reduction in mean scores in the AUDIT, 43% in the GAD-7, 45% in the PHQ-9, and 36% in the PC-PTSD.

Conclusion

In its current form, the MMHP appears to be successful in reaching significantly symptomatic medical scheme beneficiaries, with possible scope to expand its reach. Certain key design elements such as using clinical data to determine risk and need for intervention, treatment target calculation adjusted for baseline, screening for comorbidity, and current referral

sources, appear to be appropriate. Given the absence of a control group, however, further research is required to confirm the outcomes of the intervention.

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List of Acronyms

10w	Ten Weeks
aPMB	Ambulatory Prescribed Minimum Benefit
AUDIT	Alcohol Use Disorders Identification Test
BPMD	Bipolar Mood Disorder
CC	Collaborative Care
CDC	Center for Disease Control and Prevention
CDL	Chronic Disease List
CI	Confidence Interval
CMM	Chronic Medicine Management
CMS	Council for Medical Schemes
DC	Discharge
EAP	Employee Assistance Programme
Enr	Enrolment
F/U	Follow-up
FP	Family Practitioner
GAD	Generalised Anxiety Disorder
GAD-7	Generalised Anxiety Disorder Questionnaire-7
GHQ-12	General Health Questionnaire-12
HbA1C	Haemoglobin A1C
HRBI	High Risk Beneficiary Intervention

HRBM	High Risk Beneficiary Model
IMPACT	Improving Mood-Promoting Access to Collaborative Treatment
IVR	Interactive Voice Response
KZN	KwaZulu-Natal
LMICs	Low and Middle-income Countries
MDD	Major Depressive Disorder
MHCP	Mental Health Care Practitioner
MMHP	Medscheme Mental Health Programme
OR	Odds Ratio
PC-PTSD	Primary Care Post-Traumatic Stress Disorder Screen
PHQ-9	Patient Health Questionnaire-9
PMB	Prescribed Minimum Benefit
PTSD	Post-traumatic Stress Disorder
RCT	Randomised-controlled Trial
SASH	South African Stress and Health Study
WHO	World Health Organisation

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Chapter 1: Introduction

Despite growing awareness of the associations between mental health, overall health, and socio-economic welfare, mental illness remains marked by stigmatization, insufficient care and inadequate attention in social and political agendas (Tomlinson and Lund 2012). Notwithstanding – and, it could be argued, as a consequence of – the prevailing barriers to accessing mental health care, mental illness generates significant demands on health care spending worldwide. While the direct costs incurred by those who present for care for mental disorders are significant – and this, usually only once advanced illness had developed – indirect costs driven by comorbidities are also of major and increasing concern. In the United States, health care costs for the treatment of persons with major depressive disorder (MDD) rose with 27.5% from 2005 to a total of $98.9 billion in 2010 (Greenberg et al. 2015). Of the incremental costs directly associated with the presence of MDD, 48% were for the treatment of comorbidities – 7% for the treatment of other mental health disorders such as anxiety disorders, 26% for non-mental health disorders such as back and neck pain and other spinal disorders, abdominal pain, and general symptoms like malaise and fatigue, and 15% for non-depression prescription drugs, including analgesics and gastrointestinal ulcer drugs (Greenberg et al. 2015).

The association between mental health and chronic physical disorders is well established. The presence of mental illness predisposes persons to higher rates of disability and mortality (World Health Organisation 2013a), and, by implication, higher associated economic costs (Lund et al. 2013). Conversely, physical conditions such as myocardial infarction and diabetes have been shown to predispose individuals to the development of depression ((Anderson et al. 2001; Ducat , Philipson, and Anderson 2014; Egede, Zheng, and Simpson 2002; World Health Organisation 2013b). Poor mental health may also impair adherence to treatment for other chronic conditions (Nel and Kagee 2011; Kagee 2012), resulting in overall poor health outcomes (de Groot et al. 2001) and increased health care utilization and associated costs (Egede, Zheng, and Simpson 2002). Furthermore, low socioeconomic status is a common risk factor to both mental disorders and other non-communicable diseases (World Health Organisation 2013a).

Whereas – despite a paucity of data – mental health care spending in the South African public health care sector is suspected to be inadequate (Schneider et al. 2016; Lund et al. 2013), the rising cost associated with mental illness is demanding attention from funders in the country's private health care sector. While the country moves towards universal health insurance coverage, medical schemes are likely to remain the vehicles for funding of medical expenses to large numbers of South African private health care users in the foreseeable future. About 28% of South Africans make use of the private health care sector (Pretorius 2017), while just under 9 million (roughly 16% of) South Africans are beneficiaries of medical aid schemes (Pretorius 2017). Private health care accessed by users without medical scheme cover is largely limited to general practitioner and retail pharmacy consultations (Pretorius 2017). Medical schemes are regulated organisations which pool member contributions for the funding of medical expenses. These medical aid schemes provide a legislated minimum benefit package inclusive of cover for a list of 270 diagnosis-treatment pairs typically requiring in-hospital care, and 26 common chronic conditions (Republic of South Africa Department of Health 1999). Employers often include subsidies for medical scheme premiums in their remuneration. Without these subsidies, most private medical scheme memberships are unaffordable to the unemployed.

Continuously rising health care costs in the South African private health care industry, coupled with stagnating medical scheme membership growth (Alexander Forbes 2016; Council for Medical Schemes 2016) are contributing to an escalation in membership fees well in excess of consumer price index inflation (Bateman 2013; Alexander Forbes 2016; Council for Medical Schemes 2016). This is rendering medical scheme membership unaffordable to increasing numbers of South Africans, resulting in a downward spiral in medical scheme sustainability. Consequently, more South Africans will be relying on an overburdened public health sector for care.

Direct cost associated with mental health care is a significant contributor to increasing private health care expenditure in South Africa (Council for Medical Schemes 2016; Ismail 2017). In keeping with international trends (World Health Organization 2018), the prevalence of mental illness is rising in South African medical scheme populations. A 2017 report by the Council for Medical Schemes (CMS) – the medical schemes regulatory body –

lists bipolar mood disorder under the top ten chronic Prescribed Minimum Benefit (PMB)[1] conditions by prevalence, and notes a staggering 108.1% increase in prevalence from 2010 to 2015 (Phaswana 2017)[2]. Given this, combined with the starkly limited funding for ambulatory mental health care in this sector, it is unsurprising that mental health admissions are routinely within the top five hospital cost categories for several medical schemes. The CMS Annual Report lists major affective disorders (including bipolar mood disorder) as the fourth highest PMB Diagnosis and Treatment Pair[3] by cost across the industry, attracting an annual expenditure of R2,457 billion (Council for Medical Schemes 2016). The majority of these costs are generated by in-hospital care. A recent media report confirmed the same trend in the largest medical scheme in the country, Discovery Health Medical Scheme (Ismail 2017). The reported figures showed an 87% increase in mental health care expenditure from 2011 to 2016, with depression contributing around 40% of the disease burden, and an increase of 113% in in-hospital expenditure, which was R773 million over the five years, compared to R1,283 million for out of hospital care costs. Aside from direct mental health care costs, expenditure on care for other chronic diseases and related complications is also a significant contributor to rising private health care costs (Council for Medical Schemes 2016, 2017), and in the paradigm of "no health without mental health" (Prince, Patel, and Saxena 2007), any attempt at managing these costs would be wanting if it does not include trenchant attention to mental health.

The economic costs of mental illness, however, are not limited to the cost of health care delivery. According to the World Health Organisation (WHO) (2017), depression is the single largest contributor to disability worldwide. In the social realm, mental illness may lead to marginalization within communities, impoverishment, and domestic violence and abuse (World Health Organisation 2013b), and has significant consequences in the workplace. The American Center for Disease Control and Prevention (CDC) estimates that about a third of the United States (US) workforce experiences a mental or substance abuse disorder, while

[1] Legislated minimum funding standards for medical aid schemes

[2] It should be noted that common mental disorders such as major depression and anxiety disorders are excluded from this report, as they are not chronic PMBs, and 'prevalence' here is an estimate based on mental health care utilisation – see section 2.2.

[3] There are 270 Diagnosis and Treatment Pairs -- categories constituting the Prescribed Minimum Benefits Package Republic

71% of workers with mental illness have never sought medical help for their conditions (National Center for Chronic Disease Prevention and Health Promotion 2012). According to the CDC, around 80% of people with depression experience some level of functional impairment, while 27% report serious home and work challenges as a result of depression, leading to profound effects on productivity: 4.8 workdays are missed and 11.5 marked with reduced productivity over a three month period (National Center for Chronic Disease Prevention and Health Promotion 2012). The CDC adds that the bulk of the economic impact related to mental health disorders is not from the cost of treating the illness (e.g. via medical insurance subsidies), but because of income losses from unemployment, social support expenses, and indirect costs such as worker's compensation, disability, absenteeism and presenteeism (National Center for Chronic Disease Prevention and Health Promotion 2012). The effect is not limited to developed countries; mental illness has been found to have a significant impact on workplace productivity across diverse countries (Evans-Lacko and Knapp 2016). A South African study on the economic costs of severe depression and anxiety showed a reduction in personal income of USD$4798 per adult per year, resulting in a national annual productivity loss of USD$3.6 billion (Jack, Wagner, and Petersen 2014).

Prompted by the growing mental health concerns within South Africa's private health care industry, Medscheme started implementation of a novel, complex mental health programme to promote the integration of good quality mental health care into the primary care setting (Hattingh 2017b, 2017a). Medscheme is a managed care organisation and medical scheme administrator accredited by the Council for Medical Schemes in terms of the Medical Schemes Act (Republic of South Africa 1998). It provides administration and managed care services to a variety of South African medical schemes, inclusive of open community enrolment schemes and restricted enrolment schemes. Medscheme delivers services to a total of just over 3 million individuals. According to the Regulations to the Medical Schemes Act (Republic of South Africa Department of Health 1999), "managed health care" refers to

> "clinical and financial risk assessment and management of health care, with a view to facilitating appropriateness and cost-effectiveness of relevant health services within the constraints of what is affordable, through the use of rules-based and clinical management-based programmes".

The Medscheme Mental Health Programme (MMHP) aims to improve access to care, improve clinical outcomes – including a reduction in the development of complications and comorbidities – and ultimately, to curb the rise in overall health care costs in medical scheme beneficiaries affected by mental illness and substance use disorders. A secondary outcome is the reduction in workplace productivity losses related to mental illness. Having started implementation in 2016, the Medscheme Mental Health Programme is the first of its kind in South Africa and is reaching thousands of people living with mental illness and substance use disorders in the South African private health care sector. The Programme is in various stages of implementation for several medical schemes, and is based on the internationally successful *collaborative care* model (Ratzliff et al. 2013; Huijbregts et al. 2013; Crain et al. 2013; Bao et al. 2011; Chan, Fan, and Unutzer 2011; Katon et al. 2010; Unutzer et al. 2008; Hunkeler et al. 2006; Katon, Unützer, and Fan 2006; Levine, Unützer, and Yip 2005; Katon et al. 2005; Unutzer et al. 2002). As such, the programme aims to integrate mental health care into the primary care setting through effective collaboration between general practitioners, specialists, and auxiliary caregivers, and the introduction of a care manager to help coordinate the process (Hattingh 2017b). Along with an alternative reimbursement model and additional insured benefits for ambulatory care, this aims to create the necessary structure to allow the general practitioner to deliver and coordinate good quality, patient-centred mental health care (Hattingh 2017b).

In a "treatment-to-target" approach, symptom score trackers are used to systematically monitor response to treatment in order to help identify and modify suboptimal treatment plans timeously (Hattingh 2017b). Symptoms of MDD, generalised anxiety disorder (GAD), post-traumatic stress disorder (PTSD) and alcohol abuse are screened for using symptom scoring tools contained in the Patient Stress Questionnaire (Substance Abuse and Mental Health Services Administration 2011), which is a combination of the Patient Health Questionnaire-9 (PHQ-9) (Spitzer, Williams, and Kroenke 2002-2015; Kroenke and Spitzer 2002), the Generalised Anxiety Disorder Questionnaire-7 (GAD-7) (Spitzer, Williams, and Kroenke 2002-2015; Spitzer and Kroenke 2006), the Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD) (US Department of Veteran Affairs 2015; Prins, Ouimette, and Kimerling 2003) and the Alcohol Use Disorders Identification Test (AUDIT) (Babor et al. 2001). The Medscheme Care Manager administers these questionnaires telephonically to screen medical scheme beneficiaries for enrolment on the Programme, and communicates

regularly with the associated clinical practitioner regarding treatment response. A Medscheme-employed specialist psychiatrist reviews and provides recommendations on problematic cases at set intervals. This process has led to a rich collection of clinical data which, along with demographic data gathered through standard managed care processes, may provide valuable insights into the mental health status of users of the South African private health care sector services.

Given the lack of precedent of an integrated mental health care model in the South African managed care environment, and in particular, one that addresses all four the above-mentioned conditions, careful monitoring and evaluation of the processes and, ultimately, outcomes of the Programme, can help identify unforeseen pitfalls and support the development of solutions to such challenges, as well as continued enhancements and future developments. Whereas the MMHP as a whole provides ample opportunity for future research – including evaluation of its impact on medium- and long-term clinical and cost outcomes – these data will have to mature before any robust conclusions can be made. This thesis will focus on initial data generated from the MMHP in order to better understand the participants in terms of their conditions, symptom severity, demographic characteristics, and predictive factors of clinical improvement during the initial stages of the intervention. This will serve as a basis for future programme modification and may inform the prioritisation and nature of programme elements planned for future implementation, such as training for primary health care providers (including online training modules and distribution of best-practice care pathways), employee assistance programme integration, and medical scheme benefit review. Initial implementation of the MMHP was accompanied by benefit enhancements to support ambulatory mental health care, based on expected needs. Refined understanding of these needs may be leveraged as motivation to further enhance and tailor these benefits. Improved knowledge in this field may also support review of legislated PMBs which are currently ill-suited to a decentralised, primary mental health care strategy as outlined in the national health policy (National Department of Health (South Africa) 2013).

Findings from the proposed study may also inform the design and organisation of other services such as those in the occupational health and employee wellness domains, which are particularly relevant to one of the schemes in the study, and to other, similar schemes in the industry. Lastly, knowledge generated from the MMHP may find application in a future

National Health Insurance structure in South Africa, which is envisaged to incorporate existing private sector services and make use of medical scheme industry expertise (Department of Health (South Africa) 2017: 30, 59). Indeed, in June 2018, the South African National Department of Health issued an invitation for bidding for mental health service coordination by private managed care organisations (National Department of Health (South Africa) 2018), and the Medscheme proposal was informed by the current design of the MMHP.

1.1. Study Aim

This study aims to describe MMHP participants and pathways into and through the MMHP, and its initial clinical outcomes.

1.2. Objectives

1. To describe the demographic characteristics, symptom severity for depression, generalised anxiety, PTSD and/or alcohol abuse, and entry points of scheme beneficiaries who were screened, eligible and/or enrolled for intervention through the MMHP.
2. To determine associations between screening positive on the PHQ-9, GAD-7, and/or PC-PTSD, and the following variables: demographic factors, scheme, referral source, and screening positive on any of the remaining symptom scoring tools.
3. To determine the patterns of comorbidity amongst the four mental health conditions assessed in those screened for enrolment on the MMHP.
4. To determine changes in symptom severity for depression, generalised anxiety, PTSD and/or alcohol abuse at 10 weeks for those receiving intervention from the MMHP.
5. To determine predictors of changes in symptom severity for depression, generalised anxiety, PTSD and/or alcohol abuse at 10 weeks after enrolment for those receiving intervention from the MMHP.
6. To describe reasons for drop-off at various points in the MMHP.

Chapter 2: Literature Review

It is hoped that findings from this study will have relevance to the South African private health care sector, within the broader contexts of the larger South African population and health care system, and collaborative care as an approach to mental health care delivery. In the first section of this literature review, the known prevalence and correlates of mental illness in South Africa will be presented, followed by a review of the literature pertaining specifically to mental illness in the country's private health care sector. The last section will elaborate on the collaborative care model which informed the design of the MMHP.

2.1. Prevalence and Correlates of Mental Illness in South Africa

There is a lack of recent, robust mental health prevalence information in South Africa (Day and Andy 2016). The 2016 South African Health Review, using various national data sources and compiled by the Health System Trust – a non-government organisation – limits reporting on mental illness prevalence to depression, and only in one province (Day and Andy 2016). It notes a current depression prevalence in 2012 in the Eastern Cape of 15.2 (unspecified but presumably per 1000 people), and a lifetime prevalence of 31.4 (Day and Andy 2016). A national suicide rate of 3 per 100 000 in 2012 is also reported, although the underlying source of this data is unclear (Day and Andy 2016). The South African Stress and Health Study (SASH) (Herman, Stein, and Seedat 2009; Stein et al. 2008) provides comprehensive insight into the mental health status of South Africans, albeit based on data from more than a decade ago. The study reported on findings from a national household survey conducted between 2002 and 2004 and listed alcohol abuse (11.4%), major depression (9.8%) and agoraphobia (9.8%) amongst the highest individual disorders by lifetime prevalence. Per disorder class, the overall lifetime prevalence for anxiety disorders was 15.8%, for mood disorders it was 9.8%, for substance use disorders, 13.4%, and 30.3% for any disorder.

The SASH (Herman, Stein, and Seedat 2009) also investigated associations between mental illness symptomatology and demographic factors, similar to what has been studied in the

current project. In the SASH, there was a strong association between female gender and mood and anxiety disorders, whereas male gender was associated with higher prevalence of substance use disorders. The age group 35-49 years had a positive association with mood disorders, and the median age of onset of substance use disorders was 24 years, 32 years for anxiety disorders, and 37 years for mood disorders. Significant differences were found between provinces, with the highest lifetime prevalence of mental disorders shown in the Western Cape (42%), and the lowest in the Northern Cape (29%). The study also reported on the severity of 12-month prevalent cases, classifying 26% as severe, 31% as moderate, and 43% as mild, overall. Comorbidity was also reported on, ranging from 14% of respondents with a severe disorder having a single condition, to 71% of those with a severe condition having three or more.

Other studies on national South African samples investigating associations between mental illness and demographic factors include one by Tomita and Burns (2013), who reported on data (n = 13,593) from the South African National Income Dynamics Study (SA-NIDS). Using the 10-item version of the Center for Epidemiologic Studies Depression Scale (CESD-10), depression symptomatology was assessed. Females and older adults were found to have significantly higher depression scores. Peltzer and Phaswana-Mafuya (2013) investigated the association between problem drinking, socio-demographic factors and comorbidity in 2144 participants over the age of 60 years in a national population-based study in South Africa. They found a positive association between male gender and risky drinking, but none with depression. Some smaller community-based studies were also found, reporting on regional findings. Rumble et al (2009) conducted a community prevalence study in Mamre, a rural South African village in the Western Cape, and found a 27.1% weighted prevalence of psychiatric morbidity, with the majority of cases suspected to be depressive or anxiety disorders. Demographic variables were found to have no predictive value in this sample (n= 481).

Given the association between mental illness and physical comorbidity (Anderson et al. 2001; Ducat , Philipson, and Anderson 2014; Egede, Zheng, and Simpson 2002; World Health Organisation 2013b) and the likelihood of disabling symptoms to prompt health care seeking, the prevalence of mental illness in health care users can be expected to be higher than in the general population. Relevant prevalence studies on people who present for

health care services include the one by Pillay & Kriel (2006), in which depression was found to be the presenting problem in 21.6% of women accessing primary clinical psychology services in Pietermaritzburg, and anxiety and substance abuse accounted for 9.5% and 8.8%, respectively. Kagee (2008) reported on symptoms of depression and anxiety in South African diabetics and hypertensives attending a semi-rural primary care clinic in the Western Cape. Using the Beck Depression Inventory (BDI) and the 25-item version of the Hopkins Symptom Checklist (HSCL-25), he found that 26.1% of the sample (n= 119) fell in the mild to moderate range, 15.3% in moderate to severe, and 4.5% in the severe range on the BDI. Just over 30% reported feeling “quite a bit” or “extremely” tense, and a mean score on the anxiety subscale of the HSCL was found to be 20.95.

In other work commenting on relationships between mental illness and demographic variables among health care users, Folb et al (2015) evaluated baseline data from a randomised controlled trial (Folb, Timmerman, et al. 2015) studying the effectiveness of the Primary Care 101 training programme in two Western Cape districts. They reported on the prevalence of depressive symptoms, using the CESD-10, in adults attending primary care clinics in the public health sector. Among other associations, CESD-10 scores were found to be positively associated with female gender and inversely with age. Carey et al (2003) investigated the prevalence of PTSD and associated demographic factors and comorbidity in a primary clinic in Khayelitsha, a township in Cape Town. They found a PTSD prevalence of 19.9%, no gender difference, and 75% of PTSD cases with comorbid depression. Overall, depression was found in 37% of the 201 participants. A cross-sectional survey by Bhana et al (2017) investigated the prevalence of harmful alcohol use in patients attending primary chronic care clinics in the North West Province of South Africa (n = 1322). Of those screened, 45% consumed alcohol, of which 10% had been engaging in hazardous drinking, 1.7% reported harmful drinking and 1.6% were alcohol use dependent. More women were abstinent than men (60% vs 38%), and AUDIT scores were 63% higher for men than women. An 18% lower AUDIT score was observed for each decade increase in age, while a 7% increase in the AUDIT score was found for each unit increase in the PHQ-9. A second round survey (Petersen et al. 2017) consolidated these data with additional data gathered using the same screening tools in the same setting the following year, and found that women had 74% lower odds of having alcohol use disorders, and 54% higher odds of having depression, compared to men.

Other relevant work on alcohol misuse and relationships with demographic variables and comorbidities used fairly unique samples. A longitudinal cohort study over four assessment waves by Abler et al (2014) investigated the presence of depression, PTSD and alcohol abuse among South African women attending alcohol serving venues in a Cape Town township, using the CES-D, PTSD Checklist-Civilian Version (PCL-C), and AUDIT-C scoring tools. They reported that 69-71% of participants met criteria for depressive disorder, 17-21% met criteria for PTSD, and 75-86% met criteria for hazardous drinking. They also found that nearly all participants with significant PTSD symptoms had comorbid significant depressive symptoms, and reported a significant correlation between PTSD and increased alcohol use. Parry et al (2002) investigated national alcohol misuse data from various sources including "specialist treatment centers, trauma units, mortuaries, psychiatric facilities, and surveys of school students and arrestees" and found widespread misuse of alcohol, with predominance in treatment demand amongst men and older persons.

Collectively, the aforementioned studies suggest a strong association between female gender and mood disorders, while male gender and younger age appear to be positively associated with alcohol misuse. Findings regarding the association between age and mood disorders are contradictory. There also appears to be a strong association between PTSD and the presence of comorbid depression. Overall, severe symptoms seem to occur in around 20-30% of people. Several other studies found on the topic of mental illness and substance misuse prevalence in South Africa focus on unique samples such as farm workers (London 2000), children (Seedat et al. 2004), peri-partum women (Brittain et al. 2017; Sania et al. 2017; Tomlinson et al. 2017; Wong et al. 2017), people with HIV (Brittain et al. 2017; Sania et al. 2017; Wechsberg et al. 2017; Woollett et al. 2017; Conroy et al. 2017; Probst et al. 2017), or university students (Bantjes et al. 2016; Pillay et al. 2002), and have limited application in the current project.

2.2. Prevalence and Correlates of Mental Illness in the South African Private Health Care Sector

To my knowledge, there are currently no papers published in peer reviewed journals regarding the mental health status of medical scheme beneficiaries in South Africa, and available information is limited to knowledge gathered from claims data and administrative processes like registration or pre-authorisation of benefit allowances. Given the lack of clinical prevalence data, health care utilisation is often used as a proxy to estimate prevalence in the South African private health care industry. Indeed, the 2017 Council for Medical Schemes (CMS) report (Phaswana 2017) on the prevalence of chronic disease in the South African medical scheme population limits comment on mental illness to bipolar mood disorder and schizophrenia. These are the only mental health disorders included in the Prescribed Minimum Benefits Chronic Disease List (CDL), and therefore the only ones for which the CMS gathers chronic care data across the industry. Important limitations to these data include the restrictions imposed by data submission guidelines, such as counting each beneficiary with multiple chronic conditions only once, according to a hierarchy of conditions, and only counting those on active treatment as per claims data (Council for Medical Schemes 2015). It stands to reason that the prevalence reported here under-represents the true prevalence of these conditions. According to this report, bipolar mood disorder – with an overall prevalence of 3.97 per 1000 beneficiaries in 2015 – is ranked tenth amongst 26 chronic conditions, with predominance amongst females, and within the 25-75-year age group (which, unfortunately, is a range too wide to be of particular interpretative value). The prevalence of schizophrenia is reported to be less than one per 1000 in the same year.

The CMS's Annual Report (Council for Medical Schemes 2016) notes that reported expenditure for most CDL conditions is less than expected, and could be either because of under-reporting of PMB conditions by schemes, or a reflection of poor quality care for medical scheme beneficiaries. Poor access to care may be an additional factor, as the reach of mental health care to those who need it is known to be inadequate (Alonso et al. 2018). A recent study by Evans-Lacko et al (2018) found that in upper-middle-income countries like

South Africa, only 22% of 12-month DSM-IV/CIDI cases of anxiety, mood, and/or substance disorders received treatment.

Other mental disorders included in the PMB package are mainly allocated in-hospital care benefits only, the utilisation of which is reported on in the CMS Annual Report, as mentioned earlier in the Introduction. The only other report known to aggregate industry-level data is the Health Quality Assessment, a confidential report only released to participating medical schemes, with coverage to the order of 77% of the overall medical scheme membership in South Africa (Health Quality Assesment 2016). The report includes data on the rates of hospital admission and out-patient follow-up post admission for common mental disorders, as well as all-cause admission rates for people with known mental disorders. As with the CMS Annual Report, no clinical data are included in this report. To my knowledge, the current project is the first to gather mental illness symptom data amongst private health care users in South Africa at a population level.

2.3. The Case for Collaborative Care in South Africa

The WHO estimates that in low-and middle-income countries, 76% to 85% of people with severe mental disorders do not receive any treatment for their disorders (World Health Organisation 2013b). This corresponds with recent figures published by Evans-Lacko et al (2018), on data from the WHO World Mental Health surveys. There are inadequate numbers of specialised health care workers to serve their populations (World Health Organisation 2013b), which leads to poor access to mental health care of good quality. The WHO (2013b) also notes the lack of availability of non-pharmacological approaches and trained personnel to deliver these interventions as a compounding factor in mental health care quality. In South Africa, there were 1.2 psychiatrists and 7.5 psychiatric nurses per 100,000 people in 2014, nearly ten times less than in many high-income countries, while most of these health care workers remain concentrated in urbanized areas (Jack, Wagner, and Petersen 2014). In the South African private sector, there are around 400 psychiatrists (Medscheme 2017) serving approximately 9 million people.

Fragmentation of care further complicates access to and quality of care. The bulk of mental health care delivery in South Africa has historically been separated from general health care and centred on psychiatric hospitals, with little attention to mental health care in the primary care setting (Jack, Wagner, and Petersen 2014). Despite a national policy that supports the development of comprehensive primary mental health care (National Department of Health (South Africa) 2013), its realisation has been lagging (Jack, Wagner, and Petersen 2014; Schneider et al. 2016). In the country's private health care sector, this is perpetuated by the hospicentric PMBs and their insubstantial coverage for mental health care in community-based settings (Hattingh 2017b), further impeding access to mental health care. To complicate matters further, mental illness is highly stigmatised in many societies, and South Africa is no exception (Andersson et al. 2013), nor is its health care system (Egbe, Brooke-Sumner, and Kathree 2014). Stigma may lead to inadequate health care seeking behaviours by those suffering from poor mental health, and parsimonious support from families, communities and at the workplace (Egbe, Brooke-Sumner, and Kathree 2014; National Center for Chronic Disease Prevention and Health Promotion 2012), which in turn may aggravate the mental disorder and undermine treatment adherence.

Given the current concentration of mental health care access and costs around in-hospital services, and the limitations (both in terms of availability and cost) on expanding specialist resources amidst a growing illness burden, there is, as in the public sector and the world over, a strong case for the integration of mental health care into the primary care setting in the South African private sector. This however requires training, support and supervision of community-based care providers (World Health Organisation 2010), and not simply a shift of care burden from hospitals to communities. This became painfully evident in the aftermath of the controversial decision of the Gauteng Department of Health to discharge institutionalised patients with severe mental illness and/or disability to community-based care following the cancellation of a contract with Life Esidimeni in 2015 (Moseneke 2018). The move is purported to have resulted in more than 140 deaths to date (Ferlito and Dhai 2018). Subsequent investigations revealed some of the failings to include the lack of readiness of community-based carers to sufficiently accommodate these patients, insufficient funding, and poor governance (Moseneke 2018; Robertson and Makgoba 2018; Freeman 2018). If implemented with the necessary investment and fidelity, collaborative care (CC) is a potentially successful approach for achieving safe integration of mental health

care into community-based care. Often the first port of call for people living with mental illness who do present for care, the family practitioner is ideally placed at the front line of primary care delivery to facilitate the integration of mental health care in the South African private health care sector, and is therefore the obvious target for CC to centre on (Hattingh 2017b). The MMHP, which is being evaluated in this thesis, is a collaborative care project which aims to reinforce the primary mental health care offering by integrating mental health care into a holistic, person-centred, primary care model (see next section for definition of 'collaborative care'). This allows for early screening and comprehensive management for those at risk for mental illness, and *vice versa* for those with mental illness who are at risk of developing other chronic illnesses and complications (De Hert et al. 2009; Miller and Druss 2013). Under-recognition of mental illness in the usual primary care setting has been demonstrated (Mash 2002; Petersen and Lund 2011), as has an inertia to objectively review and change treatment plans in general practice (Milani and Lavie 2015; Jack, Wagner, and Petersen 2014). Along with patient support and workplace integration, the MMHP aims to reinforce the primary mental health care service through training, support and specialist supervision of family practitioners, underpinned by a collaborative care effort featuring active screening, objective outcomes monitoring, and care management and-coordination. It aims to shift the bulk of mental health care from tertiary, institutionalised care to the primary, ambulatory care setting in a progressive fashion, by avoiding first-time hospital admissions and reducing re-admission rates through improved access to care and the lowering of morbidity and complication rates. This conceptual framework is summarised in Figure 1 below.

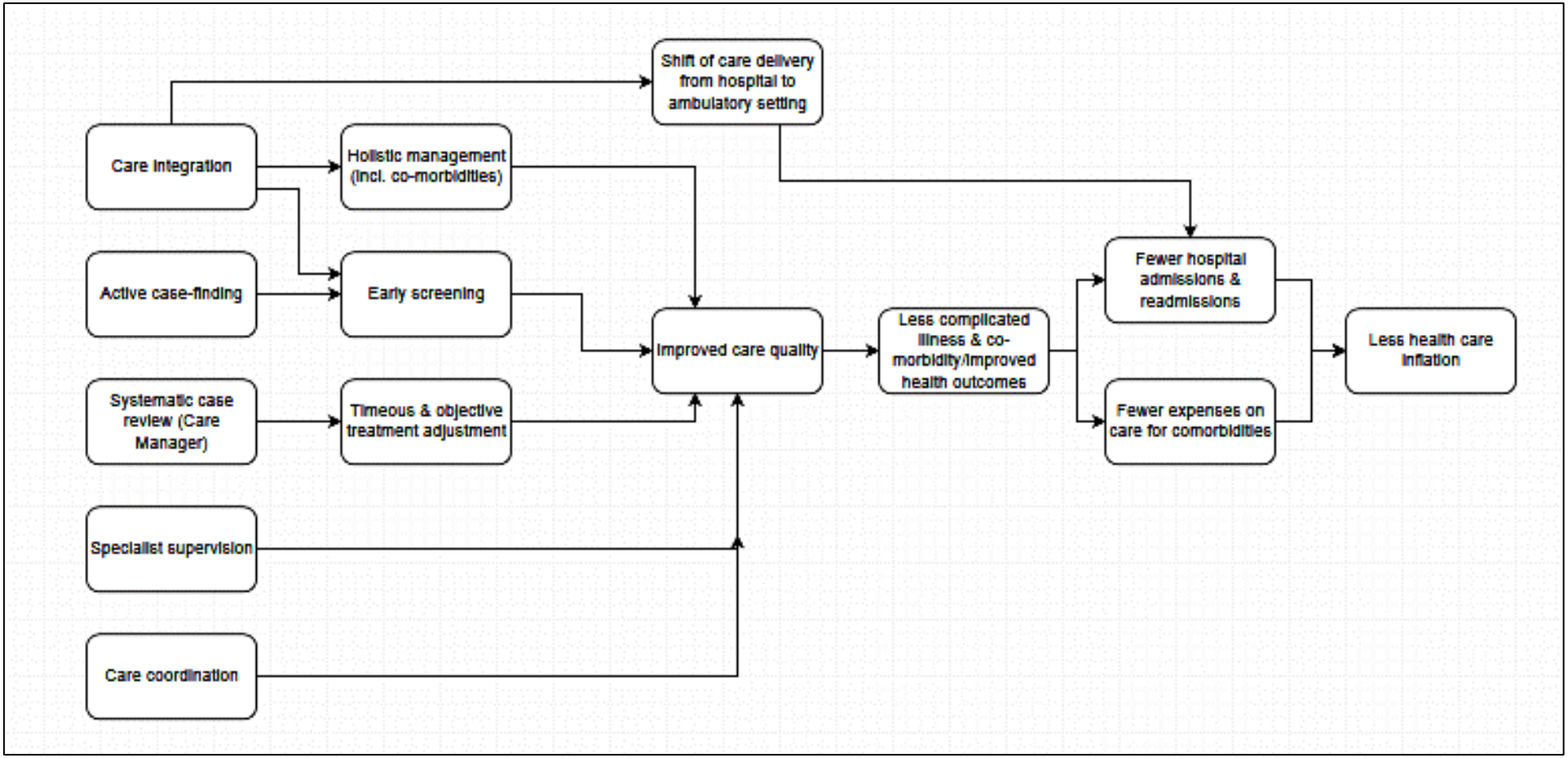

Figure 1: Conceptual Framework for the Effect of the MMHP (as a CC model) on Mental Health Care Outcomes and Costs ("Care coordination" refers to coordination between multidisciplinary team members; "care integration" refers to the integration of mental health services into the primary care setting)

2.4. Collaborative Care

In order to position and evaluate the MMHP as a collaborative care project, I conducted a structured review on the literature on collaborative care using a systematic search (Box 1)[4]. The following section will summarise relevant academic literature on the subject of collaborative care, including its definition, history and dissemination, and evidence on outcomes and their predictors.

Box 1 Literature Search Method

A PubMed search delivered a total of 1008 items with the search terms ((((((collaborative care[Title/Abstract] AND "humans"[MeSH Terms])) NOT dentist*)) AND (depression or psychiatry or (behavioural health) or anxiety or PTSD or (post-traumatic stress disorder) or mental or substance or mood))) NOT infant not child**,** and only the 978 in English and limited to humans were considered in this review. After scanning titles and abstracts, a total of 547 articles were identified as relevant, the first of which was published in 1997. Among these, 99 review articles were found, the earliest dating back to 1999. Of these, 33 had been published in the past 5 years, and were included for review in this project. An additional 59 relevant articles referenced in the recent review articles were also perused, amounting to a total of 92 articles reviewed for this section. This review aimed at identifying relevant information about the definition, history and proven outcomes of collaborative care for mental illness. In addition, commentary on predictive factors for outcomes was sought.

2.4.1 Collaborative Care: Definition

The term “collaborative care” (CC) in the mental health context generally describes a structured, coordinated, multi-disciplinary, holistic and patient-centered approach to mental

[4] Note that this is not an exhaustive systematic review, but a systematic search to provide context for the MMHP as a CC model, and to address the specific study objectives regarding predictors of outcomes in CC models.

health care located mainly in the primary care setting. Fortney et al (2015) provide a useful conceptual break-down of the components of CC:

1. It is *measurement-based*, i.e. standardised screening and monitoring tools are used to identify cases and monitor response and progress; a common example is the PHQ-9 (Huffman et al. 2014; Goodrich et al. 2013).
2. It is *team-based*: care is led by the primary care physician (Fortney et al. 2015; Bickett and Tapp 2016; Tully and Baumeister 2015; Goodrich et al. 2013; Thielke, Vannoy, and Unutzer 2007; O'Donnell, Williams, and Kilbourne 2013; Alford et al. 2011), and supported by at least one other health care professional, according to some definitions (Tully and Baumeister 2015; Coventry et al. 2014; Gunn et al. 2006). Most definitions however include at least two additional health care professionals essential to CC: a care manager (Chwastiak, Vanderlip, and Katon 2014; Goodrich et al. 2013; Thielke, Vannoy, and Unutzer 2007; O'Donnell, Williams, and Kilbourne 2013), who is usually a nurse (Fortney et al. 2015; Dreizler et al. 2014; Alford et al. 2011; Jeeva et al. 2013), and a psychiatrist, who provides case overview and decision support (Fortney et al. 2015; Huffman et al. 2014; Thielke, Vannoy, and Unutzer 2007; O'Donnell, Williams, and Kilbourne 2013).
3. It is *population-based*: Fortney et al (2015) describe the use of a registry to "monitor treatment engagement", Huffman et al (2014) refer to longitudinal symptom monitoring, while others refer to a structured management plan with scheduled follow-ups (Tully and Baumeister 2015; Coventry et al. 2014; Gunn et al. 2006). The term "treatment-to-target" was used in the Improving Mood-Promoting Access to Collaborative Treatment (AIMS) project (AIMS Center Advancing Integrated Mental Health Solutions 2016) to describe the objective monitoring of symptom response in order to initiate timeous treatment plan review, similar to that described by Thielke et al (2007) and others (Chwastiak, Vanderlip, and Katon 2014; Unutzer et al. 2002). Under the "population-based" heading, one could also include the use of electronic registries which may be created with electronic medical records (Goodrich et al. 2013) – or, in the managed care context, with health care utilisation information – for the identification of patients at high risk, relative to the general population (Goodrich et al. 2013). This can pre-empt preventative care (Goodrich et al. 2013) and help direct resources to where they are most needed.

4. It is *patient-centered*. Under this heading, Fortney et al (2015) describe the coordination of care and promotion of patient activation[5], self-management and treatment adherence, all aspects which are mainly delivered by the care manager. These concepts are common to various other definitions of CC (Goodrich et al. 2013; Huffman et al. 2014; Woltmann et al. 2012).

In their description of CC, Goodrich et al (2013) include additional, systemic requirements:

1. *Organisational support in the form of resource allocation and work-flow restructuring*. Others also point out the need for alternative reimbursement models to fee-for-service, to cater for care managers and off-site specialist support (Huffman et al. 2014; O'Donnell, Williams, and Kilbourne 2013). This is particularly relevant to the fee-for-service structure which currently dominates in private health care in South Africa, and is ill-suited to a collaborative, team-based approach to care. In their definition, Gunn et al (2006) require the introduction of mechanisms to facilitate communication between the multidisciplinary team members such as shared medical records, team meetings, and written or verbal, patient-specific feedback.
2. *Redesign of the care delivery system to emphasise care management*. In a truly collaborative model, with co-dependence on each other and the care manager, change management is likely required to engage primary care physicians and specialists who are traditionally used to practising in rather isolated circumstances.
3. *Connecting patients to community resources* (Thielke, Corson, and Dobscha 2015; Woltmann et al. 2012; Goodrich et al. 2013).

[5] "Patient self-reported knowledge, skill, and confidence for self-management of one's health or chronic condition" (Hibbard et al. 2007)

2.4.2 Collaborative Care: History and Dissemination

The CC model is a logical evolution from the Chronic Care Model, originally developed by Wagner et al (Improving Chronic Illness Care 2006-2019; 1996; 2001; Bodenheimer, Wagner, and Grumbach 2002), which proposes a set of basic elements at community, organisation, practice and patient levels of the health system, for the improvement of care for people with chronic illness. This model aims to reorganise the system in order to achieve and maintain activated and informed patients, who are interacting with proactive providers of good quality care. More than 40 years after its initial introduction (Coleman and Patrick 1976), the concept of collaborative care is well-established in mental health policy and delivery, particularly in the United States (US). As the country started moving towards alternative reimbursement structures and health maintenance organisations (HMOs) under the guidance of its Affordable Care Act, wide-spread dissemination of CC emerged. In the early 2000's, under the Improving Mood-Promoting Access to Collaborative Treatment (IMPACT) project, Unutzer et al (2002) conducted a randomised controlled trial in eighteen primary clinics from eight health care organisations in five different states in the US. After the trial, an adapted, "real-world" model was implemented in two of the participating clinics and found to have positive effects on depression outcomes similar to the trial (despite fewer programme contacts (Grypma et al. 2006)).

The seminal IMPACT trial also paved the way for several, large-scale implementations of CC models in the US. Based on the IMPACT model, the Depression Improvement Across Minnesota Offering a New Direction (DIAMOND) project has been implemented in more than 80 primary clinics in three states (Katzelnick and Williams 2015). DIAMOND pioneered an alternative, bundled payment method to include care manager and psychiatrist reimbursement (O'Donnell, Williams, and Kilbourne 2013). Funded by the Center for Medicare and Medicaid Services, the Care of Mental, Physical and Substance Abuse Syndromes (COMPASS) programme was implemented in eighteen medical groups in eight states. The focus was on patients with depression and comorbid diabetes and/or cardiovascular disease (Coleman et al. 2017). Systematic case review with specialist supervision was a key feature of this intervention (Katzelnick and Williams 2015). The Mental Health Integration Programme (MHIP) has been implemented in more than 200

community health centres in Washington State (Katzelnick and Williams 2015) since its inception in 2007 (University of Washington Psychiatry & Behavioral Sciences Division of Population Health 2018). The Re-Engineering Systems of Primary Care Treatment of PTSD and Depression in the Military (RESPECT-Mil) programme was implemented across the US Defence Force and focused on improving depression and PTSD diagnosis and management through CC (Wong et al. 2015). It was implemented in nearly a hundred primary care clinics worldwide before transitioning to the Collaborative Care Patient-Centered Medical Home Model, which is now running across the US Army, Navy and Air Force (American Psychiatric Association 2018). Lastly, the Primary Care Mental Health Integration Initiative (PC-MHI) is implemented widely by the US Veterans Health Administration, and focuses on depression, anxiety disorders, alcohol abuse and PTSD (Katzelnick and Williams 2015).

Uptake of the CC model appears to be less pervasive in developed countries other than the US (Gunn et al. 2006; Semrau et al. 2011). Although no other major implementation projects of CC in Europe were found in this literature review, there is one large project of note. In the United Kingdom, the National Health Service Improving Access to Psychological Therapies (IAPT) programme reaches nearly a million patients with depression or anxiety disorders per year. The aim is to expand this to 1.5 million people per year by 2020/2021 and to further promote integration with care for comorbid chronic conditions. Key features of the programme are the use of evidenced-based psychotherapy, systemised outcome monitoring, and supervision of outcomes (NHS England 2018).

Despite the obvious, theoretical fit of CC in resource-constrained environments, the adaptation of the CC model to low-and middle-income countries (LMICs) still requires investigation and scaling (Thornicroft, Deb, and Henderson 2016; Wainberg et al. 2017). There have, however, been some successes with the CC approach, and several projects aimed at building evidence for implementation and policy change in LMICs. The MANAS trial (Patel et al. 2010) in India, which tested a CC intervention with trained lay health counselors for depression and/or anxiety disorders, is one such example. The counselors provided case management and psychosocial interventions, while primary care physicians prescribed antidepressant medication, and there was supervision by a mental health specialist. Interestingly, the difference in outcome (greater improvement rates in depression and/or anxiety) was only seen in public health facility attenders. The COPSI trial (Chatterjee et al.

2014), also in India, tested the effectiveness of a collaborative, community-based care intervention compared to institution-only care for people with schizophrenia. The intervention was provided by trained community health workers, supervised by psychiatric social workers and treating psychiatrists. Overall, the effect was modest, but most pronounced in a rural site. The authors concluded that implementation is best reserved as an initial service introduction in service-scarce environments, as opposed to robust, established care delivery systems.

Chile's health reform policy provides a single example of system-level implementation of CC in a LMIC (Wainberg et al. 2017). The country's National Depression Treatment Programme is successfully integrating accessible, quality-assured mental health care into the ambulatory, primary care setting, and, by 2009, had reached more than 530 000 depressed people, and was managing 84% of all patients with depression exclusively in the primary care setting (Araya, Alvarado, and Minoletti 2009). It engenders collaboration between psychologists, general practitioners and mental health specialists, and integrates mental health care with care for comorbid chronic illness like diabetes and hypertension (Araya, Alvarado, and Minoletti 2009).

Closer to home in the Africa region, the PRogramme for Improving Mental health carE (PRIME) (Lund et al. 2012) has been running in five LMICs (Ethiopia, India, Nepal, South Africa and Uganda) since 2011, and aims to integrate mental health care into primary and maternal health care delivery systems. In South Africa, PRIME aimed at developing an implementation plan for the integration of mental health care for depression, alcohol use disorders and schizophrenia into an existing chronic care delivery system in the public health sector of the country's North-West Province (Petersen et al. 2016). The project excluded private health care sector services. The Emerging mental health systems in LMICs (Emerald) project, run from 2012-2017, aimed at generating evidence and capacity towards enhancing health system performance and mental health care delivery in six LMICs (Ethiopia, India, Nepal, Nigeria, South Africa and Uganda). The project also targeted stigma as a key barrier to successful mental health care delivery (Semrau et al. 2018).

2.4.3 Collaborative Care: Evidence on Effectiveness and Cost-Effectiveness

From the literature studied there appears to be general acceptance of the effectiveness of CC for the improvement of clinical and some secondary outcomes in common mental disorders (Huffman et al. 2014; Neumeyer-Gromen et al. 2004; Gilbody et al 2006), and the focus of current research appears to be on the implementation and dissemination of CC (Grypma et al. 2006; Coleman et al. 2017; Wong et al. 2015; Overbeck, Davidsen, and Kousgaard 2016; Wainberg et al. 2017; Roy-Byrne 2013; Thielke, Vannoy, and Unutzer 2007). In order to evaluate the outcomes and predictors of outcomes in the current project, however, an overview of the evidence supporting CC as an appropriate approach to improving mental health care delivery and the outcomes of projects similar to the MMHP will be presented in the following sections.

The IMPACT intervention, mentioned earlier, resulted in a significant, progressive decrease in depression symptoms and improvement in treatment response over all assessment intervals (months 3, 6, and 12) in older adults with depression (Unutzer et al. 2002). Other benefits included less functional impairment and improvement in quality of life (Unutzer et al. 2002). These effects were found to have been sustained one year after withdrawal of the intervention (Hunkeler et al. 2006). Over a four-year period, healthcare costs were lower in the intervention group compared to the control (Unutzer et al. 2008).

Since the IMPACT trial, the evidence on CC for mental illness has proliferated. A Cochrane review in 2012 by Archer et al (2012) included 79 randomised-controlled trials (RCTs) and assessed the effectiveness of CC in patients with depression or anxiety. The authors found significantly better improvement in depression outcomes in adults in the short-, medium- and long-term (0-6 months, 7-12 months, and 13-24 months, respectively) in the intervention group, but reported that these effects had not been demonstrated into the very long-term (25 months and beyond). The findings were similar for anxiety outcomes, but no comparisons were examined for anxiety in the very long-term. The investigators also found benefit in secondary outcomes such as medication use, quality of life (as relating to mental health, not physical health) and patient satisfaction. A systematic review of RCTs comparing collaborative care with usual primary care by Gilbody et al (2006) found longer-term benefit in depression outcomes for up to five years (eleven studies were included specifically

addressing longer-term outcomes). Several other authors have concluded from systematic reviews and meta-analyses that CC results in improved depression outcomes (Atlantis, Fahey, and Foster 2014; Coventry et al. 2014; Ekers et al. 2013; Huang et al. 2013; Neumeyer-Gromen et al. 2004; Sighinolfi et al. 2014; Thota et al. 2012). Hsiang et al (2017) came to a similar conclusion on studies investigating the effects exclusively in women. The positive effects of CC have also been demonstrated in the youth (Archer 2015; Asarnow et al. 2015).

Hudson et al (2016) applied the World Health Organisation's International classification of functioning, disability, and health (WHO ICF) in their meta-analysis and found that CC led to a small but significant improvement in social functioning. Woltmann et al (2012) came to a similar conclusion, and also demonstrated significant effects in symptom improvement and mental and physical quality of life across all health care system levels. Lastly, CC has also been found to improve doctor satisfaction with care (Levine, Unützer, and Yip 2005).

A systematic review by Gunn et al (2006), not included in the Archer et al (2012) review, concluded that system level interventions, like CC, implemented in the US, lead to modest benefits in depression recovery. The study included eleven RCT's, of which ten were conducted in the USA. Gunn et al (2006) questioned the relevance of such interventions to countries with primary care systems stronger than that of the US, but Sighinolfi et al (2014) found better results in countries with precisely such systems, in their systematic review and meta-analysis of CC for depression in European countries. They postulated that a robust primary care system with adequate resources may favour successful implementation of the necessary components of CC.

The bulk of evidence for CC is in the context of depression, but evidence is growing for its effectiveness in improving anxiety (Archer et al. 2012; Roy-Byrne and Wagner 2004) and other mental health disorder outcomes. Muntingh et al (2016) concluded from a systematic review and meta-analysis (which included seven studies of moderate to high quality, with a total of 2105 participants) that the evidence in anxiety disorder improvement is promising, but that the number of studies is small. Zatzick et al (2004) ran a randomised control trial with stepped care interventions for PTSD with 207 participants during the twelve months post-injury. They found significant improvement in access to evidence-based treatment, symptoms of PTSD, physical function and patient satisfaction. The body of evidence in favour

of CC appears to be less robust for bipolar mood disorder (Oud et al. 2016; Reilly et al. 2013) and schizophrenia (Reilly et al. 2013).

The theoretical promise of CC is to improve overall health outcomes; in part, a patient adherent to psychiatric medication is likely to apply the same adherence to other medications as well, and a person with less burden from mental illness symptoms may be more likely to partake in better self-care in general. Although the findings on the effectiveness of CC on depression outcomes appear consistent, the evidence on the impact on non-psychiatric comorbidities appears less robust. In people living with diabetes and depression, Huang et al (2013) found that CC resulted in significant improvement of depression outcomes and adherence to antidepressant medication and oral hypoglycaemic agents, but that the improved depression outcomes were not directly associated with significant improvement in HbA1C values. Their systematic review and meta-analysis included eight RCTs with a total of 2,238 participants in primary care settings. Atlantis et al (2014) reported a similar finding in their systematic review and meta-analysis of seven RCTs (with reports on depression outcomes in 1895 participants and glycated haemoglobin (HbA1c) level in 1556 participants), and concluded that CC resulted in significant reduction in HbA1C and depression outcomes independently. A systematic review and meta-analysis of six RCTS by Tully & Baumeister (2015) did not show significant reduction in major adverse cardiac events beyond the short term (6 months). They did however caution that these findings were limited to three trials which reported primary major adverse cardiac events end points in the short term. They also found, similar to others mentioned above, significant reduction in depression and anxiety symptoms and improvement in mental health quality of life from CC, but highlighted that few studies were conducted outside of the USA and studies were heterogeneous

Whereas the evidence for clinical effectiveness is fairly convincing, particularly in the context of depression, policy-makers and implementers also require evidence regarding cost-effectiveness and feasibility in order to justify and advocate for large-scale implementation of CC. The literature appears to be inconclusive regarding the cost-effectiveness of CC compared to usual care for mental disorders. Gunn et al (2006) claimed in 2006 that the cost-effectiveness of CC was unclear. In 2012 Woltmann et al (2012) found total health care cost neutrality between CC and usual care for depression, evaluated across all system levels

(primary, speciality, and behavioural health care). The study by Reilly et al (2013), mentioned earlier, found no significant difference in direct treatment costs of CC compared to usual care in people with BPMD or schizophrenia. In their systematic review of nineteen cost-effectiveness analyses, Grochtdreis et al (2015) found that the evidence for cost-effectiveness of CC compared to usual care in depression was ambiguous and dependent on willingness to pay[6]. A similar conclusion was reached from a cost-benefit analysis by Glied et al (2010) regarding "enhanced care interventions" which involved the training of primary care teams for the management of depression. These interventions provided greater net benefits when they were costlier. In contrast with Grochtdreis et al (2015), however, Glied et al (2010) concluded that the net benefit from CC (i.e. an intervention not solely relying on training of primary care providers) did not increase with the cost of the intervention. That training programmes alone are not cost-effective is further suggested by the findings on a German training programme for primary care providers in the context of anxiety disorders, which was more costly than usual care (König et al. 2009). This intervention in 201 participants also did not show clinical benefit.

Regarding the cost-effectiveness of CC in participants with comorbidities, Grote et al (2017) demonstrated in a randomised trial on 164 pregnant women with probably major depression or dysthymia and 106 with probable PTSD, that significant clinical benefit came at a cost increment of $1312 per participant over 18 months in the MOMCare programme for socially disadvantaged women with comorbid depression and PTSD. A systematic review (which included four economic evaluations all based in the US) by Jeeva et al (2013) highlighted the paucity of evidence on cost-effectiveness of depression care in diabetics, while Tully & Baumeister (2015), in their systematic review and meta-analysis on CC in people with coronary heart disease and depression, found no significant cost-effectiveness benefit in the short term (based on two trials), nor medium term (one trial).

Badamgarav et al (2003) speculated that improved detection and treatment under disease management programmes resulted in increased costs from medication prescription and

[6] The maximum amount a consumer is willing to pay for a particular product or service. This is a subjective measure of value (Le Gall-Ely 2009).

health care practitioner visit increases. They also found increased hospitalisations for depression in those under disease management programmes for depression. It is reasonable to speculate that these admissions were inevitable and may have been costlier at a later, more complicated stage of the disorder. Neumeyer-Gromen et al (2004) also found an increase in costs from disease management programmes, compared to usual care for depression.

Lastly, the cost-effectiveness of the IMPACT intervention was studied by Katon et al (2006). They found an average increased cost for all outpatient care of 25 US dollars over a 24-month period in the intervention group, and an increment of 25 cents per depression-free day (of which there were 115 more compared to the control group). This finding was however also influenced by willingness to pay. Interestingly, increased costs for mental health care were offset by decreased costs for non-mental health care, particularly those delivered in the outpatient setting. A later study on participants in the same original trial showed cost reduction in the longer term. In the group receiving the IMPACT intervention, total health care costs were lower compared to the control group ($29 422; 95% confidence interval, $26 479-$32 365, vs $32 785; 95% confidence interval, $27 648-$37 921) over a four year period (Unutzer et al. 2008). A bootstrap analysis suggested an 87% probability that the difference was to be ascribed to the IMPACT intervention. This, along with consideration of the longer-term duration and often insidious onset of mental illness and delayed help-seeking, suggests that cost analyses are best done over the medium to long term.

In the South African context, Jack et al (2014) concluded that the integration of mental health care into existing health care offerings without the use of specialised workers could be the most cost-efficient way to improve access to mental health care in the country. The authors also identified four major knowledge gaps which complicate the choice and planning of value-based interventions, namely (1) accurate understanding of the health and economic burdens of mental health disorders, (2) design and evaluation of interventions that integrate mental health care into existing health systems, (3) information on the use, effectiveness and costs of traditional therapies for sensible integration with biomedical approaches, and (4) cost-effectiveness evaluation of various specific interventions or packages of interventions within the local context. Interestingly, besides the cost-effectiveness of

depression care in the primary care setting, they also found that treating schizophrenia and BPMD in the community, using older psychotropic drugs paired with psychosocial care, was more cost-effective than inpatient treatment.

2.4.4 Collaborative Care: Predictors of Outcomes

The current project aimed to evaluate the associations between demographic factors and psychiatric comorbidity, and symptom change in participants in the MMHP. Few studies found in this review commented on such associations within CC interventions. Katon et al (2015) found that the effect of a CC intervention in the Depression Attention for Women Now (DAWN) study was significantly greater in uninsured women. They postulated that this difference might be explained by the presence of PTSD, but found that comorbidity of PTSD symptoms had no attenuation on outcomes. Grote et al (2016) however demonstrated that a CC intervention (MOMCare) for perinatal depression had a greater impact on depression symptoms and functional improvement in women with comorbid PTSD than in those without. In their systematic review and meta-analysis on CC for anxiety disorders, Muntingh et al (2016) concluded that, although comorbid depression was prevalent in the included studies, none of them had reported on the effects of comorbid depression on outcomes. Coventry et al (2014) concluded from their systematic review and meta-regression analysis on the characteristics of effective CC in depression, that depression severity had been inconsistently reported in the included studies and that they could not comment on the effect of severity of symptoms on propensity to respond. Ekers et al (2013) however found that the severity of symptoms at baseline did not attenuate the outcomes of nurse-delivered CC for depression. Alford et al (2011) reported on a 5-year cohort study of patients treated through CC for opioid addiction. They found that older and employed patients were significantly more likely to be treated successfully, while patients of African American or Hispanic race experienced the inverse.

The body of literature on intervention characteristics that predict outcomes seems to be slightly better developed. In keeping with the definitions presented earlier, Muntingh et al (2016) found that cooperation of the primary care physician and at least one other

professional, monitoring of symptoms, and evidence-based treatment are essential components of successful CC. Chwastiak et al (2014) claimed that definitive evidence on the essential components of successful CC is lacking, but also suggested that systematic screening and supervised care managers are essential. Coventry et al (2014) did a systematic review and meta-analysis of 74 RCTs on the characteristics of successful CC for depression and also reported that scheduled care manager supervision by a mental health specialist resulted in better depression symptom outcomes. Furthermore, they found that the inclusion of psychological interventions led to greater improvements and that systematic recruitment of participants resulted in increased antidepressant use. This is in contrast with Gilbody et al (2006) who found that the addition of brief psychotherapy did not influence outcomes.

In their evaluation of CC in Europe, Sighinolfi et al (2014) found that CC featuring high fidelity to the components in the definition by Gunn et al (2006) (see 2.4.1 Collaborative Care: Definition), resulted in greater remission rates than those that did not. In their study of nurse-delivered CC for depression, Ekers et al (2013) found that neither the number and duration of clinical contacts, nor the delivery modality had an effect on outcomes. Gilbody et al (2006) also found that the number of sessions did not influence the outcome. While Gilbody et al (2006) concluded that the professional background and supervision of care managers influenced the effectiveness of CC in depression, Coventry et al (2014) concluded to the contrary regarding training background, and suggested that non-mental health trained nurses may be just as effective as those with specialised training, provided that regular specialist supervision is in place. Gilbody et al (2006) also found that medication compliance influenced outcomes, although in some projects, and certainly in the MMHP, this is one of the secondary outcomes of the CC. According to Fortney et al (2015), physical colocation of the mental health care team is not a prerequisite for successful CC. This bodes well for telephonic interventions such as those employed in the MMHP and other resource-constrained environments where face-to-face consultation is not feasible.

In summary, the evidence on the influence of psychiatric comorbidity and demographics on the outcomes of CC is limited and equivocal. Regarding essential programme components for successful CC, the evidence seems to favour systematic symptom monitoring and care manager supervision by a mental health specialist.

2.5. Conclusion

Recent, comprehensive, national data on mental illness prevalence and associations with demographics and comorbidity in South Africa are lacking, while knowledge on mental illness in the country's private sector is mainly limited to claims-based information on PMB CDL conditions, which exclude common mental health disorders such as depression and anxiety. While collaborative care has been established as an effective strategy for scaling good quality care for common mental disorders, particularly depression, adoption outside of the US has been slow. Supervised care management, systematic case review, and evidence-based treatment appear to be key design factors necessary for successful CC implementation, but the influence of demographic factors and comorbidity on outcomes of CC is still uncertain.

Chapter 3: Method

3.1. Study Design

This was a quantitative, quasi-experimental study, using data gathered by Medscheme during the initial implementation phase of the MMHP.

3.2. Setting and Participants

3.2.1 Scheme 1 and Scheme 2

In August 2016, Medscheme started implementation of the MMHP for the two schemes sampled for this study. At the time, the mental illness burden was a priority for both. Costs for inpatient mental health care were rising and consistently featuring in the schemes' top hospital cost drivers. Scheme 1 is an open community-enrolment medical scheme, and had an average of around 145 000 beneficiaries in 2016 (Council for Medical Schemes 2017). Scheme 2 is a corporate, restricted-enrolment scheme serving mainly white-collar employees in the financial industry, with approximately 30 000 beneficiaries in 2015 (Council for Medical Schemes 2016). These schemes were among the first to implement the MMHP. Owing to its restricted membership, the demographics and disease profiles of Scheme 2 are expected to differ from Scheme 1, but may be assumed to be similar to other white-collar worker corporate schemes.

All principal members and dependant beneficiaries of Schemes 1 and 2 that were screened for enrolment on the MMHP between 1 August 2016 and 28 February 2018 were included in the study. Persons younger than 18 years were excluded from eligibility for enrolment on the MMHP as the questionnaires and intervention were designed for adults. Persons under the age of 18, who had made contact with the Programme administrators, were assisted

through standard case management interventions. As this study looked at preliminary outcomes using an existing data set, no sample size calculation was performed.

3.2.2 Medscheme Mental Health Programme (MMHP)

The MMHP is a managed care initiative aimed at curbing the health care cost inflation related to scheme beneficiaries suffering from mental illness or substance use disorders. Medical schemes, like the sample schemes, contract with Medscheme for delivery of the programme as a managed care service. The Care Manager telephonic intervention and psychiatrist consultant overview are funded under managed care fees, as part of the Medscheme managed care service. Care Managers and the psychiatric consultant are employed by Medscheme. The Care Manager team comprises of registered psychiatric nurses, social workers, and clinical agents with formal training in psychology working under supervision of a psychiatric nurse.

As a collaborative care project, the MMHP aims to promote access to improved quality and integrated mental health care, in the mentally ill population (Hattingh 2017b) where this is known to be inadequate (World Health Organisation 2013b). The Programme uses symptom scores (from the PHQ-9, GAD-7, PC-PTSD, and AUDIT questionnaires) gathered during telephonic interviews with scheme beneficiaries, to establish eligibility for enrolment, and to direct programme interventions. These comprise of interactions with treating doctors and beneficiaries in order to promote better quality of care and increased patient activation (Hattingh 2017b, 2017a).

MMHP participants are actively recruited through various managed care processes aimed at identifying beneficiaries at risk of poorly controlled or undiagnosed mental illness or alcohol use disorders.

a) *Identification for Screening by the MMHP*

Potential candidates for MMHP enrolment are identified by Medscheme through various processes directed by medical scheme benefit utilisation or beneficiaries making direct inbound telephonic contact and indicating a potential mental health or substance use problem (see Table 1). The majority of these processes are designed to flag those who are likely to be symptomatic or poorly controlled, based on health care utilisation considered in excess of the norm, signalled by medical scheme claims or specific requests for pre-authorisation of funding. Better understanding of the beneficiary profiles in relation to the various points of entry into the programme may assist with enhancing these processes.

Table 1: Entry Points Into the MMHP

1. Positive answers to mental illness screening questions in the High-Risk Beneficiary Intervention (HRBI)	The Medscheme HRBI utilises a predictive actuarial model which was developed in-house, to identify beneficiaries at high risk of incurring relatively high health care costs in the following year. The logistic regression model uses variables known to influence future health care utilisation such as age, gender, geographical location, prior health care utilisation and cost, as well as the presence of clinical conditions. Twice a year, beneficiaries managed by Medscheme are stratified according to the probability of being amongst the top 10% of highest health care claiming individuals within the following year. The HRBI is aimed at those with at least a 60% probability of being in the top 10% of highest claiming individuals. This is typically around 4% of the entire population (Mannie and Strydom 2016). The following additional criteria are applied to identify candidates for the HRBI from this group (Mannie and Strydom 2016): • Age ≤ 69 years at time of identification • Absence of HRBI in the previous programme cycle • No existing enrolment on the Aid for AIDS (AFA) programme[7].

[7] Aid for AIDS (AfA) is a managed care programme for medical scheme beneficiaries diagnosed with HIV.

	Beneficiaries deemed to be at high risk according to the above model are contacted telephonically by a Medscheme call centre agent and a general health questionnaire is administered to ascertain current health status. This information then directs behaviour change coaching to support healthy lifestyle change and effective self-care. During the period of study under the current project, this questionnaire included a slightly modified version of the PHQ-9 (Appendix A). Any responses indicating experience of any of the listed symptoms on "several" or "most days" triggered referral to the MMHP for further screening. A positive response to the question on thoughts of self-harm was also an independent trigger for referral.
2. Extraordinary and new chronic medicine funding requests	Medscheme manages the Chronic Medicine Benefit for contracted schemes through various managed care processes and interventions, including pre-authorisation of funding against available benefits and managed care protocols and formularies. In cases where requests fall outside standard protocols and formularies, funding requests are reviewed by a specialist psychiatrist. Should the psychiatrist deem the beneficiary to be a potential candidate for the MMHP, the case is referred for screening for enrolment.
3. Utilisation of ambulatory care benefits	Medscheme manages ambulatory Prescribed Minimum Benefits (aPMB) through various managed care processes and interventions, including pre-authorisation of funding against managed care protocols and "baskets of care" – benefit packages designed in accordance with PMB parameters. In cases where requests fall outside standard protocols and baskets of care, referral to the MMHP occurs for screening for enrolment. In addition, in cases where nearly half of the fifteen out-patient PMB psychotherapy sessions had been utilised within a benefit year, referral to the MMHP for screening for enrolment also occurs. This is to potentially identify cases where intensive care is required early on, before benefits become depleted.
4. Inbound telephonic contact from beneficiaries	Beneficiaries may be directed to the MMHP team by choosing the option on an interactive voice response (IVR) system when dialling the generic scheme beneficiary assistance call centre. Should the beneficiary indicate a potential need for mental health care, the MMHP team assesses eligibility for enrolment. Should there be clinical urgency, the beneficiary is assisted to obtain a consultation with an appropriate health care provider as soon as the circumstances require.

5. Discharge from institutionalised care	Beneficiaries who are discharged from institutionalised care for major depression, GAD, PTSD or alcohol abuse, are contacted within approximately one week post-discharge and enrolled on the MMHP, provided they give consent. Here, the symptoms scores are recorded to guide further intervention, but does not serve as an eligibility criterion – the hospital admission automatically serves as a qualifying criterion.
6. Other	Internal business referrals such as escalations to scheme management are screened for eligibility based on symptom scores.

Once identified as a potential candidate, enrolment criteria for the MMHP are the following:

- A recent hospitalisation for a mental illness or substance use disorder and/or
- any one of the following symptom scores: PHQ-9 ≥ 10, GAD-7 ≥10, AUDIT ≥16, or PC-PTSD ≥3 and
- beneficiary consent to participate in the MMHP and for sharing of personal information with associated health care providers and
- participation of the main mental health care provider.

b) *MMHP Interventions*

The MMHP is a complex project with various interventions directed towards supporting the beneficiary with a mental illness or substance use disorder, and the associated family practitioner (see Figure below).

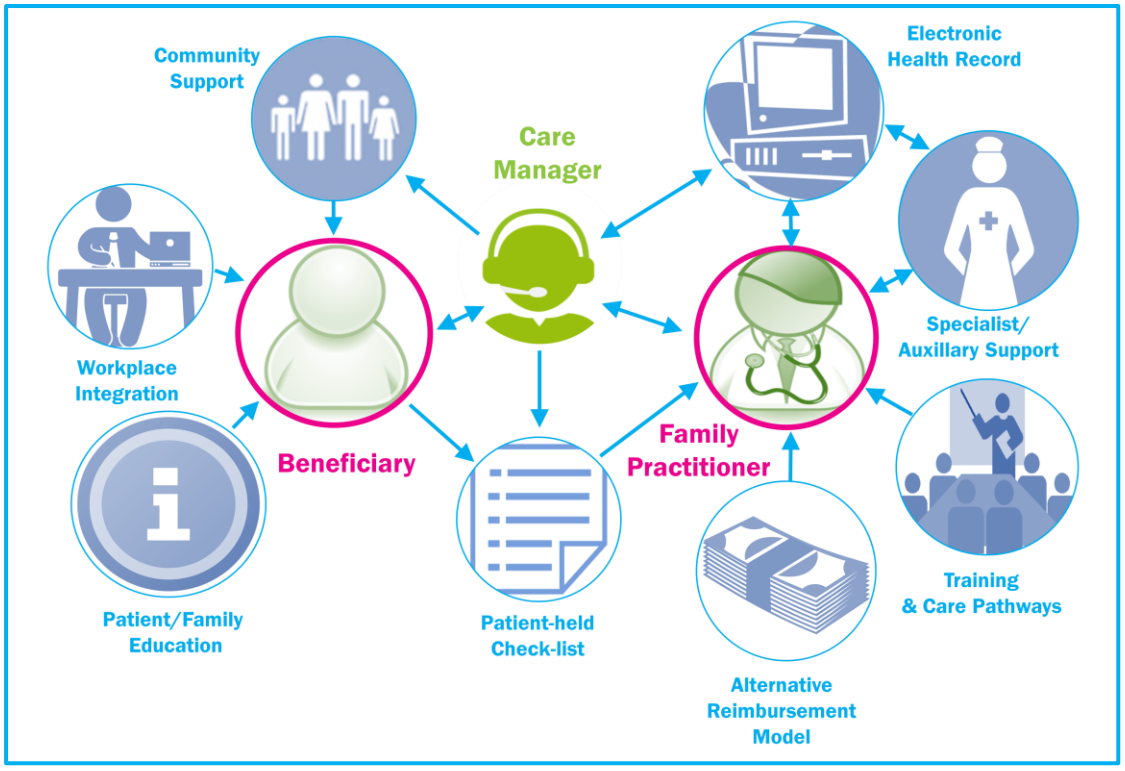

Figure 2: Components of the Medscheme Mental Health Programme (Hattingh 2017b)

i. Support to and Role of Family Practitioners

After initial contact with a beneficiary who is eligible for enrolment based on symptom severity, the beneficiary is advised to consult his/her treating doctor. Formal enrolment on the intervention occurs once the doctor has seen the patient, made/confirmed a diagnosis, and reviewed or initiated a treatment plan. Should the candidate fail to consult with their doctor after three telephonic prompts by the Care Manager, he/she is discharged from the intervention. This is in recognition of the collaboration with the treating primary care doctor as a critical requirement for programme success. Treatment and referral decisions remain with the patient's treating doctors, with envisaged enhancement of the quality of the care by way of the following:

- face-to-face and electronic-based training and support (for family practitioners) on current best practice and mental health care integration at the primary level (not yet implemented at the time of this study)
- alternative reimbursement models which incentivise good quality, integrated and coordinated care (this entails preferential reimbursement for desired outcomes and adherence to best practice principles) (not yet implemented at the time of this study)
- active monitoring of symptom response and specialist review and recommendations (see next section).

Once formally enrolled on the Programme, an additional discretionary funding benefit is activated to support ambulatory care, inclusive of family practitioner, psychiatrist, psychologist and social worker consultations. Medical schemes participating in the MMHP are also required to cover at least a basic formulary of medication for the treatment of depression and anxiety. Registration for funding for chronic medicine benefits is also facilitated by the Care Manager.

ii. Improving Quality by Promoting "Treatment-to-Target"

Once enrolled on the MMHP, The Medscheme Care Manager repeats the symptom questionnaires telephonically at set intervals (10 weeks from baseline [acute phase], and then twice during a six-month maintenance phase), and communicates regularly with the associated health care provider regarding treatment response as measured by the symptom scores. Individual symptom scores are presented in a graph, against baseline and by date, and shared via email in a standardised letter template to participating health care providers associated with the individual patient.

Notwithstanding the inherent limitations of third-party, telephonic monitoring, the objective tracking of symptoms by the Care Manager aims to promote timely identification and adjustment of ineffective treatment plans. In the case of depression and GAD, symptom scores are expected to show at least 50% improvement from baseline at around 10-12 weeks after initiation on a successful treatment plan (AIMS Center Advancing Integrated

Mental Health Solutions 2016). According to experience in the United States, 50-70% of patients will require at least one treatment plan change before they respond optimally (AIMS Center Advancing Integrated Mental Health Solutions 2016). Target scores of 15 or below on the AUDIT and 2 or below on the PC-PTSD are pursued. When treatment targets aren't met, the case is reviewed by the Medscheme psychiatrist consultant and, if deemed appropriate, the treating mental health care provider is alerted and encouraged to review the current treatment plan, and offered access to specialist advice from the Medscheme psychiatrist consultant (Hattingh 2017b). Advice might include revision of medication dosages/drug classes, referral for community-based psychotherapy and/or social work assistance, or referral for specialist care, where indicated.

Figure 3 below illustrates the process, including the different phases of intervention ("acute" and "maintenance").

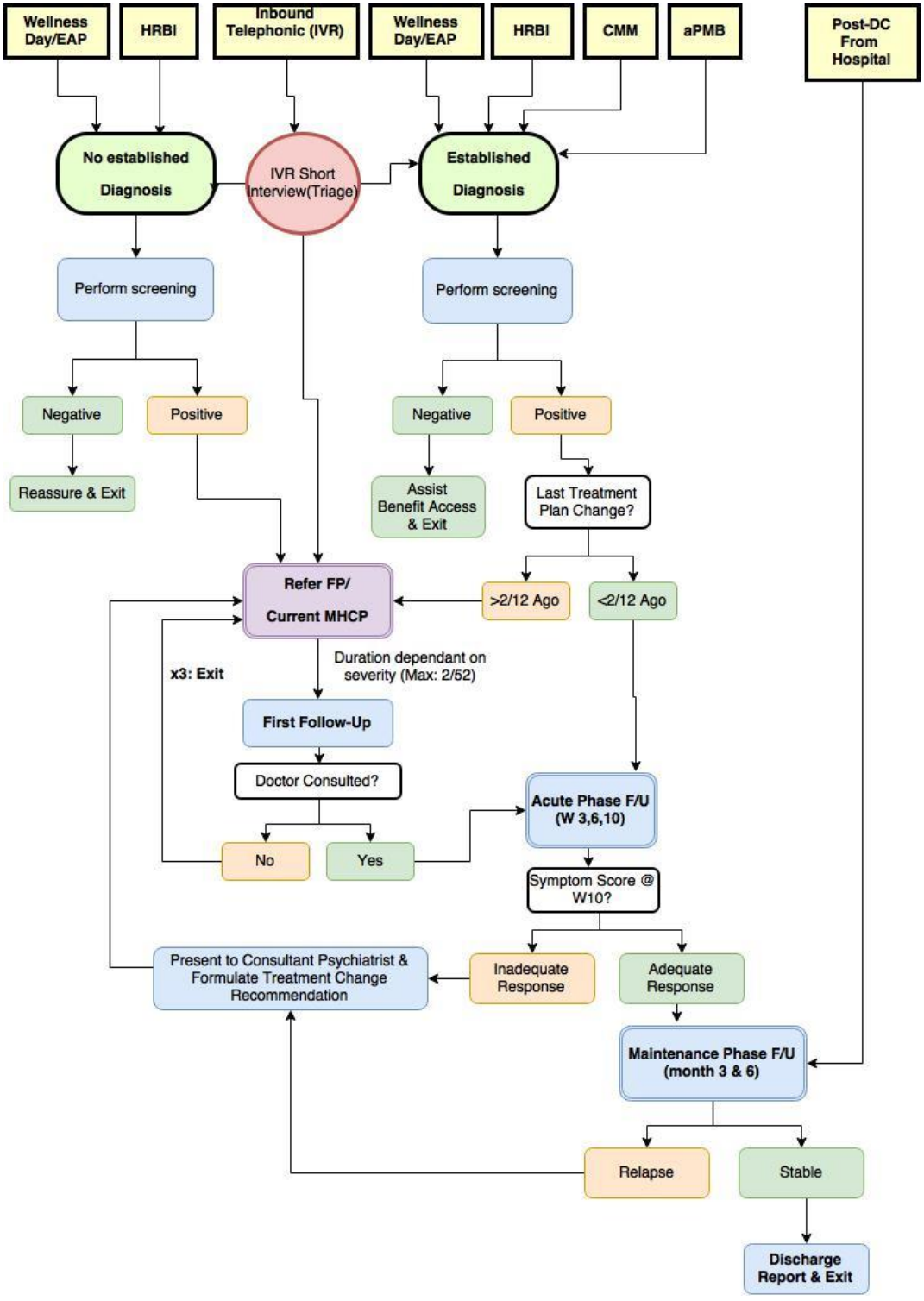

Figure 3: Medscheme Mental Health Programme Intervention Process (IVR: Interactive Voice Response; EAP: employee assistance programme; HRBI: High Risk Beneficiary Intervention); CMM: Chronic Medicine Management; aPMB: Ambulatory Prescribed Minimum Benefit Management); FP: family practitioner; MHCP: mental health care practitioner; F/U: follow-up; 10w: ten weeks; DC: discharge)

iii. Supporting the Beneficiary

Enrolees on the MMHP are encouraged to adhere to and actively participate in treatment in order to achieve desired clinical outcomes. To this end, patient activation and support for self-care are key components of the Medscheme Mental Health Programme. These are promoted through the following (Hattingh 2017b):

- Education of beneficiaries and their families, via telephone and educational brochures distributed via email. In addition to the contact intervals outlined above, telephonic contact is also made with the beneficiary at week 6 and, at the discretion of the Care Manager, additional intervals, for motivational interviewing, medicine compliance management, and benefit access assistance.
- The facilitation of behavioural activation by Care Managers during telephonic interventions.
- Patient-held checklists of items to discuss with their doctors.
- Integration with workplace wellness initiatives.
- Facilitating access to community support groups.

To promote holistic care for enrolees on the MMHP, the Care Manager ascertains when last the beneficiary had a general health check-up at the point of programme exit and facilitates access to available preventative care medical scheme benefits as needed.

Should an emergency situation be identified during the Care Manager-beneficiary conversation (e.g. suicide or self-harm risk) at any point in the programme, the beneficiary is assisted to consult with a health care professional as soon as possible, and the nominated practitioner is notified.

3.3. Data Collection and Management

Data for this study were sourced from the Medscheme data warehouse, de-identified and stored and analysed on a password-encrypted laptop computer. All MMHP data were extracted in an Excel worksheet from where relevant data for this study were selected and imported into a statistical software programme. Additional data columns were computed from the raw data, towards meeting the study objectives. Whereas this study made use of secondary data collection from the Medscheme data warehouse for analysis, some context regarding the primary data collection by Medscheme is relevant for understanding the nature, scope and limitations of the data. Medscheme Care Managers administered questionnaires during outbound telephonic calls to scheme beneficiaries to identify MMHP candidates and monitor enrolees at structured intervals to direct Programme interventions as outlined earlier. Symptom scores and additional data such as referral source were captured manually by Care Managers into an electronic user interface, which fed data to the Medscheme data warehouse. Demographic data were gathered during standard managed care operations such as membership registration.

Given the complexity and novelty of the MMHP and its continuous development, especially the earlier primary data in the set required cleaning through the development of several rules to improve the quality. These included the removal of duplicate scores, applying skip rules, populating enrolment scores with screening scores where the former were absent, correcting errors in discharge data and enrolment data, and populating Week 10 scores where missing, based on scoring captured between 8-16 weeks after enrolment. Please see Appendix B for a summary of the rules applied. This study used the data resulting from the application of these rules.

3.4. Measures and Instruments

During primary data collection by Medscheme Care Managers, symptoms of major depressive disorder, GAD, PTSD and alcohol abuse were screened for by using symptom scoring tools contained in the Patient Stress Questionnaire (Substance Abuse and Mental Health Services Administration 2011), which is a combination of the PHQ-9 (Spitzer, Williams, and Kroenke 2002-2015; Kroenke and Spitzer 2002), GAD-7 (Spitzer, Williams, and Kroenke 2002-2015; Spitzer and Kroenke 2006), PC-PTSD (US Department of Veteran Affairs 2015; Prins, Ouimette, and Kimerling 2003) and AUDIT (Babor et al. 2001; World Health Organisation 2015). Skip rules were used to shorten the questionnaire in order to reduce the time of the phone call. The skip rules are based on the PHQ-4 (Lowe et al. 2010; Pfizer 2016) and AUDIT-C (Bush, Kivlahan, and McDonnell 1998), which allow preliminary screening based on fewer questions, and progression to the full questionnaire in the case of positive answers. The negative response to the first question in the AUDIT was also used as a skip rule. Lastly, complete negative answering to the GAD-7 also served as a skip rule for administering the PC-PTSD. This was based on the assumption that sufferers of PTSD will have at least some symptoms identified by the GAD-7 (Kroenke et al. 2016; Lowe et al. 2008). Where skip rules were applied, a "zero" score was automatically assigned to subsequent questions in that section.

These tools are being used in the MMHP because they address the conditions expected to be most common in the schemes' memberships, are quick and easy to administer, are available freely in the public domain, and have been validated for use in the primary care setting (Kroenke, Spitzer, and Williams 2001; Lowe et al. 2008; Bradley, Bush, and Epler 2003; Williams 2014; Bush, Kivlahan, and McDonnell 1998). Scoring questionnaires were administered in English.

3.4.1 Symptom Score Cut-offs

a) *Patient Health Questionnaire-9 (PHQ-9)*

The PHQ-9 is a nine-item scoring tool used to assess presence and severity of depression. It has been validated for use in a South African context (Botha 2011). The same cut-off used to identify eligibility for enrolment on the MMHP, namely a score of 10 or more, was used in this analysis to identify individuals potentially suffering from depression. According to a meta-analysis (Manea, Gilbody, and McMillan 2012), the optimal scores for diagnosing depression with the PHQ-9 is between 8 and 11, with no significant differences in sensitivity or specificity within this range. At a cut-off of 10, the sensitivity is 85% and specificity 89%. In local validation studies, Bhana et al (2015) found a relatively low sensitivity (49%) with a cut-off of ≥ 9, but with a relatively high specificity (94%). Similar specificity was found in a study in HIV-infected individuals in Cameroon (Pence et al. 2012), using a cut-off of ≥ 10. The same study however found a sensitivity of only 27%, although the authors point out imprecision in their estimate of sensitivity because of the small number of major depressive disorder cases in the sample.

Cholera et al (2014) used a cut-off of ≥ 10 to define a positive screening for probable depression in a primary health care clinic with a high HIV-burden in Johannesburg, and found a sensitivity of 78.7%, and specificity of 83.4%. They also reported on post-test probability of depression in the standard score categories of 10–14 (moderate depression/anxiety, 34.2%), 15–20 (moderately severe depression/severe anxiety, 47.5%), and for a score higher than 20 (severe depression, 75%). In the current project, these same cut-offs have been used to stratify findings from the PHQ-9. Adewuya et al (2006) found good concurrent validity of the PHQ-9 with the BDI in a sample of Nigeria university students and concluded on an optimal cut-off score for identifying major depressive disorder of 10 (sensitivity 85%, specificity 99%). Lastly, Chibanda et al (2016) found a sensitivity of 85% and specificity of 69% with a cut-off of ≥ 11 in primary care attendees in a Zimbabwean population with high HIV prevalence. Given these findings, collectively, a cut-off of 10 or more for the identification of possible depression seems justified.

In order to gauge symptom severity of depression, the strata of the PHQ-9 defined as per the categories inherent in the design of the questionnaire apply in this project, and are as follows (see Table 2 below):

Table 2: PHQ-9 (Pfizer 2016)

Score	**Interpretation**
0-4:	Negative screen
5-9:	Mild depression
10-14:	Moderate depression
15-19:	Moderately severe depression
20-27	Severe depression

b) *Generalised Anxiety Disorders Questionnaire-7 (GAD-7)*

This study uses the cut-off scores proposed as per the original design of the GAD-7 instrument, a seven-item questionnaire, which includes a score of 10 or more to identify potential cases with anxiety disorders. The developers of the GAD7, Spitzer and Kroenke (2006), demonstrated the validity of the use of the GAD-7 to determine the presence and severity of generalised anxiety disorder in a large US sample. They suggested various cut-off points per severity: 5 (mild), 10 (moderate), and 15 (severe). Other international samples include those studied by Löwe et al (2008), who found the GAD-7 to be a reliable and valid screening tool for identifying anxiety in the general German population and suggested using a score of ≥ 10 to flag potential cases with anxiety disorder. Delgaldillo et al (2012) demonstrated a sensitivity for detecting anxiety disorder of 80% and specificity of 86% in a small sample of attendees of a community drug treatment service in the United Kingdom using a cut-off score of ≥ 9. Kertz et al (2013) found good sensitivity (83%) but poor specificity (46%) in identifying GAD in patients enrolled in a partial hospital programme in the US (a brief hospitalisation intervention focused on skills training and psychoeducation) (Kertz, Bigda-Peyton, and Bjorgvinsson 2013; Neuhaus 2006). Beard and Bjorgvinsson (2014) similarly questioned the validity of use of the GAD-7 as a screening tool in patients in acute psychiatric facilities, but found it to perform well in measuring symptom severity. Whereas

the GAD-7 has been validated for use in primary care populations internationally, no such studies could be found specifically for South Africa. In the Zimbabwean study by Chibanda et al (2016) mentioned in the previous section, the GAD-7 was found to have a sensitivity of 89%, and specificity of 73% for the detection of anxiety at a cut-off score of ≥ 10. A recent meta-analysis and systematic review by Plummer et al (2016) found the range of scores 7-10 to be an acceptable cut-off for identifying GAD, with a sensitivity of 83% and specificity of 84% at a cut-off score of 8, and similar pooled sensitivity and specificity for other scores within that range. The symptom severity strata as per the categories inherent in the design of the GAD-7 are shown in Table 3 below:

Table 3: GAD-7 (Spitzer, Williams, and Kroenke 2002-2015; Spitzer and Kroenke 2006)

Score	Interpretation
0-4:	Negative screen
5-9:	Mild anxiety
10-14:	Moderate anxiety
15-21	Severe anxiety

c) *Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD)*

The PC-PTSD is a four-item score designed for the detection of PTSD in primary care settings (US Department of Veteran Affairs 2015). It is used in veteran affairs medical centres and community-based outpatient clinics in the US (Spoont M, Arbis, and Fu 2013). It was developed based on diagnostic criteria included in the DSM-IV. In the original development study by Prins et al (2003), the optimal cut-off point was found to be a score of 3, in terms of balancing sensitivity (77%) and specificity (85%). The authors did however recommend instead using a cut-off of 2 for identifying the need for further investigation in primary care populations, as this increases sensitivity to 91%, at the cost of a decline in specificity to 72%. For the purposes of the current project, the optimal cut-off of 3 was used to distinguish positive screening for the presence of PTSD, in keeping with its use in the MMHP. No studies to validate this tool in African samples have been found, and findings should hence be interpreted with caution. Unlike for the other tools used in this project, which stratify results

in categories of severity, the PC-PTSD inherently serves to produce a binary result (positive or negative screening) only.

d) *Alcohol Use Disorders Identification Test (AUDIT)*

The Alcohol Use Disorders Identification Test (AUDIT) was first published by the WHO in the late 1980's and has since been widely used for the screening for risky or harmful alcohol use. It has been studied in a variety of settings, including primary care patients (Volk et al. 1997; Piccinelli et al. 1997), in a telephonic population survey (Ivis, Adlaf, and Rehm 2000), as part of a general health questionnaire (Daeppen et al. 2000) – which has some smilarity to the MMHP approach – and in various cultural settings and countries (Isaacson et al. 1994), including Sub-Saharan Africa (Blair et al. 2016) and, specifically, South Africa (Morojele et al. 2017; Myer et al. 2008). Several studies suggest a cut-off score of 8 to have acceptable sensitivity and specificity for identifying current alcohol use disorder (Babor et al. 2001; Allen et al. 1997; Cherpitel 1995), although a more recent review by Reinert and Allen (2007) suggests a cut-off of 5 or 6 to be more appropriate in females. Reinert and Allen (2007) also found similar accuracy to the full AUDIT when using the abbreviated, three-item AUDIT-C, while Asiimwe et al (2015) confirmed the robustness of the AUDIT-C even in settings where drink standardisastion is difficult, such as in its Ugandan HIV-infected study sample. This favours the use of the AUDIT-C as a skip rule, as is currently done in the MMHP. Morojele et al (2017) however found the AUDIT-C to perform less well compared to other abbreviated versions of the full AUDIT, in district antiretroviral treatment (ART) clinics in Tshwane (South Africa), but still with acceptable accuracy at a low cut-off (2 or more). Blair et al (2016) suggested the use of a low AUDIT threshold of ≥3 in the post-war setting in Northern Uganda, in order to optimise sensitivity and allow for the identification of early stage problem drinking where they believe interventions to be potentially less invasive and less costly. Myer et al (2008) however found 100% sensitivity and 95% specificity when testing the "WHO-defined" AUDIT cut-off of ≥ 8 (Babor et al. 2001) in a cohort of HIV-infected individuals in the Western Cape. As per the instrument use guidelines (Babor et al. 2001), a score of 8-15 should elicit simple advice, whereas a score of 16 or above requires further intervention and monitoring. Based on this, a score of 16 or more is used to enroll

beneficiaries for further intervention in the MMHP, and those below are offered once-off, simple telephonic advice.

The strata as per the categories inherent in the design of the AUDIT were used to analyse the data, and are as follows:

Table 4: AUDIT (Babor et al. 2001)

Score	Risk Level
0-7	Zone I: low risk drinking or abstinence
8-15	Zone II: alcohol use in excess of low-risk guidelines
16-19	Zone III: harmful and hazardous drinking
20-40	Zone IV: alcohol dependence

3.5. Ethics

Approval for the performance of this study was obtained from the University of Cape Town Human Research Ethics Committee (reference number: 816/2017). This research was observational in nature and the primary data had been collected and stored as part of existing Medscheme managed care processes. The study posed no additional time burden to participants, and there were no foreseeable risks to individuals whose data were utilised in this study. Medscheme data extracts for the purposes of this study were anonymised. Written consent was obtained from the Principal Officers of Scheme 1 and Scheme 2 for the use of scheme member and beneficiary data for the purposes of this study.

3.6. Data Analysis

Data analysis was conducted using SPPS version 25 (IBM Corp. 2017). Means and proportions of demographics (age, gender and province), scheme type (1 or 2), pathways to entry (hospital discharge, aPMB/CMM, HRBM, Inbound telephonic, and Other), and type and severity of the disorder were calculated for scheme beneficiaries screened for, eligible for and receiving intervention through the MMHP. Using logistic regression, the association between the presence of moderate or severe symptoms of 1) depression, 2) generalised anxiety disorder, and 3) post-traumatic stress disorder, and the following was assessed in those screened for enrolment on the MMHP: scheme type, demographic characteristics, and presence of any of the remaining conditions with moderate or severe symptoms. Moderate/severe symptoms of depression, anxiety and PTSD were identified by a PHQ-9 score of ≥ 10, a GAD-7 score of ≥ 10, and a PC-PTSD score of ≥ 3 (hence forth referred to as positive scores), respectively. Univariate models were created for each predictive variable, and those with statistically significant ($p < 0.05$) associations were included in a final multivariate model. Given that low scores on the GAD-7 is used as a skip rule for screening for PTSD, screening positive on the PC-PTSD was excluded from PHQ-9 models to avoid skewing of the GAD-7 contribution. Proportions of those screened positive *vs* negative were calculated for alcohol abuse using a score of 16 as cut-off.

Percentages of the sample with a single condition, one, two and three comorbidities were also analysed, as well as the proportions of co-occurrence per various combinations of conditions.

Wilcoxon signed rank tests were used to determine the change in symptom severity between baseline and 10 weeks in those receiving intervention through the MMHP, as data were not normally distributed. This was done separately for 1) depression, 2) generalised anxiety disorder, 3) post-traumatic stress disorder, and 4) alcohol abuse.

Linear regression models were created to analyse the predictors of change in clinical scores from enrolment to Week 10. This was done separately for 1) depression, 2) generalised anxiety disorder, and 3) post-traumatic stress disorder. The following independent variables were analysed respectively in univariate models for each symptom scoring tool: scheme,

age, gender, region, referral source, and the other symptom scores, where appropriate. The nine provincial regions were consolidated into the four categories with the most cases: Gauteng, Western Cape, “Other Province” (i.e. Limpopo, Mpumalanga, North-West, Northern Cape, Eastern Cape, Free State, KwaZulu Natal (KZN)), and Province Unknown. Referral source categories were consolidated into “Other than Hospital Discharge” (i.e. aPMB/CMM, HRBM, Inbound telephonic, and Other), “Hospital Discharge” and “Unknown”. Scatterplots suggested that the relationships between the dependent and independent variables were linear. No collinearity was found in the data. Residuals were found to be normally distributed. Durbin-Watson statistics were between 1.5 – 2.5 for each independent variable and therefore the data were not auto-correlated. Plots of standardised residuals *vs* standardised predicted values showed no obvious signs of funnelling, suggesting that the assumption of homoscedasticity was met. Cook’s Distance values were all under 1, suggesting that there were no individual cases unduly influencing the models. There was no multicollinearity in the data, with all VIF scores below 10, and tolerance scores above 0.2. Baseline scores of the index conditions were included in the models as independent predictors. A final, multivariate model was created for each symptom score. Finally, a table with reasons for attrition in sample size at Week 10 and programme completion is presented.

Chapter 4: Results

A total of 1217 individuals screened for enrolment on the MMHP were included in this study. At the time of sampling, 765 had been eligible for enrolment and 658 had been enrolled. A total of 208 individuals had reached the 10 week intervention stage (see 4.3 & 4.4). Characteristics of participants screened, those eligible for enrolment on the MMHP, and those enrolled are shown in Table 5 below. Screened participants were fairly evenly distributed across the age groups from 26-65 years, while those eligible for programme enrolment were more concentrated in the younger age groups. Females predominated in this sample, and provincial distribution was mainly concentrated in the Western Cape and Gauteng. Numbers and percentages within symptom scoring categories for depression, anxiety, PTSD, and alcohol misuse in each group are also shown in Table 5.

Table 5: Baseline Characteristics

	All screened (n=1217)	**Eligible (n=765)**	**Enrolled (n=658)**
Age			
Mean (Range)	48.07 (18-92)	43.50 (18-85)	43.69 (18-85)
18-25 years	100 (8.2%)	76 (9.9%)	63 (9.6%)
26-35 years	231 (19%)	187 (24.4%)	161 (24.5%)
36-45 years	214 (17.6%)	167 (21.8%)	146 (22.2%)
46-55 years	243 (20%)	170 (22.2%)	144 (21.9%)
56-65 years	223 (18.3%)	107 (14%)	88 (13.4%)
66-75 years	167 (13.7%)	47 (6.1%)	48 (7.3%)
76-100 years	39 (3.2%)	11 (1.4%)	8 (1.2%)
Gender			
Female	868 (71.3%)	593 (77.5%)	509 (77.4%)
Male	349 (28.7%)	172 (22.5%)	149 (22.6%)

	All screened (n=1217)	Eligible (n=765)	Enrolled (n=658)
Scheme			
1	865 (71.1%)	483 (63.1%)	428 (65%)
2	352 (28.9%)	282 (36.9%)	230 (35%)
Region			
Eastern Cape	89 (7.3%)	53 (6.9%)	45 (6.8%)
Free State	42 (3.5%)	28 (3.7%)	25 (3.8%)
Gauteng	364 (29.9%)	216 (28.2%)	182 (27.7%)
KZN	82 (6.7%)	44 (5.8%)	39 (5.9%)
Limpopo	12 (1.0%)	9 (1.2%)	8 (1.2%)
Mpumalanga	28 (2.3%)	16 (2.1%)	12 (1.8%)
North West	40 (3.3%)	22 (2.9%)	19 (2.9%)
Northern Cape	33 (2.7%)	20 (2.6%)	19 (2.9%)
Western Cape	290 (23.8%)	175 (22.9%)	162 (24.6%)
Unknown	237 (19.5%)	182 (23.8%)	147 (22.3%)
Referral source			
aPMB/CMM	76 (6.2%)	44 (5.8%)	39 (5.9%)
Hospital Discharge	178 (14.6%)	178 (23.3%)	178 (27.1%)
HRBM	29 (2.4%)	17 (2.2%)	10 (1.5%)
Other	64 (5.2%)	54 (7.1%)	50 (7.6%)
Inbound Telephonic	78 (6.4%)	76 (9.9%)	60 (9.1%)
Unknown	792 (65.1%)	396 (51.8%)	321 (48.8%)
Baseline Symptom Scores			
AUDIT			
AUDIT mean score (SD)	1.89 (3.56)	2.01 (4.17)	1.94 (3.97)
Zone I: Low risk (0-7)	1141 (94%)	699 (91.6%)	600 (91.3%)
Zone II: Use in excess of low risk (8-15)	52 (4.3%)	43 (5.6%)	40 (6.1%)

	All screened (n=1217)	Eligible (n=765)	Enrolled (n=658)
Zone III: Harmful or hazardous use (16-19)	13 (1.1%)	13 (1.7%)	11 (1.7%)
Zone IV: Alcohol dependence (20-40)	8 (0.7%)	8 (1%)	6 (0.9%)
GAD-7			
GAD-7 mean score (SD)	8.70 (7.36)	13.11 (5.55)	12.32 (6.13)
Negative screen (0-4)	462 (38.1%)	71 (9.3%)	90 (13.7%)
Mild anxiety (5-9)	160 (13.2%)	99 (13%)	92 (14%)
Moderate anxiety (10-14)	242 (19.9%)	242 (31.8)	187 (28.5%)
Severe anxiety (15-21)	350 (28.8%)	350 (45.9%)	286 (43.7%)
PHQ-9			
PHQ-9 mean (SD)	10.56 (9.23)	16.08 (7.06)	15.18 (7.82)
Negative screen (0-4)	458 (37.7%)	65 (8.5%)	87 (13.2%)
Mild depression (5-9)	110 (9%)	51 (6.7%)	44 (6.7%)
Moderate depression (10-14)	159 (13.1%)	159 (20.8%)	123 (18.7%)
Moderately severe depression (15-19)	207 (17%)	207 (27.1%)	170 (25.9%)
Severe depression (20-27)	282 (23.2%)	282 (36.9%)	233 (35.5%)
PC-PTSD			
PC-PTSD pos number (percentage)	404 (33.6%)	404 (52.8%)	322 (48.9%)
PC-PTSD mean (SD)	1.44 (1.69)	2.23 (1.67)	2.09 (1.69)

”Pos”: refers to cases with scores in the moderate or severe ranges of each symptom category. See Chapter 3 for detailed definitions; HRBM: high risk beneficiary risk model; CMM: chronic medicine management; aPMB: ambulatory prescribed minimum benefit management.

4.1. Associations between Screening Results, Demographics, Scheme, and Referral Source

4.1.1 Patient Health Questionnaire-9 (PHQ-9)

As shown in Table 6 below, of those screening positive on the PHQ-9, the majority were females (77.6%), and from Scheme 1 (61.3%), the largest scheme. Provincial distribution was concentrated in Gauteng (32.3%) and the Western Cape (24.8%). For a significant proportion of the sample, the referral source is unknown, whereas for the remainder, 20.1% of those screened positive were referred from hospital discharge, while 10.8% were self-referred via inbound telephonic contact. Only 2.6% of those with PHQ-9 positive screening also screened positive on the AUDIT tool, whereas 83% of PHQ-9 screened positive cases also screened positive on the GAD-7, and 54.6% also screened positive on the PC-PTSD.

In the univariate logistic regression models, gender, age, scheme, unknown province, and referrals from hospital discharge, inbound telephonic, and 'other' were all statistically significantly associated with PHQ-9 positive screening, as was a positive screening on each of the other three clinical screening tools (AUDIT, GAD-7 and PC-PTSD).

In the multivariate model, province was excluded, as the only statistically significant category was "unknown" in the univariate model for province. In the multivariate model, a statistically significant association was demonstrated between gender and PHQ-9 positive screening, with and odds ratio of 1.51, favouring females (95% CI = 1.03 – 2.21). The association with the scheme was also statistically significant, with beneficiaries in Scheme 1 less likely to screen positive (OR = 0.62, 95% CI = 0.41 – 0.92). Age was also a statistically significant contributor, with a decrease in likelihood to screen positive with increase in age (OR: 0.99, 95% CI= 0.98 – 1.00). Referral from hospital discharge and inbound telephonic were statistically significant (p-values of 0.006 and 0.022, respectively), both with higher likelihood to yield positive screening, compared to referral from aPMB/CMM (OR = 3.05, 95% CI = 1.37 – 6.8 and OR = 3.88, 95% CI= 1.13 – 12.4, respectively). Lastly, screening positively on the GAD-7 was found to be a very strong predictor of comorbid positive screening on the PHQ-9 (OR = 36.6, 95% CI = 25.4 – 52.6). The association with AUDIT

screened positive was not significant in the multivariate model. This model predicted 64.4% of the variance, as indicated by the Nagelkerke R^2 statistic.

Table 6: Logistic Regression Model for Age, Gender, Scheme, Region, Referral Source, AUDIT ≥ 16, GAD ≥ PC-PTSD ≥3, and Proportions of Screened Participants with Moderate/Severe Depression (PHQ-9 ≥ 10)

	PHQ-9 ≥ 10	PHQ-9 < 10	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gender				
Male	145 (22.4%)	204 (35.9%)	1.00	
Female	503 (77.6%)	365 (64.1%)	1.94 (1.51 – 2.49)	1.51 (1.03 – 2.21)
Scheme				
2	251 (38.7%)	101 (17.8%)	1.00	
1	397 (61.3%)	468 (82.2%)	0.34 (0.26 – 0.45)	0.62 (0.41 – 0.92)*
Age				
Median (SD)	43 (14.06)	56 (16.39)	0.96 (0.95 – 0.97)	0.99 (0.98 – 1.00)
Region				
Eastern Cape	47 (7.3%)	42 (7.4%)	1.00	
Free State	23 (3.5%)	19 (3.3%)	1.08 (0.52 – 2.26)	
Gauteng	180 (27.8%)	184 (32.3%)	0.87 (0.55 – 1.39)	
KZN	35 (5.4%)	47 (8.3%)	0.67 (0.36 – 1.22)	
Limpopo	8 (1.2%)	4 (0.7%)	1.79 (0.50 – 6.37)	
Mpumalanga	12 (1.9%)	16 (2.8%)	0.67 (0.29 – 1.58)	
North West	19 (2.9%)	21 (3.7%)	0.81 (0.38 – 1.71)	
Northern Cape	15 (2.3%)	18 (3.2%)	0.75 (0.33 – 1.66)	
Western Cape	149 (23.0%)	141 (24.8%)	0.94 (0.59 – 1.52)	
Unknown	160 (24.7%)	77 (13.5%)	1.86 (1.13 – 3.05)	

	PHQ-9 ≥ 10	PHQ-9 < 10	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Ref Source				
aPMB/CMM	37 (5.7%)	39 (6.9%)	1.00	1.00
Hospital Discharge	130 (20.1%)	48 (8.4%)	2.86 (1.63 – 4.99)	3.05 (1.37 – 6.78)*
HRBM	15 (2.3%)	14 (2.5%)	1.13 (0.48 – 2.66)	1.24 (0.34 – 4.51)*
Other	49 (7.6%)	15 (2.6%)	3.44 (1.66 – 7.16)	2.57 (0.90 – 7.38)*
Inbound Telephonic	70 (10.8%)	8 (1.4%)	9.2 (3.9 – 21.8)	3.88 (1.13 – 12.4)*
Unknown	347 (53.5%)	445 (78.2%)	0.82 (0.51 – 1.32)	0.99 (0.49 – 2.00)*
AUDIT ≥ 16				
No	631 (97.4%)	565 (99.3%)	1.00	1.00
Yes	17 (2.6%)	4 (0.7%)	3.81 (1.27 – 11.4)	3.44 (0.85 – 13.9)*
GAD-7 ≥ 10				
No	110 (17%)	515 (90.5%)	1.00	1.00
Yes	538 (83%)	54 (9.5%)	46.6 (33.0 – 66.0)	36.6 (25.4 – 52.6)*
PC-PTSD ≥ 3				
No	294 (45.4%)	519 (91.2%)	1.00	
Yes	354 (54.6%)	50 (8.8%)	12.5(9.0 – 17.4)	

*Adjusted for age and gender

4.1.2 Generalised Anxiety Disorder Questionnaire-7 (GAD-7)

The majority of those screening positive on the GAD-7 were female (77.9%), and from Scheme 1 (60.8%), as shown in Table 7 below. Screened-positive individuals were concentrated in Gauteng (26.9%) and the Western Cape (23.3%), with the province unknown in 25.5%. The majority of screened positive cases had an unknown referral source (54.2%), while the remainder came mainly from hospital discharge (18.4%) and inbound telephonic

(11.1%). Only 2.4% of those with a positive GAD-7 screening also screened positive on the AUDIT tool, while 90.9% also screened positive on the PHQ-9.

Gender, scheme, age, unknown province, referrals from hospital discharge, 'other', and 'inbound telephonic' were all statistically significantly associated with positive GAD-7 screening scores in the univariate logistic regression models. Positive screening on the PHQ-9 was also statistically significantly associated.

For the same reasons as mentioned in the previous section, province was excluded from the multivariate model. In this model, only age (OR = 0.97, 95% CI = 0.96 – 0.98) and positive screening on the PHQ-9 were statistically significant. The PHQ-9 positive screening was found to be a very strong predictor of concomitant positive screening on the GAD-7 (OR = 36.4, CI = 25.3 – 52.2). As per the Nagelkerke R^2 statistic, the model predicted 63.2% of variance.

Table 7: Logistic Regression Model for Age, Gender, Scheme, Region, Referral Source, AUDIT ≥ 16, and PHQ-9 ≥ 10, and Proportions of Screened Participants with Moderate/Severe Anxiety (GAD-7 ≥ 10)

	GAD-7 ≥ 10	GAD-7 < 10	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Gender				
Male	131 (22.1%)	218 (34.9%)	1.00	
Female	461 (77.9%)	407 (65.1%)	1.89 (1.46 – 2.43)	1.36 (0.93 – 2.00)
Scheme				
2	232 (39.2%)	120 (19.2%)	1.00	
1	360 (60.8%)	505 (80.8%)	0.37 (0.29 – 0.48)	0.76 (0.52 – 1.13)*
Age				
Median (SD)	42 (13.84)	56 (16.21)	0.96 (0.95 – 0.96)	0.97 (0.96 – 0.98)

	GAD-7 ≥ 10	GAD-7 < 10	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Region				
Eastern Cape	40 (6.8%)	49 (7.8%)	1.00	
Free State	16 (2.7%)	26 (4.2%)	0.75 (0.36 – 1.60)	
Gauteng	159 (26.9%)	205 (32.8%)	0.95 (0.60 – 1.51)	
KZN	36 (6.1%)	46 (7.4%)	0.96 (0.52 – 1.75)	
Limpopo	7 (1.2%)	5 (0.8%)	1.72 (0.51 – 5.82)	
Mpumalanga	14 (2.4%)	14 (2.2%)	1.23 (0.52 – 2.87)	
North West	16 (2.7%)	24 (3.8%)	0.82 (0.38 – 1.74)	
Northern Cape	15 (2.5%)	18 (2.9%)	1.02 (0.46 – 2.28)	
Western Cape	138 (23.3%)	152 (24.3%)	1.11 (0.69 – 1.79)	
Unknown	151 (25.5%)	86 (13.8%)	2.15 (1.31 – 3.53)	
Ref Source				
aPMB/CMM	36 (6.1%)	40 (6.4%)	1.00	
Hospital Discharge	109 (18.4%)	69 (11.0%)	1.76 (1.02 – 3.02)	0.70 (0.32 – 1.51)*
HRBM	14 (2.4%)	15 (2.4%)	1.04 (0.44 – 2.44)	1.22 (0.33 – 4.5)*
Other	46 (7.8%)	18 (2.9%)	2.84 (1.40 – 5.76)	1.59 (0.57 – 4.4)*
Inbound Telephonic	66 (11.1%)	12 (1.9%)	6.1 (2.85 – 13.1)	1.73 (0.61 – 4.9)*
Unknown	321 (54.2%)	471 (75.4%)	0.76 (0.47 – 1.21)	0.82 (0.41 – 1.65)*
AUDIT ≥ 16				
No	578 (97.6%)	618 (98.9%)	1.00	
Yes	14 (2.4%)	7 (1.1%)	2.14 (0.86 – 5.34)	

	GAD-7 ≥ 10	GAD-7 < 10	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
PHQ-9 ≥ 10				
No	54 (9.1%)	515 (82.4%)	1.00	
Yes	538 (90.9%)	110 (17.6%)	46.6 (33.0 – 66.0)	36.4 (25.3 – 52.2)*

*Adjusted for age and gender

4.1.3 Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD)

As shown in Table 8, the majority of those screening positive on the PC-PTSD were female (80.4%), and, again, were from the larger Scheme 1 (62.9%). Most screened positive cases were located in Gauteng (29.5%), followed by unknown province (23.5%), and Western Cape (22.3%). Again, the majority of screened positive cases were from an unknown referral source (51.5%), while the remainder came mainly from hospital discharge (20.3%) and 'inbound telephonic' (11.6%). Of those screening positive on the PC-PTSD, 3% also screened positive on the AUDIT, and 87.6% also screened positive on the PHQ-9.

In the univariate logistic regression models, gender, scheme, age, and referrals from hospital discharge, 'other' and 'inbound telephonic' were all statistically significant. Screening positive on the AUDIT and PHQ-9 respectively were also significantly associated with positive PC-PTSD screening.

In the multivariate regression model, gender was found to be a significant predictor of screening positive on the PC-PTSD, favouring females (OR = 1.65, 95% CI = 1.18 – 2.31). Age was also found to be a statistically significant predictor for positive screening, favouring younger age (OR = 0.97, 95% CI 0.96 – 0.98). Referral source was found not to be a significant predictor in the multivariate model, nor was AUDIT screening positive. Screening positive on the PHQ-9 was however found to be a significant predictor for also screening positive on the PC-PTSD (OR = 9.1, 95% CI = 6.4 – 12.8). According to Nagelkerke R^2 statistic, this model predicted 36.4% of the variance.

Table 8: Logistic Regression Model for Age, Gender, Scheme, Region, Referral Source, AUDIT ≥ 16, and PHQ-9 ≥ 10, and Proportions of Screened Participants with Moderate/Severe PTSD (PC-PTSD ≥ 3)

	PC-PTSD ≥ 3	PC-PTSD < 3	Unadj. OR (95% CI)	Adjusted OR (95% CI)
Gender				
Male	79 (19.6%)	270 (33.2%)	1.00	
Female	325 (80.4%)	543 (66.8%)	2.05 (1.54 – 2.72)	1.65 (1.18 – 2.31)
Scheme				
2	150 (37.1%)	202 (24.8%)	1.00	
1	254 (62.9%)	611 (75.2%)	0.56 (0.43 – 0.72)	1.11 (0.805 – 1.53)*
Age				
Median (SD)	40 (13)	54 (16.42)	0.96 (0.95 – 0.97)	0.97 (0.96 – 0.98)
Region				
Eastern Cape	26 (6.4%)	63 (7.7%)	1.00	
Free State	15 (3.7%)	27 (3.3%)	1.35 (0.62 – 2.93)	
Gauteng	119 (29.5%)	245 (30.1%)	1.18 (0.71 – 1.95)	
KZN	25 (6.2%)	57 (7.0%)	1.06 (0.55 – 2.05)	
Limpopo	6 (1.5%)	6 (0.7%)	2.42 (0.72 – 8.21)	
Mpumalanga	9 (2.2%)	19 (2.3%)	1.15 (0.46 – 2.87)	
North West	9 (2.2%)	31 (3.8%)	0.70 (0.29 – 1.68)	
Northern Cape	10 (2.5%)	23 (2.8%)	1.05 (0.44 – 2.52)	
Western Cape	90 (22.3%)	200 (24.6%)	1.09 (0.65 – 1.83)	
Unknown	95 (23.5%)	142 (17.5%)	1.62 (0.96 – 2.74)	
Ref Source				
aPMB/CMM	23 (5.7%)	53 (6.5%)	1.00	
Hospital Discharge	82 (20.3%)	96 (11.8%)	1.97 (1.11 – 3.49)	1.31 (0.68 – 2.51)*
HRBM	11 (2.7%)	18 (2.2%)	1.41 (0.58 – 3.45)	2.51 (0.86 – 7.3)*
Other	33 (8.2%)	31 (3.8%)	2.45 (1.23 – 4.9)	1.82 (0.82 – 4.1)*
Inbound Telephonic	47 (11.6%)	31 (3.8%)	3.49 (1.79 – 6.8)	1.99 (0.91 – 4.3)*

	PC-PTSD ≥ 3	PC-PTSD < 3	Unadj. OR (95% CI)	Adjusted OR (95% CI)
Unknown	208 (51.5%)	584 (71.8%)	0.82 (0.49 – 1.37)	1.02 (0.56 – 1.86)*
AUDIT ≥ 16				
No	392 (97.0%)	804 (98.9%)	1.00	
Yes	12 (3.0%)	9 (1.1%)	2.74 (1.14 – 6.6)	1.57 (0.59 – 4.2)*
PHQ-9 ≥ 10				
No	50 (12.4%)	519 (63.8%)	1.00	
Yes	354 (87.6%)	294 (36.2%)	12.5 (9.0 – 17.4)	9.1 (6.4 – 12.8)*

*Adjusted for age and gender

4.1.4 Alcohol Use Disorders Identification Test (AUDIT)

Given the very small number of positive screenings on the AUDIT (21 cases), no regression model was performed. As shown in Table 9, of the screened positive cases, 57.1% were female, 57.1% were from Scheme 1, and the majority were from Gauteng (33.3%) and had an unknown referral source (66.7%). Of those screening positive, 14 (66.7%) also screened positive on the GAD-7, while 17 (81%) also screened positive on the PHQ-9. Screening positive on the PHQ-9 was the only statistically significant association, based on the Fisher's Exact Test result (p-value = 0.01).

Table 9: Proportions, Chi-Square and Fisher's Exact Tests of Screened Participants with Moderate/Severe Alcohol Abuse (AUDIT ≥ 16) and Gender, Age, Scheme, Region, Referral Source, GAD-7 ≥and PHQ-9 ≥10.

	AUDIT ≥ 16	***AUDIT < 16***	***Chi-Square (p-value)***	***Fisher's Exact Test (p-value)***
Gender			0.15	0.15
Female	12 (57.1%)	856 (71.6%)		
Male	9 (42.9%)	340 (28.4%)		
Age			0.42	
Median (SD)	35 (10.82)	48 (16.1)		

	AUDIT ≥ 16	*AUDIT < 16*	*Chi-Square (p-value)*	*Fisher's Exact Test (p-value)*
Scheme			0.16	0.22
1	12 (57.1%)	853 (71.3%)		
2	9 (42.9%)	343 (28.7%)		
Region			0.88	0.87
Eastern Cape	0 (0%)	89 (7.4%)		
Free State	0 (0%)	42 (3.5%)		
Gauteng	7 (33.3%)	357 (29.8%)		
KZN	1 (4.8%)	81 (6.8%)		
Limpopo	0 (0%)	12 (1.0%)		
Mpumalanga	1 (4.8%)	27 (2.3%)		
North West	1 (4.8%)	39 (3.3%)		
Northern Cape	0 (0%)	33 (2.8%)		
Western Cape	6 (28.6%)	284 (23.7%)		
Unknown	5 (23.8%)	232 (19.4%)		
Ref Source			0.41	0.40
aPMB/CMM	0 (0%)	76 (6.4%)		
Hospital Discharge	2 (9.5%)	176 (14.7%)		
HRBM	0 (0%)	29 (2.4%)		
Other	2 (9.5%)	62 (5.2%)		
Inbound Telephonic	3 (14.3%)	75 (6.3%)		
Unknown	14 (66.7%)	778 (65.1%)		
GAD-7 ≥ 10	14 (66.7%)	578 (48.3%)	0.96	0.12
PHQ-9 ≥ 10	17 (81.0%)	631 (52.8%)	0.01	0.01

4.2. Psychiatric Comorbidity

Just under 60% of all cases screened were positive on at least one of the screening tools. Of those who screened positively on any one of the scoring tools, 49.4% screened positively for at least two conditions, while 26.3% screened positively for at least three conditions (see Figure 4 and Table 10 below). On the combination of PHQ-9 and GAD-7, 73.8% screened positive, while 48.6% screened positive on the combination of PHQ-9 and PC-PTSD.

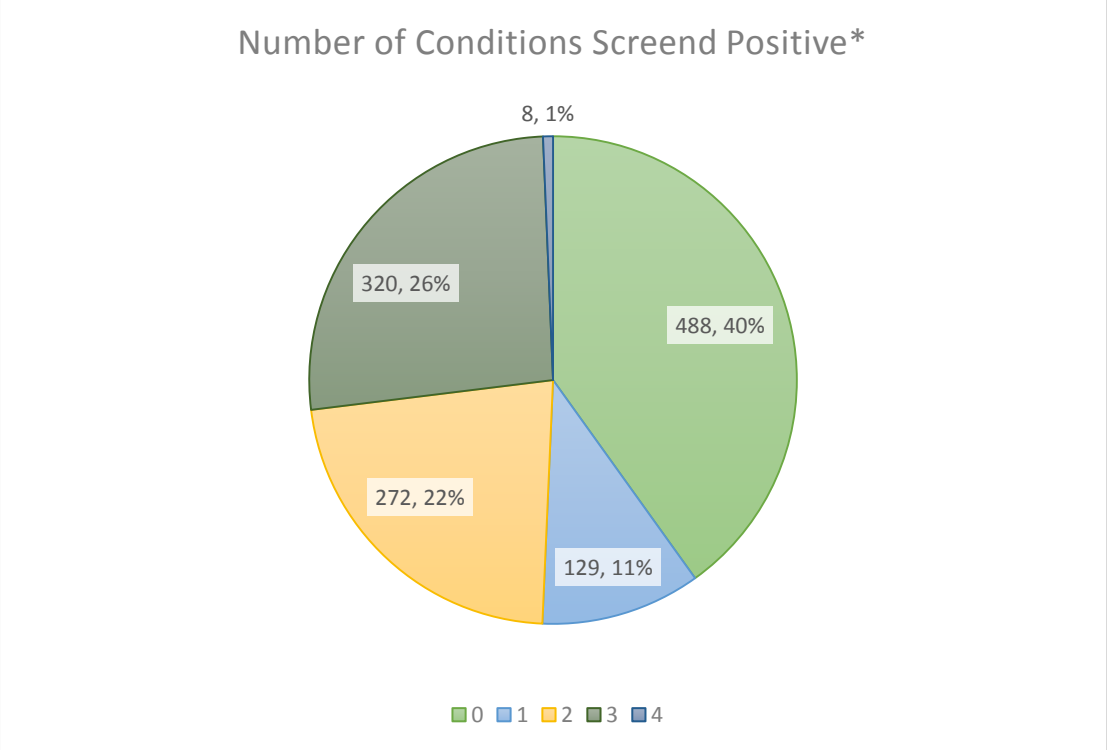

*Figure 4: Number of Co-morbidities amongst Screened Cases *"Screened positive" refer to cases with scores in the moderate and severe ranges of each symptom category. See Chapter 3 for detailed definitions*

Table 10: Proportion of Co-morbidity amongst Screened Cases per Condition

Screened Positive*	Number	Percentage of total screened	Percentage of total screened positive*
PHQ-9 & GAD-7	538	44.2%	73.8%
PHQ-9 & PC-PTSD	354	29.1%	48.6%
PHQ-9 & AUDIT	17	1.4%	2.3%
AUDIT & GAD-7	14	1.2%	1.9%
AUDIT & PC-PTSD	12	1.0%	1.6%
GAD-7 & PHQ-9 & AUDIT	13	1.1%	1.8%
PC-PTSD & AUDIT & PHQ-9	10	0.8%	1.4%

*"Screened positive" refer to cases with scores in the moderate and severe ranges of each symptom category. See Chapter 3 for detailed definitions.

4.3. Change in Symptom Severity from Enrolment to Week 10

Using a Wilcoxon signed rank test, the difference in symptom scores at enrolment *vs* Week 10 was found to be statistically significant in all four symptom scoring categories. The percentage reduction in mean scores were 21% in the AUDIT, 43% in the GAD-7, 45% in the PHQ-9, and 36% in the PC-PTSD, as shown in Table 11 below.

Table 11: Change in Symptom Severity from Enrolment to Week 10 (Limited to Cases with Both Enrolment and Week 10 Scores Per Condition)

Score Name (sample size)	Mean at Enrolment	Mean at Week 10	Mean difference	% Reduction from Enrolment	p-Value
AUDIT (n=207)	2.08	1.65	0.44	21%	0.017
GAD-7 (n= 208)	14.18	8.09	6.10	43%	<0.001
PHQ-9 (n = 208)	16.97	9.36	7.61	45%	<0.001
PC-PTSD (n = 200)	2.55	1.64	0.91	36%	<0.001

In the univariate linear regression models (see Table 12), scheme and PHQ-9 enrolment score were found to be significantly associated with change in the PHQ-9 score from enrolment to Week 10. In the multivariate model ($R^2 = 0.235$), only enrolment PHQ-9 score was found to have a significant contribution ($p < 0.001$, ß = -0.48, 95% CI = -0.75 – -0.45).

In the univariate models for GAD-7, age, province unknown, and enrolment GAD-7 score were statistically significant predictors. In the multivariate model ($R^2 = 0.147$), only enrolment GAD-7 score was found to be significant ($p < 0.001$, ß = -0.36, CI = -0.72 – -0.34). Province was excluded from the model, given that the only significant category in the univariate model was the unknown group.

For PC-PTSD, only the PC-PTSD enrolment score was found to be significant in the univariate models, as shown in Table 12. This was included in a model adjusted for age and gender, and was still found to be significant ($p < 0.001$, ß = -0.53, CI = -0.72 – -0.45). The adjusted R^2 for this model was 0.265.

Table 12: Linear Regression for Change from Enrolment to Week 10 (Unadjusted models and models adjusted for age and gender)

	PHQ-9		***GAD-7***		***PC-PTSD***	
	Unadjusted Beta (95% CI)	**Adjusted Beta (95% CI)**	**Unadjusted Beta (95% CI)**	**Adjusted Beta (95% CI)**	**Unadjusted Beta (95% CI)**	**Adjusted Beta (95% CI)**
Gender	0.07 (-1.47 – 4.32)		0.08 (-0.93 – 3.91)		0.02 (-0.54 – 0.70)	
Scheme	0.15 (0.19 – 4.79)	0.05 (-1.29 – 2.86)	0.04 (-1.46 – 2.44)		0.02 (-0.43 – 0.56)	
Age	0.02 (0.08 – 0.10)		0.16 (0.015 – 0.163)		0.05 (0.01 – 0.03)	
Region						
Gauteng	0		0		0	
Western Cape	-0.09 (-5.0 – 1.11)		-0.008 (-2.73 – 2.43)		0.01 (-0.63 – 0.75)	
Other Provinces	-0.06 (-3.79 – 1.47)		-0.73 (-3.33 – 1.08)		-0.06 (-0.79 – 0.36)	
Province Unknown	-0.13 (-6.2 – 0.31)		-0.15 (-5.6 – -0.13)		0.06 (-0.43 – 0.99)	
Ref Source						
Other than Hospital Discharge	0		0		0	
Hospital Discharge	-0.09 (-5.4 – 1.18)		-0.01 (-2.86 – 2.68)		0.04 (-0.55 – 0.92)	
Unknown	0.001 (-2.51 – 2.56)		0.03 (-1.68 – 2.59)		0.08 (-0.24 – 0.84)	
AUDIT Enr Score	0.01 (-0.27 – 0.33)		0.08 (-0.11 – 0.39)		0.10 (-0.02 – 0.11)	
GAD Enr Score	0.11 (-0.43 – 0.04)		-0.38 (-0.73 – -0.36)	-0.36 (-0.72 – -0.34)		
PHQ Enr Score	-0.49 (-0.76 – -0.46)	-0.48 (-0.75 – -0.45)	0.07 (-0.22 – 0.07)		0.04 (-0.03 – 0.05)	
PTSD Enr Score					-0.52 (-0.72 – -0.45)	-0.53 (-0.72 – -0.45)

4.4. Reasons for Programme Exit

Of 1217 participants, 817 (67.1%) were still active on the programme at the time of data extraction, and 400 had exited the programme (either prior to or after enrolment). Reasons for programme exit are show in Figure 4 below, and are broadly divided into three main groups: lost to follow-up (27.5%), programme criteria not met at screening (28.7%), and programme completed (32.3%). Among those that were enrolled who had already exited the programme at the time of data extraction (n = 243), 52.3% had completed the programme, 35% had been lost to follow-up, and 7.4% had requested to be exited. A total of 136 enrolled participants had exited before the 10-week mark. Of those, 47.1% had been lost to follow up, and 11.8% had exited upon beneficiary request. Completion of the programme prior to the 10-week mark was noted in 39% of cases, and in 3 cases (2.2%), the reason for exit was captured as “Programme Criteria Not Met”.

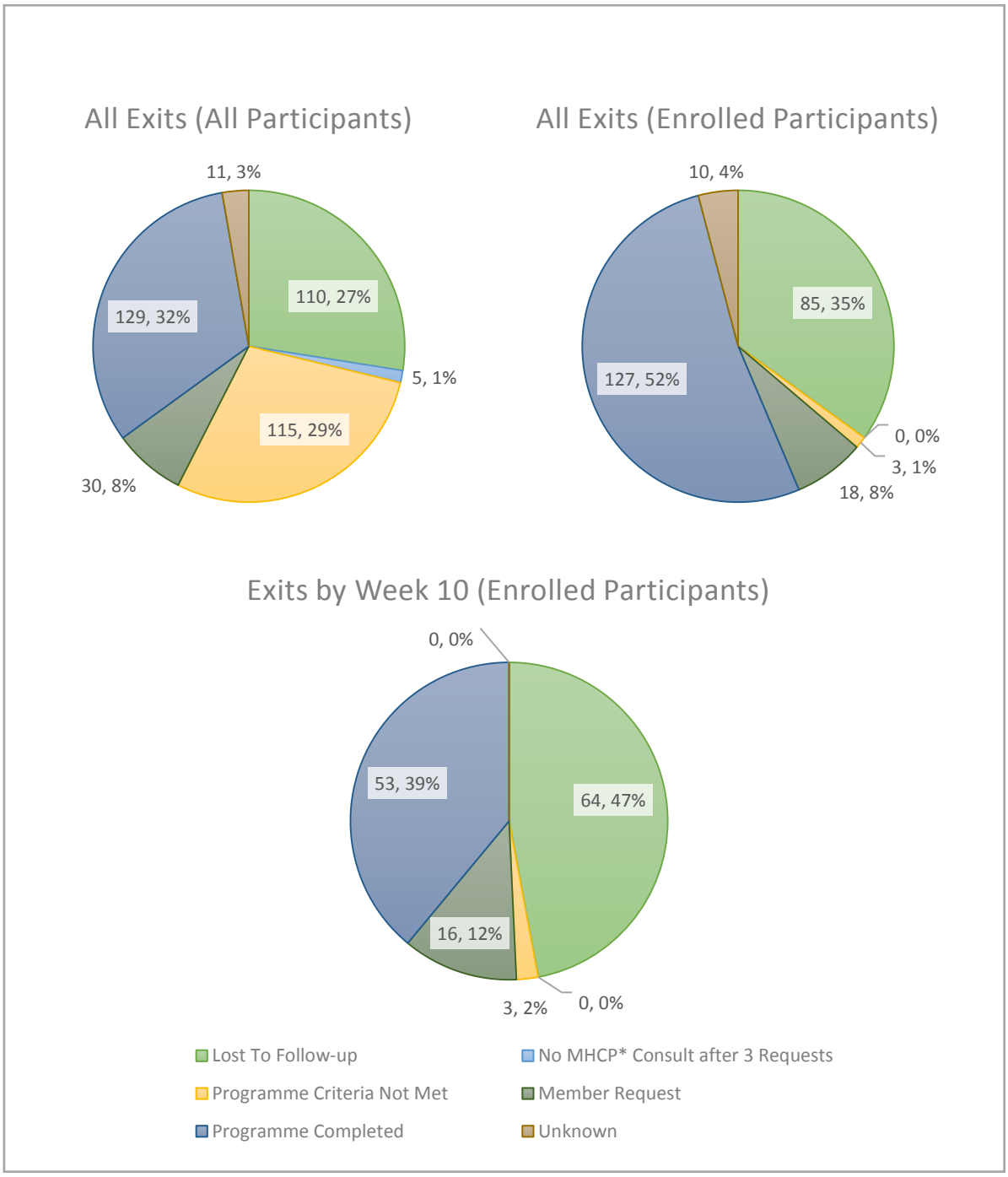

Figure 5: Reasons for Exit from the Programme (number, percentage); Mental Health Care Practitioner*

Chapter 5: Discussion

5.1. Summary

This study aimed to describe the participants and pathways into and through the MMHP, and its initial clinical outcomes. Demographic characteristics, psychiatric morbidity and co-morbidity, and the main pathways into the programme have been analysed, as well as association amongst these and symptomatic mental illness in this sample. Several significant predictors for screening positive on the PHQ-9, GAD-7 and PC-PTSD, respectively, were found. A positive symptom response was demonstrated in all four conditions at the 10 Week mark of the intervention. Demographics and referral source were found to be poor predictors of response, but there was a strong association with baseline score on the index condition. Evaluation of reasons for programme exit highlights the importance of loss to follow up as an area for further investigation.

5.2. Characteristics and Entry Points of Scheme Beneficiaries Screened, Eligible and/or Enrolled on the MMHP

The characteristics in this sample and associations with clinical morbidity are presented in Tables 5-9. This sample is generally older than the overall scheme memberships: the mean age of screened cases in this sample (48.1 years) is higher than that of the overall Scheme 1 membership (between 40 – 42 years over the period studied)(Medscheme Health Intelligence Unit 2018), and well above the mean in Scheme 2 (34 – 36 years)(Medscheme Health Intelligence Unit 2018). This may be partly due to the fact that beneficiaries under the age of 18 years were excluded from this sample, but are represented in the mean ages of the overall scheme memberships. The mean ages for those eligible (43.5 years) and enrolled (43.7 years), as well as concentration of age in the 26—55 years categories in these groups suggest that younger people in this sample are affected by mood disorders, compared to other previous South African studies. While an association between mood

disorders and ages 35-49 years was demonstrated in the SASH study (Stein et al. 2008; Herman, Stein, and Seedat 2009), a sizeable proportion of eligible cases in the current sample fall within the 26-35 years group (24.4%). In a study by Kessler et al (2007) on WHO World Mental Health surveys, the median age-of-onset for anxiety disorders was 25-53 years, for mood disorders it was 25-45 years, and for substance use disorders it was 18-29 years. Considering this, it seems that the MMHP may be successful in reaching those with moderate to severe mental illness early on in the disease progression. More in-depth analyses of case histories may help confirm this.

The majority of cases in this sample where the province is known, are concentrated in the Western Cape and Gauteng. Although the SASH study (Herman, Stein, and Seedat 2009; Stein et al. 2008) also found the highest lifetime prevalence of mental disorders in the Western Cape, this distribution in the current study is likely to be heavily influenced by the regional distribution of the overall membership of Schemes 1 and 2, which is also concentrated in these two provinces (Medscheme Health Intelligence Unit 2018). This is mainly due to the historical development of these schemes around specific employer groups located in these provinces.

This sample is predominantly female (71.3%), which is notably higher than the overall proportions in Scheme 1 (around 53% were female, during the period studied) and Scheme 2 (around 56%) (Medscheme Health Intelligence Unit 2018). Women may be more likely to seek health care for mental illness (Galdas, Cheater, and Marshall 2005; Thompson et al. 2016), which would result in them being identified more frequently through the MMHP referral sources which predominantly rely on information from previous health care interactions. While the majority of referral sources into the MMHP were unknown (65.1% in the screened group; 51.8% in the eligible group), the remainder mainly came from the post-hospital discharge source (14.6% in the screened group; 23.3% in the eligible group).

As the referral sources into the MMHP were designed to identify potentially poorly controlled cases, it is expected that the prevalence of the tested conditions would be higher in this sample than in the general population, which is indeed the case. In the screened group, 48.6% were found to have moderate to severe symptoms of anxiety on the GAD-7, 53.2% of depression on the PHQ-9, and 33.2% of PTSD on the PC-PTSD. Broken down into mild, moderate and severe symptoms in those with scores of 5 and above on the PHQ-9 and

GAD-7, respectively, symptom severity is markedly higher in this sample compared to findings from the SASH study (Stein et al. 2008; Herman, Stein, and Seedat 2009). In the latter, 12-month prevalent case severity of mood disorders was classified as 31% moderate and 26% severe. In the current sample, 21% fell in the moderate depression range, 27.3% in moderately severe depression, and 37.2% had potentially severe depression. On the GAD-7, 32.2% fell within the moderate anxiety range, and 46.5% in the severe anxiety category. The tools used in the SASH (Herman, Stein, and Seedat 2009; Kessler et al. 2006) to determine severity however differed from those used in the current study, and the comparison here should be read with caution. Broadly, compared to previous studies on health care users, the prevalence of potential depression in the current sample is similar to what was found in chronic health care users in the Western Cape (56%) by Folb et al (2015), while the prevalence of both potential PTSD and depression is significantly higher than that reported in the Carey et al (2003) study on South African primary health care users (19.9% and 37%, respectively). Further investigation into chronic non-psychiatric comorbidity in the current sample may be of use to explain this.

Amongst cases eligible for enrolment, the mean PHQ-9 score (16.1) falls within the moderately severe depression category, while the GAD-7 mean score (13.1) falls within the moderate anxiety category. In both conditions, the means for those enrolled are slightly lower (15.18 for PHQ-9, and 12.32 for GAD-7), which may suggest that some of the severe cases drop off after screening and prior to enrolment.

Together with the relatively large proportion of cases screening positive on any one condition (59.9%), the relatively high mean scores on the GAD-7, PHQ-9 and PC-PTSD support continuation with current referral avenues to source cases with significant symptoms, and consideration of additional referral sources to reach potentially missed cases.

5.3. Predictors of Screening Positive on the PHQ-9, GAD-7, and/or PC-PTSD

In a detailed investigation into the characteristics of this sample, the associations between screening positive on the PHQ-9, GAD-7, and/or PC-PTSD, and the following variables were assessed: demographic factors, scheme, referral source, and screening positive on any of the remaining symptom scoring tools. The positive association found between the hospital discharge and inbound telephonic sources and positive screening on the PHQ-9 highlights these referral sources as of particular importance in identifying cases eligible for enrolment. The inbound telephonic source is likely to attract people who already have confirmed diagnoses with potentially poor symptom control, who may contact their medical scheme administrator to access additional mental health care funding benefits. It may be of value to advertise the service to those with known mental illness, and invite inbound telephonic contact where appropriate.

Notwithstanding the limitations regarding the missing data on referral source (see Section 5.8.3), the finding that referral from the Medscheme High Risk Beneficiary Model (HRBM) group is not statistically significantly associated with positive screening on any of the symptom scoring tools, is of particular interest. It suggests a discordance between the financial risk predicted by the Medscheme health care claims-based model, and the current clinical severity of mental illness symptoms. As the HRBM predicts risk of incurring relatively high health care costs within the next year, this discordance may be explained by the fact that mental health care users may defer accessing help despite significant symptoms (Wang et al. 2007; Henderson, Evans-Lacko, and Thornicroft 2013; Cheung et al. 2017). This would result in them not having historic health care claims that predict increased future risk, despite being significantly symptomatic and in need of care. The predictive model also uses a combination of all health care claims, including non-mental health-related claims. The discrepancy may thus also point to a dilution of the contribution of mental illness in the predictive model. These considerations support the addition of clinical risk criteria to help identify mental health risk in managed care interventions where claims-based risk prediction models are used.

As with other studies on South African samples (Herman, Stein, and Seedat 2009; Tomita and Burns 2013; Folb, Timmerman, et al. 2015), females in this sample were more likely to screen positive for depression (OR = 1.51, 95% CI = 1.03 – 2.21). Younger age was also a statistically significant predictor for screening positive for depression, anxiety and PTSD (OR = 0.99; 95% CI 0.98 – 1.00, OR = 0.97; 95% CI 0.96 – 0.98, and OR = 0.97; 95% CI 0.96 – 0.98, respectively). This is in keeping with recent findings by Thomas et al (2016), which suggested a linear improvement in mental health with increase in age, starting from young adulthood. Participants from Scheme 1 were less likely to screen positive for depression compared to Scheme 2 beneficiaries (OR = 0.62, 95% CI = 0.41 – 0.92). As an open enrolment scheme, Scheme 1 is likely to have a more diverse membership compared to Scheme 2, which is a closed enrolment scheme in a corporate environment. This finding suggests that depression screening and management should be a particular focus for Scheme 2, with possible extension to workplace wellness and occupational health initiatives.

5.4. Patterns of Comorbidity in Those Screened for Enrolment on the MMHP

The presence of comorbidity in the programme eligible group is particularly noteworthy, with nearly 50% of cases screening positive for at least two conditions, and just over 25% for at least three. This is notably higher compared to a national US sample (Kessler et al. 2005) (22% with two diagnoses, and 23% with three or more), albeit that these were actual DSM-IV diagnoses and not just positive primary screening results as was the case in the current study. Even higher rates of comorbidity were found in the SASH, with a corresponding figure of 71% of respondents with a severe condition having three or more conditions, as determined using the World Health Organization World Mental Health Composite International Diagnostic Interview scales (Herman, Stein, and Seedat 2009; Kessler and Ustun 2004). Again, the use of different clinical rating scales limits direct comparison to the findings in the current study. A further significant difference from the SASH participants is that the current sample is from persons with medical scheme coverage which implies more favourable socio-economic conditions than that experienced by the general South African

population, from where SASH participants were sampled. Given the impact of socio-economic welfare on mental health (World Health Organisation 2013b), this may have been a confounding factor in the current sample.

In this study, the predictive value of screening positive on the GAD-7 for concomitant potential depression ($p < 0.001$, OR = 36.6, CI = 25.4 – 52.6) is impressive, as is the inverse, with screening positive on the PHQ-9 significantly increasing the odds of screening positive on the GAD-7 ($p < 0.001$, OR = 36.4, CI = 25.3 – 52.2). This is in keeping with findings by Kessler et al (2015) on the WHO World Mental Health Surveys done in 74 045 adults across 24 countries, using DSM-IV criteria and the WHO Composite International Diagnostic Interview (CIDI). They found that 45% of respondents with lifetime MDD had one or more lifetime anxiety disorders. The figure was 41.6% for 12-month MDD and concomitant 12-month anxiety disorders.

Screening positive for depression was also found to be a significant predictor for screening positive for PTSD (OR = 9.1, 95% CI = 6.4 – 12.8). This is in keeping with previous findings from Abler et al (2014) and Carey et al (2003), the latter who demonstrated 75% of PTSD cases with comorbid depression in a South African primary care clinic sample. The corresponding figure in the current study is 87.6%. These findings highlight the importance of screening for psychiatric comorbidities in those with known depression, anxiety and/or PTSD.

5.5. Changes in Symptom Severity and Predictors of Change for Those Receiving Intervention from the MMHP

In this study, there were statistically and clinically significant improvements in clinical scores for all four conditions at Week 10, compared to baseline: 21% percentage reduction in mean scores in the AUDIT, 43% in the GAD-7, 45% in the PHQ-9, and 36% in the PC-PTSD. During the first three months of intervention, the IMPACT trial (Unutzer et al. 2002) also produced a 29.8% reduction in the mean Symptom Checklist Depression Scale (SCL-20) score in the intervention group. The reduction in the usual care group at three months was 12.6%. At

face value, these preliminary findings suggest positive clinical impact of the MMHP, but in the absence of a control group, confounding factors could not be accounted for in this study (see Section 5.8.6).

Index condition enrolment scores were found to be the only significant predictors of change in PHQ-9, GAD-7, and PC-PTSD scores, respectively. Higher baseline scores resulted in less change by Week 10. It is to be expected that cases that are treatment resistant and/or exhibit severe symptomatology would be more difficult to manage and yield poorer responses. Ekers et al (2013) however found that baseline symptom severity did not influence depression outcomes in a nurse-delivered CC intervention. The findings in the current study are however congruent with the results from a study by Kelly et al (2015), in which several baseline characteristics were found to be associated with poorer outcomes in the treatment of anxiety disorders, including GAD and PTSD. These characteristics included comorbid depression and increased severity of underlying anxiety disorder. Notwithstanding, they concluded that females and participants with increased severity of depression or GAD were most likely to benefit from CC, compared to usual care. The finding in the current study supports the use of individual baseline scores in the calculation of clinical targets, as is currently the process in the MMHP. Additional intervention may also have to be considered for those with extremely high baseline scores.

5.6. Reasons for Drop-off from the MMHP

The results show significant percentages in loss to follow up after enrolment (35%) and overall (27%). Other collaborative care initiatives, such as the CollAborative care in Screen-Positive ElderRs with major depressive disorder (CASPER) randomised controlled trial (RCT) which was run in the UK (n = 705), however, produced similar figures: 24% lost to follow up in the CC group *vs* 10% in the usual care group at 4 months follow up; 32% in CC group *vs* 21.3% in usual care group at 12 months) (Gilbody et al. 2017). An RCT in Spain by Aragones et al (2014) on CC for depression also had significant attrition in the CC intervention group (9% at 12 months; 28% at 36 months).

Anecdotally, Care Managers in the MMHP often have difficulty getting hold of beneficiaries telephonically for follow-ups, which was likely a major contributing factor to attrition in the current study. Possible mitigations are discussed in the section on Recommendations (5.9) below. The relatively low percentage of cases exiting because of not engaging with their treating doctor prior to enrolment (1.3%) is encouraging, as doctor involvement is a key element of the treatment-to-target approach in the intervention.

5.7. Strengths

This study was done on the first nation-wide collaborative care project in South Africa, and the first in the country's private health care sector. Given the adaptation off the CC model to this environment, the study offers several novel perspectives. The majority of established international CC models employ care managers located in the primary care service location, whereas experience with off-site telephonic care management such as used in the MMHP, is less common. While the bulk of CC initiatives in the US have focussed mainly on depression and on anxiety disorders to a lesser extent (Gilbody et al. 2006; Bower et al. 2006; Katon and Unutzer 2006; Roy-Byrne, Craske, and Sullivan 2010; Unutzer et al. 2008), the MMHP applies the CC model to four conditions, namely depression, GAD, PTSD and alcohol abuse. This presents an opportunity to better understand the impact of CC on all these conditions, as well as the prevalence of psychiatric co-morbidity and its influence on outcomes. The existing body of evidence on demographic predictors of outcomes of CC seems to be poorly developed. The current study investigated associations between demographic factors and initial outcomes in the MMHP, and found none of statistical significance. Baseline symptom severity however significantly influenced response to intervention; prior to this study, evidence on this also seemed sparse and equivocal for other CC interventions.

While it is not a representative sample of all medical scheme beneficiaries, the symptom score data gathered through the MMHP provides some insight into the mental health status of persons using the South African private health care sector services. In the absence of other clinical private sector data, the findings from South African community studies such as the SASH study (Herman, Stein, and Seedat 2009; Stein et al. 2008) and others served as

comparators in the current project. The community studies used as reference were epidemiological investigations of random samples. The sample in the current project differs in that participants in the MMHP are identified through previous interactions with health care services. The current sample however also differs from other samples from health care users (Pillay and Kriel 2006; Kagee 2008; Carey et al. 2003; Folb, Lund, et al. 2015) by virtue of the MMHP's outbound recruitment process – contacting those identified as potentially at risk of symptomatic illness, and gathering data from them to direct further interventions, as is typical in managed care disease management programmes. A limitation noted in the SASH study report is the general reluctance of persons with mental illness to take part in mental health surveys (Stein et al. 2008; Kessler et al. 1998). Within the MMHP, there are unique incentives to participate, such as gaining access to additional funding benefits upon qualification for the programme. This may have led to inclusion of persons in the current sample who would otherwise have declined community-based research surveys, albeit not representative of the general community. Lastly, whereas several local studies were limited to relatively small, distinct geographical areas, the current study includes national data, broken down by province.

5.8. Limitations

Within the context of the MMHP in a live, operational managed care environment, there were several limitations in this study that should be considered:

5.8.1 First-time Telephonic Contact

For the initial screening, beneficiaries were contacted without pre-arrangement or preparation via telephone, unless they were referred via preceding telephonic managed care interventions. The outbound call from the Medscheme Care Manager thus created an opt-out scenario, where potential enrolment was actively offered to those suspected at risk of undiagnosed or poorly controlled illness, which is quite different from the typical clinical

scenario where a patient opts in to seek help. This may have presented barriers to developing trust and rapport between beneficiaries and Medscheme Care Managers, which may have resulted in untruthful answers to symptom score questionnaires, which in turn may have resulted in lower than expected scores and missed cases. Another element of apprehension might have existed due to possible perceptions among medical scheme beneficiaries that medical schemes and administrators are simply intent on cutting health care expenditure, and that the motive for this is a pursuit of profit, and not the interest of the beneficiary (Competition Commission (South Africa) Health Market Inquiry 2016; Schreuder 2017). The third barrier was the lack of face-to-face consultation with the Care Manager, and the time constraints imposed on the telephonic interaction by operational efficiency and managed care cost containment requirements.

5.8.2 Data Quality

It should be acknowledged that primary data collection occurred in a managed care operational environment, which may lack the fidelity to prescribed data capturing processes as would be expected where primary data collection forms part of the actual research project. Given the manual process of data capturing, some primary data errors can be expected. Whereas a score of “zero” on the symptom scoring tools used in the MMHP denotes an actual value, “zero” scores have been captured incorrectly in some cases, for a variety of reasons. Examples include cases where questionnaires were not completed during a telephonic interaction, and, instead of capturing no score, a zero had been incorrectly captured. It is expected that fewer of these errors would have occurred during the initial (screening) contact compared to later follow-ups, where participants have been anecdotally reported to be less keen to engage in the questionnaire again, and more ‘false’ zeroes were captured. In this study, false zeroes may be misinterpreted as negative scores (i.e. no potential mental health problems), where in fact the scoring wasn’t completed. Results may therefore reflect an underestimate of the true prevalence and morbidity within the sample. Change in symptom score at different points of measurement may also have been influenced by this.

A further limitation results from the manual calculation and capturing of scores for a large proportion of the period studied. A Microsoft Excel calculator was used by Care Managers to calculate individual total scores per condition, and these totals had to be transferred manually into the electronic database interface. This created an opportunity for human error. This process was gradually replaced by electronic calculation during the latter months (around August 2017), and repeat analysis on more recent data may yield more robust results.

The capturing of "completion" of the programme prior to the 10-week mark (39% of cases exiting before the 10-week mark), and capturing of "Programme Criteria Not Met" as reason for exit in 3 cases (2.2%), is problematic. This is incongruent with the programme design, as programme completion should not happen prior to Week 10, nor should a candidate be enrolled if programme criteria are not met. This may point to either an operational process flaw or a data capturing error, or a combination. These cases should best be interpreted as reason for exit unknown. These errors also cast suspicion on the quality of programme exit data overall, and these findings should be viewed with caution. The quality of future data may benefit from standard operating procedure adherence and data collection training on this particular aspect.

5.8.3 Missing Data

Along with symptom scores, referral source data were captured manually by Care Managers. Among all cases, 65.1% had no referral source captured. In the enrolment group, this figure was 48.8%, and in the Week 10 groups, it was around 38%. This significantly limited the ability to assess the role of referral source in the analyses. This was mitigated by creating a dummy variable for unknown referral source in the linear regression models. In the logistic regression models for associations between predictors and the presence of positive screening, this may have skewed findings regarding referral source. Further analysis is recommended once the quality of these data has been improved.

Although demographic data were sourced from existing membership information in the Medscheme data warehouse, there is also a significant proportion of cases with unknown

province (19.5% of all cases; 22.3% of enrolled cases). The effect was however reduced in the linear regression analyses on symptom score change, as the percentage in these groups was around 15%, which was considered to be acceptable.

5.8.4 Attrition of Sample Size at Week 10

The analyses of change in clinical scores from enrolment to Week 10 were limited to those in the sample that had a Week 10 score for the condition analysed. These groups are significantly smaller than the total sample (AUDIT: n = 207, GAD-7: n= 208, PHQ-9: n = 208 and PC-PTSD: n = 200). At the time of data extraction, a proportion of cases would have been recent enrolments who had not yet reached the 10-week stage, while others would have been lost to follow-up prior to the Week 10 intervention (64 cases, 47.1%), and in others still there may have been a delay in performing or capturing the Week 10 intervention.

5.8.5 Low AUDIT Scores

The extremely low percentage of cases with a positive AUDIT score in this sample is in stark contradiction with the known alcohol abuse burden in the general South African population (Herman, Stein, and Seedat 2009; Parry et al. 2002) and health care users (Pillay and Kriel 2006; Bhana et al. 2017). Anecdotal feedback from Care Managers revealed a discomfort with performing the AUDIT questionnaire telephonically, as questions are perceived to probe overly sensitive information. Some anecdotal feedback also implied a reluctance from beneficiaries to answer the questions. Another contributing factor might be the relatively high cut-off value of 16 which is used to define problematic alcohol use and qualification for enrolment on the MMHP. This issue may be mitigated by implementing a self-administered version of the AUDIT through an electronic portal, which may curb some of the sensitivity around revealing sensitive information verbally to a stranger. It would also add convenience to the process and allow a beneficiary to complete the questionnaire in complete privacy,

whereas unscheduled phone calls may not always allow for that. Alternatively, Care Managers should be trained in performing the AUDIT score telephonically, with focus on reassuring the beneficiary of the confidentiality of the information, and the establishment of trust and rapport with the beneficiary. In addition, consideration could be given to lowering the qualifying AUDIT score to 8. Only 73 cases in the sample however have an AUDIT screening score of ≥ 8, which suggests that optimal operational performance of the questionnaire should take priority.

5.8.6 Assessing the Impact of the Intervention

The symptom score decrease demonstrated in this analysis may result from regression to the mean, response to treatment plans independent from the programme, or a combination of these and other factors. Without a control group, the effect of the intervention on the change in score could not be assessed. Given that the main impact of the intervention centres on the Week 10 treatment plan review, a similar evaluation of the change in scores at programme completion may provide additional insight. As a result of the poor quality of the programme exit data, however, this evaluation was not performed in this study. Improved data quality may allow for further analysis of this kind.

5.8.7 Application in the South African Public Health Sector

While this study contributes to the limited body of published research on private health care sector populations in South Africa, the situation of this work limits its application in the country's public health care sector. Users of the latter may be expected to have different characteristics, particularly in terms of socio-economic welfare, which has a significant effect on mental illness (World Health Organisation 2013b). The structure of the health care system is also different between the public and private sectors. In the public sector, the main primary care contact is a local clinic, often managed by nursing staff. In the private sector, the family practitioner is generally the main source of primary care. The MMHP also

relies heavily on historical managed care interactions and claims data to source participants; this infrastructure does not currently exist in the public health sector. Adaptation of the model in a National Health Insurance or similar structure in South Africa would require consideration of these factors.

5.9. Recommendations

5.9.1 Policy and Practice

Unique in its implementation both in the South African private health care sector, and through managed care, the MMHP could possibly be replicated elsewhere in the South African private sector, but also in other settings – specifically in the South African context, in an imminent National Health Insurance structure.

a) *Recommendations for Collaborative Care Initiatives through Managed Care*

Claims-based risk prediction models are increasingly used in managed care and health insurance systems (Hamad et al. 2015; Kansagara et al. 2011; Carlsson, Börjesson, and Edgren 2002; Austin et al. 2011; Chang and Weiner 2010). Given the discordance found in this study between the claims-based risk prediction model and propensity of candidates to be significantly symptomatic, the addition of clinical risk indicators - such as symptom scoring - for identifying scheme beneficiaries in need of managed care intervention is supported. Particularly in those with mental illness, the current claims-based risk prediction models may miss cases with significant symptoms which are likely to result in preventable financial expenditure in the medium to long term.

The use of baseline scores to calculate individual treatment targets is also recommended, given the significant contribution of baseline scores to symptom score change found in this study.

b) *Recommendations for the MMHP*

Just over 60% of those screened met criteria for enrolment on the MMHP. I suggest that this is acceptable – should the screening capacity of the MMHP be extended by increasing operational resources or adding additional referral sources, for example, this number may decrease as it approaches a figure that could be expected from a community screening yield (the SASH found a 30.3% lifetime prevalence for any disorder (Stein et al. 2008)). This however has to be balanced against the operational cost impact. As the MMHP matures and outcomes data become available, the optimal figure for this yield may be determined by a cost-benefit/return on investment analysis.

Based on the finding suggestive of drop-off of clinically severe cases from the MMHP, increased case-finding and follow up by health care providers to ensure adequate reach of mental health care in those cases where the MMHP had failed retention, is encouraged. This confirms the importance of communicating with associated MHCPs where enrolled cases had dropped off, as is currently the process in the MMHP. Future investigations into reasons for drop-off may prove useful in the development of retention strategies.

Several options exist for improving data quality which will enable more robust and detailed analyses of the MMHP in the future. Care Manager training should focus on ensuring accuracy of data capturing, particularly of programme exit data, and clinical scores, as these direct interventions. This should ideally be supported by user-friendly electronic interfaces which guide appropriate data capturing with drop-down options and disallowing case completion in the event of incomplete data capturing. Referral source data could benefit from the same, or could alternatively be sourced elsewhere, as referrals to the Care Managers are generated through existing automated reports.

The surprisingly low AUDIT scores found in this study may suggest ineffective administration of the tool in the MMHP. Self-reported capturing of symptom scores through a beneficiary-facing electronic interface may have inherent advantages, as also suggested by Chang and Krosnick (2009; 2010). It may reduce apprehension of being confronted or embarrassed by truthful answers while talking to a stranger on the phone, and it will allow Care Managers to spend more time on motivational interviewing and psychoeducation during telephonic

interventions. Uptake of self-reporting may however be a challenge in the private health care environment, and may require a considerable incentive initiative. In the meantime, additional training and quality assurance management on effective completion of the AUDIT tool for Care Managers is recommended. A scheduling system for Care Manager phone calls which has been agreed with receiving beneficiaries may also help ensure availability and comfort of the beneficiary to answer questions truthfully. In future iterations of the MMHP, symptom scoring may be done by treating mental health care providers who had established rapport through prior face-to-face interaction. Scores can be captured on an electronic health record for sharing with relevant role-players, including care managers and specialist case reviewers. Intuitively, this should improve the quality of symptom scoring data. The contrary has however been found by Vöhringer et al (2013), who showed improved sensitivity and similar specificity in the self-administered PHQ-9 *vs* administration by a general practitioner in a small sample (n = 197) in a low-income primary care setting in Chile. A similar comparison may be insightful in the MMHP environment.

Given the considerable psychiatric comorbidity burden in this sample, it is recommended that screening for psychiatric comorbidity should be routine practice in those with known common mental health disorders such as depression and anxiety, and particularly in those identified through the MMHP. This could be included as a focus in training initiatives for general practitioners, as well as best-practice guides distributed via the MMHP project.

c) *Recommendations for the SA Private Health Care Sector*

Given the significant prevalence of potential depression, anxiety and PTSD in this sample, it is recommended that scheme benefit design in both schemes should support management of these conditions. It is possible that similar prevalence exists in other, similar medical schemes in the private health care sector. Review of Prescribed Minimum Benefits to cater for adequate management of these conditions is also recommended (see *1. Introduction* on current PMB limitations). Similar analyses of community samples within the private sector may aid in informing such review.

Based on the relatively higher likelihood of Scheme 2 beneficiaries to screen positive for depression, it is recommended that this scheme prioritises screening and management of depression in the workplace.

5.9.2 Future Research

Despite the poor quality of programme exit data, the sizeable portion of cases lost to follow up (27%) is of concern and may require further investigation into reasons and possible mitigations. Qualitative analyses which include those who had dropped off may be a valuable starting point. This should be supported by review of quantitative data such as scheme membership changes (e.g. leaving the scheme membership would result in leaving the MMHP).

A randomised controlled trial would be required to control for confounding factors and spontaneous resolution of symptoms to determine the effectiveness of the MMHP in improving clinical symptoms. In such an investigation, the following variables would be useful for inclusion: demographics (age, gender, and geographical region), morbidity and comorbidity (ideally, of both mental and physical illness), baseline mental health symptoms scores, and health care funding benefit richness (i.e. the extent of financial coverage). Additional variables such as marital status, employment and social support may also be useful, but these data are not readily and routinely available in the medical scheme industry. Given that symptom data are gathered telephonically, the costs involved in such an endeavour may however be prohibitive outside of a strictly research environment and require dedicated funding. This complicates the measurement of programme impact on clinical outcomes. Other outcomes such as health care expenditure, admission rates, readmission rates, concentration of care in- or out of hospital, and medication adherence can however by analysed by finding a retrospective case-matched control group, once data had adequately matured and time had been allowed for programme completion, post-

programme cost experience, and claims run-off[8]. These data are readily available in the managed care environment. Such metrics may serve as proxies for clinical outcomes, but are in and of themselves of significant relevance to the private health care funding industry, as well as broader public mental health initiatives such those as envisaged within a National Health Insurance system.

Lastly, this project may benefit from further research on implementation fidelity, and barriers and facilitators towards this. It may be of value to focus on adherence to processes of psychiatrist-supervised systematic case review, as previous evidence suggests that this is a key success factor for CC models (Coventry et al. 2014; Chwastiak, Vanderlip, and Katon 2014; Sighinolfi et al. 2014; Muntingh et al. 2016). This should also be a key consideration when evaluating outcomes after programme completion.

[8] Refers to the time it takes for health care claims to be submitted to and processed by the claims administrator. This generally takes up to three months. Timing of data extraction should account for this so as not to lose data on costs that have been incurred but are still being processed.

Chapter 6: Conclusion

To my knowledge, this is the first study on a national collaborative care project in South Africa. There is also no known South African research of this kind in managed care and/or private health care sector populations prior to this study, and it is hoped that this will serve as a starting point to develop the knowledge in this field.

The MMHP is unique in its concurrent screening and intervention on four psychiatric conditions (MDD, GAD, PTSD and alcohol use disorders), and the use of off-site care managers and a psychiatrist reviewer employed by a managed care organisation. It also differs from most CC initiatives in that it encourages referral to existing psychotherapy resources (i.e. community-based health care providers independent of the MMHP), instead of offering psychotherapy as a standard part of the intervention. Another unique feature is the identification of persons at risk of mental illness through existing managed care processes.

In its current form, the MMHP appears to be successful in reaching significantly symptomatic medical scheme beneficiaries, with 60% of those screened found to be moderately to severely symptomatic on at least one of the four conditions. In the screened group, 48.6% were found to have moderate to severe symptoms of anxiety on the GAD-7, 53.2% of depression on the PHQ-9, and 33.2% of PTSD on the PC-PTSD. The unexpectedly low percentage of screened-positive cases on the AUDIT (1.7%) requires further investigation. Referral after discharge from psychiatric inpatient care or self-referral via inbound telephonic contact were particularly likely to yield positive screening results for depression.

This study also provided some insight into predictors of potential mental illness in individuals screened in the MMHP. Strong associations were demonstrated between female gender and potential depression (OR = 1.51, 95% CI = 1.03 – 2.21) and/or PTSD (OR = 1.65, 95% CI = 1.18 – 2.31), while younger age was significantly associated with higher likelihood of screening positive for potential depression (OR: 0.99, 95% CI= 0.98 – 1.00), PTSD (OR = 0.97, 95% CI 0.96 – 0.98) and/or GAD (OR = 0.97, 95% CI = 0.96 – 0.98). Relatively high rates of possible comorbidity were also found in this study, especially between depression and anxiety: of those screening positive for any one condition, 73.8% screened positive on the combination

of PHQ-9 and GAD-7. Screening positive on the PHQ-9 was found to be a very strong predictor of concomitant positive screening on the GAD-7 (OR = 36.4, 95% CI = 25.3 – 52.2), and *vice versa* - screening positively on the GAD-7 strongly predicted positive screening on the PHQ-9 (OR = 36.6, 95% CI = 25.4 – 52.6). Screening positive on the PHQ-9 was also a significant predictor for screening positive on the PC-PTSD (OR = 9.1, 95% CI = 6.4 – 12.8).

Two hundred and eight participants had reached the 10 Week intervention. There were statistically and clinically significant improvements in clinical scores for all four conditions at Week 10 after enrolment on the MMHP, compared to baseline: 21% reduction in mean scores in the AUDIT, 43% in the GAD-7, 45% in the PHQ-9, and 36% in the PC-PTSD. Although similar to the experience in other CC initiatives, the lost-to-follow up figure of 27% after screening requires further investigation.

Based on the findings in this study, certain key design elements of the MMHP appear to be appropriate. These include the use of clinical data to determine risk and need for intervention in the managed care environment, treatment target calculation adjusted for baseline, screening for comorbid mental illness, and current referral sources using existing managed care processes. Symptom response in the initial stages of the programme is encouraging, but further research is required to confirm the outcomes of the intervention.

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Appendix A

Modified PHQ-9 Administered to High-Risk Beneficiaries

INTRO (Optional): Often patients with chronic conditions feel down due to their health problems hence I am asking the following questions		
Over the last 2 weeks have you been bothered with any of the following?	- Little interest or pleasure in doing anything - Feeling down or depressed or hopeless -Trouble sleeping or not getting much sleep -Feeling tired or having very little energy -Poor appetite or over eating -Feeling bad about yourself -Trouble concentrating -Moving or speaking slowly or the opposite being fidgety or restless more than usual -Any thoughts about harming yourself	
If you selected any of the above, how often and severe would you rate your problem?	Never, seldom, several days, most days	If yes to thoughts about harming self, trigger to MMHP (if yes to any of the other questions: trigger if several or most days)

Appendix B

Rules Applied to Primary Data

Primary data went through initial evaluation to prepare them for use in reporting and analysis. Due to the limitations mentioned in Chapter 5 as well as complexity in the data storage tables, certain rules had to be applied in order to source usable, reliable data. Below are descriptions of the data cleaning rules pertinent to this project.

1. The first score found captured for a member/beneficiary is used as the screening score with its corresponding date.
2. Multiple scores entered for the same member/beneficiary, or date, or symptom category, are cleared with reason "ERROR - DUPLICATE SCORE". This will result in a missing value for that score, instead of arbitrarily picking one of the contradictory scores for use in the analysis. The query tree (indicating referral source) associated with the first set of scores is used.

E.g. Before:

QUESTION	ANSWER_VALUE	COMPLETED_DATE
Total score for Alcohol assessment	0	19/MAY/16
Total score for Anxiety assessment	7	19/MAY/16
Total score for Anxiety assessment	21	19/MAY/16
Total score for Depression assessment	7	19/MAY/16
Total score for Depression assessment	24	19/MAY/16
Total score for PTSD assessment	4	19/MAY/16

After:

QUESTION	SCREENED_DATE	SCREENED_SCORE	SCREENED_COMMENT
Total score for Alcohol assessment	19/MAY/16	0	
Total score for Anxiety assessment	19/MAY/16	(null)	ERROR - DUPLICATE SCORE
Total score for Depression assessment	19/MAY/16	(null)	ERROR - DUPLICATE SCORE
Total score for PTSD assessment	19/MAY/16	4	

3. Test for four scores per member/beneficiary:

If a score was missing, the missing category was created with a blank score and error indicator, and the screened date was copied to the missing score to complete the set of four.

E.g.: PTSD score missing:

Before:

QUESTION	ANSWER_VALUE	COMPLETED_DATE
Total score for Alcohol assessment	5	10/MAY/17
Total score for Anxiety assessment	0	10/MAY/17
Total score for Depression assessment	15	10/MAY/17

After:

QUESTION	SCREENED_DATE	SCREENED_SCORE	SCREENED_COMMENT
Total score for Alcohol assessment	10/MAY/17	5	
Total score for Anxiety assessment	10/MAY/17	0	
Total score for Depression assessment	10/MAY/17	15	
Total score for PTSD assessment	10/MAY/17	(null)	ERROR - ANSWER NOT CAPTURED

4. Update PTSD score = 0 if GAD-7 score = 0 (apply skip rule)

   If PTSD score had not been captured for the member/beneficiary, but GAD-7 had been captured with zero total, the PTSD total was assumed to also be zero.

E.g. Before:

QUESTION	ENROLMENT_DATE	ENROLMENT_SCORE	ENROLMENT_COMMENT
Total score for Anxiety assessment	12/JUL/16	0	
Total score for PTSD assessment	12/JUL/16	(null)	ERROR - ANSWER NOT CAPTURED
Total score for Depression assessment	12/JUL/16	0	
Total score for Alcohol assessment	12/JUL/16	(null)	ERROR - ANSWER NOT CAPTURED

After:

QUESTION	ENROLMENT_DATE	ENROLMENT_SCORE	ENROLMENT_COMMENT
Total score for Anxiety assessment	12/JUL/16	0	
Total score for PTSD assessment	12/JUL/16	0	ERROR - ANSWER NOT CAPTURED
Total score for Depression assessment	12/JUL/16	0	
Total score for Alcohol assessment	12/JUL/16	(null)	ERROR - ANSWER NOT CAPTURED

5. Update enrolment score to screened score where beneficiary has positive screening and future scoring

6. Post-hospital discharge beneficiaries should be enrolled on the MMHP regardless of score; update enrolment score where this is missing:

   Update enrolment score/date with screened score/date where enrolment is blank and referral source = 'REF FROM HBM POST DC'

7. Update enrolment score/date with screened score where this is missing and beneficiary has a positive screening score, and future screening is found.

8. Correct discharge comment when entry criteria were met but the opposite captured incorrectly:

If DISCHARGE DATE > ENROLMENT DATE and POSITIVE SCREENING and (DISCHARGE_COMMENT = 'DISCH. NO MHCP CONS AFTER 3 REQ' or DISCHARGE_COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET')
THEN update the DISCHARGE_COMMENT to 'DISCHARGE REASON UNKNOWN'

9. Clear scoring data where entry criteria not met:

Clear ENROLMENT, WEEK 6, WEEK 10, MONTH 3 data where SCREENED TOTAL SCORING = 0 AND ENROLMENT TOTAL SCORING = 0 AND REFERRAL SOURCE <> 'REF FROM HBM POST DC'. SET DISCHARGE_DATE = SCREENED_DATE AND DISCHARGE_COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET'

10. Erroneous discharge captured prior to enrolment

If ENROLMENT DATE > DISCHARGE_DATE and (DISCHARGE_COMMENT = 'DISCH. NO MHCP CONS AFTER 3 REQ' or DISCHARGE_COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET'), then clear discharge comment and discharge date.

11. Discharge and enrolment on the same day: we clear the Enrolment Comment, Enrolment Score and Enrolment Date where a Discharge and Enrolment occur on the same date and no future scoring is found:

If ENROLMENT DATE = DISCHARGE_DATE and (DISCHARGE_COMMENT = 'DISCH. NO MHCP CONS AFTER 3 REQ' or DISCHARGE_COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET') and WEEK_6_SCORE = 0 AND WEEK_10_SCORE =0 and MONTH_3_SCORE = 0, THEN CLEAR ENROLMENT SCORE, COMMENT AND DATE

12. Invalid capturing of an enrolment: we clear the Enrolment Comment, Enrolment Score and Enrolment Date where no future scoring is found and the Member has a negative screening:

If (DISCHARGE_COMMENT = 'DISCH. NO MHCP CONS AFTER 3 REQ' or DISCHARGE_COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET' or 'DISCHARGE REASON UNKNOWN') and
WEEK_6_SCORE = 0 AND WEEK_10_SCORE =0 and MONTH_3_SCORE = 0 and POSITIVE_SCREENED_MEMBER is null, THEN CLEAR ENROLMENT SCORE, COMMENT AND DATE

13. Clear erroneous enrolments with no future scoring and negative entry scores, and not referred from post-hospital discharge:

CLEAR ENROLMENT COMMENT, SCORE AND DATE WHERE 4 SCORES = 0 AND NO FUTURE SCORES and <> 'REF FROM HBM POST DC'. UPDATE THE DISCHARGE QUERY TREE ‘DISCH. PROGRAMME CRITERIA NOT MET’ AND SET DISCHARGE_DATE = SCREENED_DATE

14. Update programme discharge indicator and date where no valid enrolment:

NO ENROLMENT SCORES FOUND, NO FUTURE SCORES FOUND, MEMBER IS NEGATIVE SCREENED, REFERRAL SOURCE <> 'REF FROM HBM POST DC’, THEN UPDATE DISCHARGE COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET' AND DISCHARGE_DATE = SCREENED_DATE

15. Remove erroneous enrolment data:

NO ENROLMENT SCORES FOUND, FUTURE SCORES FOUND, MEMBER IS NEGATIVE SCREENED, REFERRAL SOURCE <> 'REF FROM HBM POST DC’, THEN UPDATE DISCHARGE COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET' AND DISCHARGE_DATE = SCREENED_DATE, CLEAR ALL FUTURE SCORING

16. Correct erroneous none-enrolment data:

CLEAR DISCHARGE INFO WHERE REFERRAL SOURCE = 'REF FROM HBM POST DC'

AND DISCHARGE_COMMENT = 'DISCH. PROGRAMME CRITERIA NOT MET'

17. Week 10 rule:

Fetch all records for beneficiary not used in the snapshot table which are between 8-16 weeks after enrolment date, and extract maximum date and assign to Week 10.

e.g. The records from 28 March were used for Screening and Enrolment. The records for 3 July had no query tree assigned so we assigned the scores to Week 10.

QUESTION	ANSWER_VALUE	COMPLETED_DATE	QUERY_TREE_POINTS	SNAP_USED
Total score for Depression assessment	0	28/MAR/17	SUCC-QUEST ENROL (MAINT PHASE)	SCREENED
Total score for Anxiety assessment	0	28/MAR/17	SUCC-QUEST ENROL (MAINT PHASE)	SCREENED
Total score for Alcohol assessment	0	28/MAR/17	SUCC-QUEST ENROL (MAINT PHASE)	SCREENED
Total score for PTSD assessment	(null)	28/MAR/17	ERROR - ANSWER NOT CAPTURED	SCREENED
Total score for Depression assessment	12	03/JUL/17	(null)	(null)
Total score for Anxiety assessment	11	03/JUL/17	(null)	(null)
Total score for PTSD assessment	3	03/JUL/17	(null)	(null)
Total score for Alcohol assessment	0	03/JUL/17	(null)	(null)

18. Clear incorrect discharge data where the discharge date < enrolment date.