

# 2022

A METHODS PAPER

# Workforce Estimate to Treat Mental Disorders in the Kingdom of Saudi Arabia

Reimbursable Advisory Services:  
Technical Assistance on Health Economics



المجلس الصحي السعودي  
Saudi Health Council

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KINGDOM OF SAUDI ARABIA



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# Abbreviations

DALYs	disability-adjusted life years	MNS	mental, neurological, and substance abuse
FTE	full-time equivalent	PHC	primary health care
GBD	Global Burden of Disease	WHO	World Health Organization
KSA	Kingdom of Saudi Arabia	WMH-CIDI	World Mental Health Composite International Diagnostic Interview
MENA	the Middle East and North Africa		
mhGAP	mental Health Gap Action Programme		



# Key Messages

## KEY MESSAGES

- The need-based workforce estimate arrives at the total number of psychiatrists, nurses, and psychosocial care providers required to meet the epidemiologic need of mental health conditions of the population in the Kingdom of Saudi Arabia (KSA).
- All priority conditions have cost-effective treatment interventions that a trained workforce is able to administer. Need-based models were based on core assumptions about the capacity of the KSA health workforce to detect, diagnose, and treat priority mental, neurological, and substance use (MNS) conditions.
- There is an epidemiologic need for a total of 17,128 full-time-equivalent (FTE) health care providers to treat priority MNS disorders, of whom 97.0 percent of FTEs should be nurses and psychosocial care providers and 3.0 percent should be psychiatrists. Overall, the workforce needed to treat MNS conditions translates to 49.2 health workers per 100,000 population.
- Overall, KSA appears to have a need-based shortage of 10,402 health workers to treat mental disorders. This shortage is substantial when compared to other high-income countries.
- Policy interventions for addressing this shortfall are discussed.



# INTRODUCTION

# 1

Mental, neurological, and substance abuse (MNS) disorders describe a range of conditions that affect the brain and cause distress or functional impairment. MNS disorders include mood disorders (for example, bipolar disorder and depression), behavioral disorders (for example, conduct disorder), and developmental delays (for example, autism spectrum disorder). Globally, almost one in five people (17.6 percent) would meet the diagnostic criteria for MNS disorders within the past 12 months (Steel et al. 2014). When considered across a lifetime, this rate increases to one in every three people (29.2 percent) (Steel et al. 2014).

**In the Middle East and North Africa (MENA), MNS disorders make up 10.88 percent of the burden of disease** as measured in disability-adjusted life years (DALYs) (GBD 2020).<sup>1</sup> The burden of disability is not limited to emotional distress. Persons with MNS disorders experience, on average, a 15–30 percent lower life expectancy (Colton and Manderscheid 2006) due to comorbidity with substance abuse as well as mental and physical conditions. However, the reason for this is not solely related to the individual. Individuals with MNS disorders also face external challenges, some of which begin before the detection of disease and others after treatment. Patients with MNS disorders are more likely to experience barriers to accessing medical care (including difficulty with accessing physical health services) (Kilbourne, McCarthy, and Post 2006). This can impede screening, diagnosis, and treatment of other underlying physical conditions (Frayne et al. 2005).

**Furthermore, the connection between MNS disorders and premature death from**

**cardiovascular disease and cancers is well documented** (Crump, Sundquist, and Winkleby 2013; Fagiolini and Goracci 2009; Lawrence, Hancock, and Kisely 2013). Patients with bipolar disorder and depression, on average, experience lower rates of screening for cardiovascular diseases (Frayne et al. 2005). Moreover, physical health conditions, if left untreated, can exacerbate mental health conditions (Fagiolini et al. 2003), which can result in a recurring cycle of disease and disability. For example, bipolar patients who are obese have more bipolar episodes, episodes of longer duration, shorter times between episodes, and more suicide attempts than do non-obese patients (Fagiolini et al. 2003).

**The proper treatment of MNS disorders demonstrably improves the lives and functioning of patients; nevertheless, there are special issues that need to be considered.** Among those that suffer from major depressive disorder and bipolar disorder, the severity and persistence of depressive episodes predict absenteeism and loss of productivity (Kessler et al., 2006). This problem is more severe for bipolar patients who report more distress with depressive symptoms (as compared to mania symptoms) (Calabrese et al., 2004). Nevertheless, for this risk group,

<sup>1</sup> One DALY can be thought of as one year of life lost due to disability or premature death. This measure quantifies the health gap between the ideal health state—a theoretical state in which mortality is caused only by old age—and years of life spent disabled/injured in subpar health due to disease. DALYs are often used as a basis for health policy making as well as for setting intervention priorities.

prior to initiating antidepressant medication, it is necessary to screen for a history of bipolar disorder to avoid triggering an onset of mania. The treatment of schizophrenia with antipsychotic medications (Newcomer 2007) and the treatment of bipolar disorder with common pharmacological therapies (Kemp 2014) can produce metabolic changes that lead to weight gain and diabetes, which in turn increases the risk of cardiovascular disease. These adverse metabolic events can lead to drug non-adherence (Kemp 2014; Newcomer 2007), which can worsen existing conditions. Addressing unhealthy lifestyle factors (such as smoking, lack of physical activity, and unhealthy eating, which can increase the risk of obesity and diabetes), in conjunction with pharmacological treatments, is necessary to mitigate the onset of cardiovascular disease (Scott and Happell 2011).

**The aforementioned examples illustrate the individual, environmental, and systemic risk factors that pose complex challenges for health care providers.** When unaddressed, these risk factors have the potential to amplify the potential sequelae of MNS disorders on population health (Al Dhaheri et al., 2021). Addressing these issues means removing the barriers to seeking help for persons with MNS conditions. This begins with creating public awareness about MNS disorders as a matter of population health that includes physical, emotional, and societal consequences as part of the overall narrative. Public awareness creates an environment that ensures that persons with MNS conditions can get the treatment they need to manage the course of their condition in a way that enables them to be functional in society. Such awareness represents an important step in reducing the burden of disability and premature death from these conditions.

**In the MENA region, a lack of public awareness, the presence of stigma, and a lack of research into cultural differences in risk factors, prognosis, and treatment (Jaalouk et al., 2012) inhibit a comprehensive understanding of the cumulative burden of MNS disorders.** MENA scholars have noted the limited availability of mental health facilities (WHO EMRO 2017), limited mental health

training for doctors (Rhouma et al., 2016), and a scarcity of dedicated mental health professionals (Okasha, Karam, and Okasha 2012). However, the Kingdom of Saudi Arabia (KSA) is one of the top providers of mental health services and one of the top contributors to mental health research (Abumadini 2019; Jaalouk et al., 2012) in the region. As of 2017, there were 25 mental health hospitals and 4 psychiatric units in general hospitals (WHO EMRO 2017). Within the past decade, the accessibility and availability of mental health resources has increased substantially (Al-Habeeb and Qureshi 2010; Al-Habeeb, Helmi, and Qureshi 2016). Advances in mental health research include quantifying and classifying mental illness in primary care settings (Alzahrani et al., 2019; El-Tantawy et al., 2010), KSA-specific cultural considerations (AlAteeq et al., 2018; Alosaimi et al., 2019; Mahmoud 2018), and, more recently, a national study assessing the population prevalence and correlates of mental health conditions in KSA (Al-Subaie et al., 2020).

**KSA's progress around mental health service delivery has been commendable in recent decades.** A few new developments stand out, including specialty programs for drug and alcohol addiction and specialty programs for particular populations (i.e., children, adolescents, and elderly). Additionally, KSA spends 4% of total healthcare spending on mental health disorders. Saudi Arabia has been prioritizing mental health delivery as well with more PHC workers being trained to treat mental disorders.

**Despite KSA's developments in this area in recent decades, significant social challenges remain.** Research has shown that Saudi-specific social and cultural factors need to be considered as part of service delivery for mental health conditions (Abolfotouh et al., 2019; Alissa 2021). One of these factors involves the perception of mental illness and the role of the family in Saudi culture. There is a belief that mental disorder is the result of supernatural causes, weak faith, or weakness of character (Alosaimi et al., 2019). Lack of public awareness of the origin, treatment of, and functional capability of patients with mental disorders (Alosaimi et al., 2014) means that affected individuals may attempt to hide

their disorder or be unwilling to seek help if having a condition would reflect poorly on their family (AlAteeq et al. 2018; Mahmoud 2018). This stigmatization could delay much-needed treatment and result in further progression of disease.

**The Ministry of Health in KSA is the main provider of mental health services**, with other government agencies providing psychiatric treatment for state employees. From 1983, the Ministry of Health began to decentralize psychiatric services and established 21 regional psychiatric hospitals by 2014, which were augmented by free-standing private psychiatric clinics. Mental health training is increasingly available to primary care doctors and postgraduates (Koenig et al, 2014). By 2010 there were over 700 psychiatrists and 1126 psychologists, social workers and occupational therapists working in mental health. In 2014, a mental health law was passed, adopting several recommendations promoted by the WHO in the United Nations Principles for the Protection of Persons with Mental Illness and the Improvement of Mental Health Care. Another important feature of the KSA mental healthcare system is that the proportion of all mental health spending devoted to treatment in mental hospitals (78%)

**This problem of stigma poses multiple challenges for health care practitioners**, including demand-side patient underutilization of mental health services (Al-Krenawi 2005), limited screening and detection (patient somatization of mental health conditions [Al-Krenawi, 2005; Koenig et al., 2013]); and a shortage of the supply of Saudi mental health professionals (El-Gilany, Amr, and Iqbal 2010). Underutilization of mental health services in the medical system means that persons with MNS disorders instead turn to faith healers and traditional remedies (Alosaimi et al. 2019). Furthermore, special training for mental health

screening has been recommended for primary care providers, who serve as the first point of access to the treatment of MNS disorders within the health care system (Becker 2004). Lastly, the negative perception of mental illness and psychiatry means that there is a shortage of mental health professionals in KSA (El-Gilany, Amr, and Iqbal 2010).

**In addition to social challenges, the COVID-19 pandemic has led to an unanticipated increase in the demand for mental health services.** During the lockdown, up to 23.6% of survey respondents reported a moderate or severe psychological impact with severe symptoms of stress (Alkhamees et al., 2020). People with and without psychiatric illnesses were more likely to show higher levels of PTSD, anxiety, depression and stress (Alkhamees et al., 2020). These symptoms were more severe for those with existing mental conditions. This situation has exacerbated existing mental health service delivery gaps (especially among hard to reach and rural populations).

**This report estimates the gap between the current supply of mental health workers and the number needed to adequately treat the population for KSA by estimating the current prevalence of mental health disorders and needed resources for treatment.** The analysis employs an epidemiologic need-based model of MNS disorders in KSA to estimate the need for mental health workers. This need-based model departs from most economic demand-based estimates in that it uses the population-based prevalence of MNS disorders as the cornerstone of its estimate. As such, this need-based model does not account for either governmental or patient willingness-to-pay. This approach has been used in both MENA and other regions and therefore permits direct comparisons of KSA's results with those of other countries (Bruckner et al. 2011; Gailey et al., 2021; Scheffler et al. 2016).





**Estimates for a potential mental health workforce gap in KSA were calculated using five steps.** These steps were undertaken (WHO 2003): **Step 1:** Quantify target population for priority mental health conditions: a) Obtain age-specific population prevalence data. b) Identify age-specific population counts. **Step 2:** Identify number of expected cases per year. a) Multiply the age-specific prevalence of priority health conditions by population size to arrive at the total number of (age-specific) cases. **Step 3:** Set target service coverage for each condition. **Step 4:** Estimate cost-effective health care service resource utilization for each condition. **Step 5:** Estimate service resources needed for each condition. a) Calculate full-time-equivalent (FTE) staff needed for each treatment setting at target coverage. b) Assign staffing ratios based on treatment setting needs.

## Step 1: Quantify Target Population for Priority Mental Health Conditions

As defined in the World Health Organization (WHO)'s Mental Health Gap Action Programme (mhGAP) report (WHO 2008, p. 4), we focused on 11 priority mental health conditions: depression, bipolar disorder, schizophrenia, dementia, alcohol use, drug use, suicide, epilepsy, and intellectual disabilities, and developmental and behavioral disorders in children. Prioritization for these conditions was determined by assessing their impact on cost-effectiveness, affordability, and feasibility of treatment (Bruckner et al. 2011; WHO 2008). We focused on these conditions because of their large disability burden and the availability of cost-effective treatment service interventions that can be administered by a health worker.

After identifying the priority conditions, the target population with these conditions was quantified in two parts. The first part consisted of identifying the age-specific population prevalence of MNS disorders using five data sources: the Saudi National Mental Health

Survey (Altwajiri et al. 2020), the WHO Global Observatory Database (Vardell 2020), the WHO World Alzheimer's Report (Alzheimer's Disease International 2016), primary research, and the IMHE Global Burden of Disease (IMHE 2020).

### *Obtain Age-Specific Population Prevalence Data*

We prioritized studies conducted in KSA or MENA that sampled from a near-complete population sampling frame that includes households and individuals from population registers and/or censuses and lists of children from schools. Of the studies considered, case-control designs without 100 percent geographic representativeness selection were preferred over non-case-control studies from a more geographically representative population.

Priority was given to studies with stronger sampling methods and research design, and that included a medical professional to validate a diagnosis of an MNS disorder. We used results from studies that employed a nationally and geographically representative sampling of households and participant recruitment

in addition to a case-control design.<sup>2</sup> This was the Saudi National Mental Health Survey (Altwaijri et al., 2020). As a second option, we used prevalence estimates from non-nationally representative case-control studies. There were three studies that met these criteria including regional meta-analyses (Alzheimer's Disease International 2016; Vardell 2020) and the primary source literature (Al Rajeh et al. 2001).

In the case of assessing prevalence of developmental, behavioral, and emotional conditions in children, we reviewed two studies that utilized case-control design where survey instruments included assessments of multiple perspectives including parents, teachers, and children (Eapen et al., 2007; Mohammadi et al. 2016). However, when compared to Global Burden of Disease (GBD) estimates (GBD 2020),

the estimates from primary sources (Eapen et al. 2007; Mohammadi et al., 2017) differed greatly and ranged from being 10 times lower for childhood intellectual disabilities to 12.6 times higher for childhood emotional disorders.<sup>3</sup> These differences were deemed to arise from study design challenges rather than reflecting a true difference in the prevalence of these disorders across regions. Therefore, for these conditions, we deferred to GBD estimates. In the case of dementia, we utilized a meta-analysis study (Alzheimer's Disease International 2016). Table 1 summarizes the studies that were included in this study and their relative ranking in priority of the aforementioned criteria. (See appendix A for a full description of data sources.) Table 2 summarizes the results of the literature review prevalence estimates for each priority mental health condition.

<sup>2</sup> In absence of a probability sample of households or individuals, a community-based study that selected individuals for participation through a community register was preferred. Case control was necessary for inclusion.

<sup>3</sup> For childhood intellectual disabilities, the Eapen et al. (2007) study found a prevalence of 0.29 percent for intellectual disabilities. This is 10 times lower than GBD estimates at 3.01 percent (IMHE 2020). For childhood emotional disorders, the Mohammadi et al. (2017) study found a prevalence of 9.58 percent for childhood conduct/behavioral disorders and 7.86 percent for childhood emotional disorders. These estimates were 3.2 and 12.6 times higher than GBD estimates (3.01 percent and 0.62 percent, respectively).

TABLE 1 OVERVIEW OF SELECTION CRITERIA FOR ESTIMATES OF PREVALENCE FOR PRIORITY HEALTH CONDITIONS IN 2020

Rank	Research Type	Data Source	Sampling Methodology	Mental Health Conditions
1	Population survey	World Mental Health Survey (Altwaijri et al., 2020)	Multistage household probability sample with case-control design. Fully structured diagnostic interview using the World Mental Health Composite International Diagnostic Interview (WMH - CIDI). Part 1 - Core diagnostic assessment administered by trained interviewer. Part 2 - Respondents who meet criteria for any disorder in Part 1 + subsample of ~25% of non-criteria respondents.	Depression, alcohol use disorder, and drug use disorders
2	Meta analysis <sup>a</sup>	World Alzheimer's Report (Alzheimer's Disease International 2016)	Systematic literature review conducted via PubMed/Medline for population-based studies among people 60+ years. <sup>c</sup>	Dementia
3	Primary Research	Al Rajeh et al. 2001	Community sample of N = 23,700 Saudis in Thugbah with case control. Part 1 – Structured interview was carried out by trained interviewer using WHO protocol for detecting neurological disorders. Part 2 – Individuals identified as having a neurological disorder were evaluated by a neurologist.	Epilepsy
4	Simulation	WHO Global Health Observatory (Vardell 2020)	Statistical modeling performed using data from regional health observatories and international agencies with consultation from member states and experts. Includes household surveys, civil registration of vital events, and institution-based sources (administrative and health facilities)	Suicidal ideation
5	Simulation	IHME Global Burden of Disease <sup>b</sup>	Statistical modeling incorporates data from censuses, national surveys, primary research, births, and vital registration.	Bipolar disorder, <sup>c</sup> child intellectual and development disorders, child conduct/behavioral disorders, and child emotional disorders

Source: Original table for publication

Note: GBD = Global Burden of Disease; WMH - CIDI = World Mental Health Composite International Diagnostic Interview.

a. Studies for the Middle East and North Africa relied on data from expert consensus panels (2005) and studies from Egypt and Turkey. (Arslantas et al. 2009; El Tallawy et al. 2012; El Tallawy et al. 2014; Gurvit et al. 2008 ; Keskinoglu et al. 2013).

b. IHME. 2020. Global Burden of Disease Database, accessed July 8, 2021.

c. For bipolar disorder, we initially utilized estimates from World Mental Health Surveys. However, these estimates resulted in projections of workforce needs that were 1.5 times higher than historical estimates for low- and middle-income countries (Bruckner et al. 2011). These substantially higher estimates would significantly impact the ability to compare current and historical estimates in low- and middle-income countries. Therefore, we utilized GBD estimates for bipolar disorder.

TABLE 2 PREVALENCE (%) OF PRIORITY MENTAL HEALTH CONDITIONS IN 2020

Age Group	Schizophrenia <sup>a</sup>	Bipolar Disorder <sup>a</sup>	Depression <sup>b</sup>	Suicidal Ideation <sup>c</sup>	Dementia <sup>d</sup>	Alcohol Use Disorder <sup>b</sup>	Other Drug Use Disorders <sup>b</sup>	Epilepsy <sup>e</sup>	Child Intellectual Disabilities <sup>a</sup>	Child Conduct/Behavior <sup>a</sup>	Child Emotional Disorders <sup>a</sup>
0-14	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.76%	1.36%	2.75%	0.69%
15-34	0.33%	1.11%	3.39%	0.07%	n.a.	0.25%	3.29%	0.54%	n.a.	n.a.	n.a.
35-49	0.53%	1.09%	4.13%	0.09%	n.a.	0.29%	2.36%	0.32%	n.a.	n.a.	n.a.
50-64	0.43%	1.04%	4.17%	0.10%	0.10%	0.16%	1.32%	0.23%	n.a.	n.a.	n.a.
65+	0.24%	0.69%	3.51%	0.15%	2.44%	0.10%	0.63%	0.56%	n.a.	n.a.	n.a.
<b>Total</b>	<b>0.41%</b>	<b>1.07%</b>	<b>3.80%</b>	<b>0.07%</b>	<b>0.10%</b>	<b>0.20%</b>	<b>1.90%</b>	<b>0.50%</b>	<b>1.36%</b>	<b>2.75%</b>	<b>0.69%</b>

Sources: a. GBD 2019; b. Altwajiri et al. 2020; c. Vardell 2020; d. Alzheimer's Disease International 2016; e. Al Rajeh et al. 2001.

Note: This table is not adjusted for comorbidity of conditions. DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, fourth edition; ICD-10 = International Classification of Diseases, Tenth Revision; n.a. = not applicable.

Definition of mental health conditions

Schizophrenia = cases that meet ICD-10 criteria for schizophrenia only.

Bipolar disorder = cases that meet ICD-10 criteria for bipolar disorder only.

Depression = cases that meet DSM-IV criteria for major depressive disorder only with clinical follow-up.

Suicidal ideation = WHO Global Health Observatory suicide death rate multiplied by factor of 20 (Kerkhof 2000; Schmidtke et al. 1996).

Dementia = cases that meet ICD-10 criteria for dementia multiplied by a 0.5 correction factor (Rodriguez et al. 2008).

Alcohol use disorder = cases that meet DSM-IV criteria for alcohol dependence and alcohol use disorder with clinical follow-up.

Other drug use disorders = cases that meet DSM-IV criteria for substance (non-alcohol) dependence and substance (non-alcohol) use disorders with clinical follow-up.

Epilepsy = cases that meet the International League Against Epilepsy definition for seizures (within past 6 months) with clinical and electroencephalographic follow-up.

Childhood intellectual disabilities = cases that meet the ICD-10 criteria for pervasive developmental disorder including autism.

Childhood conduct and behavioral disorders = cases that meet ICD-10 criteria for attention deficit hyperactivity disorder, conduct disorder, and oppositional defiant disorder.

Childhood emotional disorders = cases that meet ICD-10 criteria for depressive disorders (major depression and dysthymia) and mania (bipolar disorder).

## Identify Age-Specific Population Counts

The relevant age-specific population counts were identified using UN Population Estimates (table 3).

TABLE 3 POPULATION BY AGE GROUP, 2020

Age Group	Count
0–14	8,597,715
15–34	11,011,479
35–49	9,951,215
50–64	4,035,509
65+	1,217,949
Total	34,813,867

Source: United Nations Department of Economic and Social Affairs (UN DESA) 2019.

### Step 2: Identify the Number of Expected Cases per Year

This age-specific prevalence of priority health conditions was applied to UN population estimates for Saudi Arabia (table 3) to arrive at the total number of cases within the population.

#### Multiply the Age-Specific Population Prevalence of Priority Health Conditions by Population Size

For example, the estimated prevalence of bipolar disorder is 1.11 percent for persons ages 15–34,<sup>4</sup> which yields 122,510 cases.

$$\text{prevalence} \times \text{population} = \text{number of expected cases}$$

$$1.11\% \times 11,011,479 = 122,510$$

### Step 3: Set Target Coverage for the Target Populations for Each Condition

Targets for health service coverage quantify the service resource allocation and delivery that is feasible for the population affected by a given MNS disorder. Target rates for coverage of each disorder were obtained via literature

review (Belfer 2008; Chisholm, Lund, and Saxena 2007; Chisholm et al., 2016; Ding et al., 2008; Ferri et al., 2004; Kataoka, Zhang, and Wells 2002). Target coverage rates were set higher (for example, 80 percent) for conditions that have a higher disability, visibility, and vulnerability—such as schizophrenia and bipolar disorder. Targets were lower (for example, 25 percent) for conditions that are challenging to detect and/or are less likely to involve the patient seeking care. For example, alcohol use disorder (Chisholm, Lund, and Saxena 2007) remains relatively “hidden” in the sense that persons with this disorder are not likely to be identified by a clinician and not likely to seek care. See table B1 in appendix for details.

Defining the target population effectively determines who, based on epidemiologic need, would require access to health services. This need-based target differs from other benchmarks (for example, WHO 2021) that determine need based on desired equity goals (for example, universal health coverage in which all individuals are able to receive the help that they need, when they need it, without financial hardship, and without barriers to accessibility). The need-based target assumes no cost barriers to care and diverges from other benchmarks in that it does *not* assume universal treatment coverage of 100 percent for all persons with MNS disorders.

<sup>4</sup> The prevalence (1.11 percent) shown is rounded down from (1.11256576431905 percent).

$$\text{number of expected cases} \times \frac{\text{target coverage}}{\text{target population}}$$

The target coverage for bipolar disorder is 80 percent, which means that the target population for patients with bipolar disorder ages 15–34 is 98,008 persons.

$$122,510 \times 80\% = 98,008 \text{ persons}$$

#### Step 4: Estimate Cost-Effective Health Care Service Resource Utilization for Each Condition

The health care service delivery model in the mhGAP estimates the FTE staff needed to effectively deliver mental health interventions for low- and middle-income countries. The required inputs—health care worker, rate of use, and facility type—for staffing calculations vary for each of the priority health conditions in accordance with the literature (Chisholm, Lund, and Saxena 2007). See table B2 in appendix B for more details.

The total annual outpatient visits and inpatient bed-days that would be expected for the target population at the specified target service coverage rates (see tables B2 and B3 in appendix B) are used to estimate FTE. Assuming that health care workers provide 11 consultations per day with 225 working days per year, 176,414 outpatients visits for patients with bipolar

disorder (ages 15–34 only) per year will require 71 hospital outpatient FTE employees. Within the outpatient primary care setting, we assume that psychosocial care providers will perform 77.50 percent of the tasks and that nursing care providers will perform 20.83 percent. This leaves psychiatrists and specialists with the remaining 1.67 percent of the tasks. Following this distribution, 1 psychiatrist, 15 nurses, and 55 psychosocial care providers are needed to treat the target population for patients with bipolar disorder ages 15–34.<sup>5</sup>

#### Step 5: Estimate service resources needed for each condition

Next, estimates of service resources were calculated for each of the priority conditions. This was assessed in outpatient visits (for treatment settings in day care and primary care) and inpatient bed-days (for treatment settings in acute care and long stay/residential care).

$$\text{FTE needed} = \frac{\text{service utilization (e.g., visits per year)}}{(\text{consultations per day} \times \text{working days per year})}$$

Using the total number of outpatient visits and inpatient bed-days, we applied the calculations for staffing patterns to each health care setting. The final step consists of assigning staffing ratios based on treatment settings.

<sup>5</sup> The unrounded FTE are 71.28 FTE which includes 1.19 psychiatrists, 14.85 nurses, and 55.24 psychosocial care providers.

# RESULTS

# 3

## Prevalence and Cases

**Saudi Arabia is estimated to have a high prevalence of MNS disorders equating to a high number of cases in need of treatment.**

Table 4 shows the total target cases that will require treatment by age group. The total number is 1,153,051, or 3,312 per 100,000, for the priority mental health conditions. Of the target population of persons with MNS disorders, 48 percent of the target population is estimated to suffer from depression or bipolar disorder (see table 5).

## Needed Consultations

**It is estimated that approximately 7,084,807 regular visits per year are needed for the selected MNS conditions with bipolar disorder, depression, and drug use disorders contribute to the highest proportion of total outpatient visits.** Table 6 shows the expected annual outpatient and inpatient resources needed (as measured in visits and days) to manage the target cases of priority mental health conditions. Regular (outpatient) visits account for 71.16 percent of the total outpatient visits. This equates to 7,084,807 regular visits per year (or 20,351 per 100,000 population). Day care visits make up 28.84 percent of total outpatient visits (or 8,247 visits per 100,000 population). In Table 7, expected annual outpatient visits and inpatient days are shown by condition. Bipolar disorder, depression, and drug use disorders contribute to the highest proportion of total outpatient visits. The treatment models for depression, drug use disorders, and bipolar

disorder assume that regular visits (90.5 percent, 75.9 percent, and 56.1 percent, respectively) will make up the majority of outpatient care. Bipolar disorder has a prevalence of 1.07 percent and comprises over one-third (38.6 percent) of total outpatient visits (3,847,290). This is due to the high treatment service coverage of 80 percent and the high average service utilization for both outpatient visits (see appendix B). Compared to bipolar disorder, depression has a higher population prevalence at 3.80 percent and contributes to about half of the number of outpatient visits (1,730,891), which is 17.4 percent of the total outpatient visits. This is due to its relatively lower treatment coverage (33 percent) and the average service utilization for depression.

**Need varies significantly by age group due to the significant variation by age group in inpatient and outpatient visits needed.**

Children ages 0–14 have the lowest rates of total outpatient visits and inpatient bed usage. This low rate can be attributed to the lower target treatment coverage (20 percent) for disorders in children and the lower service utilization rate for childhood conduct/behavioral disorder and intellectual and developmental disorders. Patients ages 35–49 have the highest rate of outpatient regular visit usage, at 24,835 visits per 100,000 population. This group has the highest prevalence of schizophrenia, alcohol use disorder, and drug use disorders, as well as the second highest rate of depression. Patients who are ages 65+ have the highest rate of inpatient bed-day usage, at 41,136 bed-days per 100,000 population for community residential care. The primary conditions affecting this

group are depression and dementia, at 3.51 percent and 2.44 percent, respectively, of which the treatment model for dementia consists primarily of residential care.

**Residential care makes up the majority of total inpatient days with bipolar disorder contributing to the largest proportion of annual residential care bed-days.**

Table 7 shows that residential care makes up the overwhelming majority of total inpatient days (90.38 percent, or 5,276,959 bed-days) and acute treatment makes up 9.84 percent (or 561,462 bed-days). Bipolar disorder contributes to the largest proportion of annual residential care bed-days at 37.09 percent, or 1,957,393 bed-days.<sup>6</sup> Other drug use disorders have a prevalence of 1.90 percent and target coverage of 50 percent. This condition makes up the second highest residential bed-days at 31.06 percent, or 1,813,700 bed-days. Dementia has a population prevalence of 0.10 percent and is expected to contribute 7.8 percent of total residential bed-days per year. These figures are already adjusted for comorbidity of conditions. Within the conditions assessed, there are staff FTE and treatment optimizations that could be made if the comorbidities are identified and treatable as part of another condition's treatment model. (See appendix C for full details.)

## Estimated Staff Needs

**A large number of inpatient and outpatient visits are estimated equating to a large FTE staff need.** The selected conditions would require approximately a total of 9,955,933 outpatient visits and 5,838,421 inpatient visits (see table 7). This amounts to 17,128 FTE staff, or 49.2 per 100,000 population. The estimated number of staff needed to treat the priority mental health conditions is shown in table 8. A total of 1,047 psychiatrists, 9,440 nurses, and 6,641 psychosocial care providers would be needed to address the priority mental health conditions.

**The shortfall in psychiatrists is not as drastic as that in psychiatric nurses and psychosocial care providers, where current supply needs to almost triple to meet need.** Using the 2017 estimates from the World Health Organization, KSA currently has 9333 psychiatrists, 3,711 psychiatric nurses, and 2,082 psychosocial care providers (table 9). This is significantly lower than the estimated need, which amounts to 1,047 psychiatrists, 9,440 psychiatric nurses, and 6,641 psychosocial care providers. A total shortfall of 10,402 mental health workers is predicted, the vast majority (98.9 percent) of which are nurses and psychosocial care providers (see table 9).

<sup>6</sup> The population prevalence for bipolar disorder is 1.07 percent and target coverage is 80 percent.



TABLE 4 TARGET POPULATION THAT REQUIRES TREATMENT FOR PRIORITY MENTAL HEALTH CONDITIONS IN 2020

Age Group	Schizophrenia <sup>a</sup>	Bipolar Disorder <sup>a</sup>	Depression <sup>b</sup>	Suicidal Ideation <sup>c</sup>	Dementia <sup>d</sup>	Alcohol Use Disorder <sup>b</sup>	Other Drug Use Disorders <sup>b</sup>	Epilepsy <sup>e</sup>	Childhood Intellectual Disabilities <sup>f</sup>	Childhood Conduct/Behavioral Disorders <sup>g</sup>	Childhood Emotional Disorders <sup>h</sup>	Total Target Cases	Total Cases per 100,000 Population
0-14	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	52,390	23,322	47,215	11,799	134,726	1,567
15-34	28,837	98,008	123,225	1,933	0	4,917	154,212	47,483	n.a.	n.a.	n.a.	458,615	4,165
35-49	41,952	86,785	135,591	2,104	0	4,671	88,414	25,596	n.a.	n.a.	n.a.	385,114	3,870
50-64	13,776	33,448	55,513	986	2,047	724	15,292	7,529	n.a.	n.a.	n.a.	129,314	3,204
65+	2,370	6,747	14,113	426	14,861	126	1,183	5,456	n.a.	n.a.	n.a.	45,282	3,718
<b>Total</b>	<b>86,936</b>	<b>224,988</b>	<b>328,442</b>	<b>5,450</b>	<b>16,908</b>	<b>10,438</b>	<b>259,100</b>	<b>138,454</b>	<b>23,322</b>	<b>47,215</b>	<b>11,799</b>	<b>1,153,051</b>	<b>3,312</b>

Sources: a. GBD 2019; b. Alhewajiri et al. 2020; c. Vardell 2020; d. Alzheimer's Disease International 2016; e. Al Rajeh et al. 2001.

Note: Table 4 shows the target population for each condition unadjusted for comorbidity. DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, fourth edition; ICD-10 = International Classification of Diseases, Tenth Revision; n.a. = not applicable.

Definition of mental health conditions:

Schizophrenia = cases that meet ICD-10 criteria for schizophrenia only.

Bipolar disorder = cases that meet ICD-10 criteria for bipolar disorder only.

Depression = cases that meet DSM-IV criteria for major depressive disorder only with clinical follow-up.

Suicidal ideation = WHO Global Health Observatory suicide death rate multiplied by factor of 20 (Kerkhof 2000; Schmidtke et al. 1996).

Dementia = cases that meet ICD-10 criteria for dementia multiplied by a 0.5 correction factor (Rodriguez et al. 2008).

Alcohol use disorder = cases that meet DSM-IV criteria for alcohol dependence and alcohol use disorder with clinical follow-up.

Other drug use disorders = cases that meet DSM-IV criteria for substance (non-alcohol) dependence and substance (non-alcohol) use disorders with clinical follow-up.

Epilepsy = cases that meet the International League Against Epilepsy definition for seizures (within past 6 months) with clinical and electroencephalographic follow-up.

Childhood intellectual disabilities = cases that meet the ICD-10 criteria for pervasive developmental disorder including autism.

Childhood conduct and behavioral disorders = cases that meet ICD-10 criteria for attention deficit hyperactivity disorder, conduct disorder, and oppositional defiant disorder.

Childhood emotional disorders = cases that meet ICD-10 criteria for depressive disorders (major depression and dysthymia) and mania (bipolar disorder).

TABLE 5 PERCENT OF TARGET POPULATION THAT REQUIRES TREATMENT FOR PRIORITY MENTAL HEALTH CONDITIONS (% WITHIN AGE GROUPS) IN 2020

Age Group	Schizophrenia <sup>a</sup>	Bipolar Disorder <sup>a</sup>	Depression <sup>b</sup>	Suicidal Ideation <sup>c</sup>	Dementia <sup>d</sup>	Alcohol Use Disorder <sup>b</sup>	Other Drug Use Disorders <sup>b</sup>	Epilepsy <sup>e</sup>	Childhood Intellectual Disabilities <sup>a</sup>	Childhood Conduct/Behavioral Disorders <sup>a</sup>	Childhood Emotional Disorders <sup>a</sup>
0-14	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	38.9%	17.3%	35.0%	8.8%
15-34	6.3%	21.4%	26.9%	0.4%	0.0%	1.1%	33.6%	10.4%	n.a.	n.a.	n.a.
35-49	10.9%	22.5%	35.2%	0.5%	0.0%	1.2%	23.0%	6.6%	n.a.	n.a.	n.a.
50-64	10.7%	25.9%	42.9%	0.8%	1.6%	0.6%	11.8%	5.8%	n.a.	n.a.	n.a.
65+	5.2%	14.9%	31.2%	0.9%	32.8%	0.3%	2.6%	12.0%	n.a.	n.a.	n.a.
<b>Total</b>	<b>7.5%</b>	<b>19.5%</b>	<b>28.5%</b>	<b>0.5%</b>	<b>1.5%</b>	<b>0.9%</b>	<b>22.5%</b>	<b>12.0%</b>	<b>2.0%</b>	<b>4.1%</b>	<b>1.0%</b>

Sources: a. GBD 2019; b. Altwajiri et al. 2020; c. Vardell 2020; d. Alzheimer's Disease International 2016; e. Al Rajeh et al. 2001.

Note: Table 5 shows the target population for each condition unadjusted for comorbidity, DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, fourth edition; ICD-10 = International Classification of Diseases, Tenth Revision; n.a. = not applicable.

Definition of mental health conditions

Schizophrenia = cases that meet ICD-10 criteria for schizophrenia only.

Bipolar disorder = cases that meet ICD-10 criteria for bipolar disorder only.

Depression = cases that meet DSM-IV criteria for major depressive disorder only with clinical follow-up.

Suicidal ideation = WHO Global Health Observatory suicide death rate multiplied by factor of 20 (Kerkhof 2000; Schmidtke et al. 1996).

Dementia = cases that meet ICD-10 criteria for dementia multiplied by a 0.5 correction factor (Rodriguez et al. 2008).

Alcohol use disorder = cases that meet DSM-IV criteria for alcohol dependence and alcohol use disorder with clinical follow-up.

Other drug use disorders = cases that meet DSM-IV criteria for substance (non-alcohol) dependence and substance (non-alcohol) use disorders with clinical follow-up.

Epilepsy = cases that meet the International League Against Epilepsy definition for seizures (within past 6 months) with clinical and electroencephalographic follow-up.

Childhood intellectual disabilities = cases that meet the ICD-10 criteria for pervasive developmental disorder including autism.

Childhood conduct and behavioral disorders = cases that meet ICD-10 criteria for attention deficit hyperactivity disorder, conduct disorder, and oppositional defiant disorder.

Childhood emotional disorders = cases that meet ICD-10 criteria for depressive disorders (major depression and dysthymia) and mania (bipolar disorder).

TABLE 6 TOTAL EXPECTED ANNUAL OUTPATIENT VISITS AND INPATIENT DAYS FOR TARGET CASES FOR PRIORITY HEALTH CONDITIONS IN 2020

Age Group	Outpatient						Inpatient			
	Day Care Visits		Regular Visits <sup>a</sup>		Per 100,000 Population	Acute Days	Per 100,000 Population	Community Residential Days		Per 100,000 Population
	Visits	Per 100,000 Population	Visits	Per 100,000 Population				Days	Per 100,000 Population	
0-14	11,565	135	830,004	9,654	0	0	24,260	282		
15-34	1,198,973	10,888	2,734,653	24,835	228,322	2,073	2,287,633	20,775		
35-49	1,140,475	11,461	2,410,451	24,223	231,727	2,329	1,847,245	18,563		
50-64	405,895	10,058	843,195	20,894	85,003	2,106	616,808	15,285		
65+	114,217	9,378	266,505	21,881	16,410	1,347	501,012	41,136		
<b>Total</b>	<b>2,871,125</b>	<b>8,247</b>	<b>7,084,807</b>	<b>20,351</b>	<b>561,462</b>	<b>1,613</b>	<b>5,276,959</b>	<b>15,158</b>		

Source: Calculations for visits and day-beds performed using data from GBD 2019; Altwajiri et al. 2020; Vardell 2020; Alzheimer's Disease International 2016; Al Rajeh et al. 2001; Chisholm, Lund, and Saxena 2007.

Note: This table is adjusted for comorbidity of conditions and treatable diseases. See details in appendix C.

a. Regular visits includes hospital outpatient visits, primary health care (PHC) treatment, and PHC screenings.

TABLE 7 TOTAL EXPECTED ANNUAL OUTPATIENT VISITS AND INPATIENT DAYS FOR TARGET CASES BY PRIORITY MENTAL HEALTH CONDITION IN 2020

Condition	Total Outpatient Visits			Total Inpatient Days		
	Day Care	+ Regular Visits	= Total Outpatient Visits per Condition	Acute	+ Residential Care	= Total Inpatient Days per Condition
Bipolar disorder	1,687,408	2,159,882	3,847,290	404,978	1,957,393	2,362,371
Depression	164,221	1,566,670	1,730,891	0	239,763	239,763
Other drug use disorders	310,920	979,398	1,290,318	0	1,813,700	1,813,700
Schizophrenia	652,016	834,581	1,486,597	156,484	756,339	912,823
Epilepsy	0	969,180	969,180	0	34,614	34,614
Conduct/behavioral disorders in children	5,666	330,030	335,696	0	2,550	2,550
Intellectual disability in children	0	76,964	76,964			0
Dementia	42,270	76,086	118,355	0	456,514	456,514
Emotional disorders in children	5,899	56,279	62,178	0	8,613	8,613
Suicide ideation	2,725	25,613	28,338	0	6,430	6,430
Alcohol use disorder	0	10,125	10,125	0	1,044	1,044
<b>Total</b>	<b>2,871,125</b>	<b>7,084,807</b>	<b>9,955,933</b>	<b>561,462</b>	<b>5,276,959</b>	<b>5,838,421</b>

Source: Calculations for visits and day-beds performed using data from GBD 2019; Altwajiri et al. 2020; Vardell 2020; Alzheimer's Disease International 2016; Al Rajeh et al. 2000; Chisholm, Lund, and Saxena 2007.

TABLE 8 ESTIMATED FTE STAFF NEEDED TO TREAT MENTAL HEALTH CONDITIONS IN 2020

Age Group	Psychiatrists			Psychiatric Nurses			Psychosocial Care Providers <sup>a</sup>			Total FTE Staff Needed		
	FTE Staff Needed	Per 100,000 Population	Per 100,000 Treated Cases	FTE Staff Needed	Per 100,000 Population	Per 100,000 Treated Cases	FTE Staff Needed	Per 100,000 Population	Per 100,000 Treated Cases	FTE Staff Needed	Per 100,000 Population	Per 100,000 Treated Cases
0-14	10	0.1	7.4	108	1.3	80.4	279	3.2	207	397	4.6	295.0
15-34	447	4.1	97.6	4,003	36.4	872.9	2,619	23.8	571	7,069	64.2	1,541.5
35-49	368	3.7	95.7	3,360	33.8	872.4	2,333	23.4	606	6,061	60.9	1,573.9
50-64	124	3.1	95.7	1,137	28.2	879.3	797	19.8	616	2,058	51.0	1,591.4
65+	94	7.7	207.8	794	65.2	1,753.5	469	38.5	1,036	1,357	111.4	2,997.5
<b>Total</b>	<b>1,047</b>	<b>3.0</b>	<b>90.5</b>	<b>9,440</b>	<b>27.0</b>	<b>815.4</b>	<b>6,641</b>	<b>18.7</b>	<b>564</b>	<b>16,943</b>	<b>48.7</b>	<b>1,469.4</b>

Source: Calculations for FTE performed using data from GBD 2019; Altvajjiri et al. 2020; Vardell 2020; Alzheimer's Disease International 2016; Al Rajeh et al. 2001; Chisholm, Lund, and Saxena 2007.

Note: Calculation assumes that there are 225 working days per year with 11 consultations per day (WHO 2003). FTE = full-time equivalent.

a. Psychosocial care providers includes social workers and psychologists.

TABLE 9 ESTIMATED FTE STAFF SHORTFALL TO TREAT MENTAL HEALTH CONDITIONS IN 2020

	Psychiatrists		Psychiatric Nurses		Psychosocial Care Providers <sup>a</sup>		Total	
	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000
<b>FTE staff supply</b>	933	2.7	3,711	10.7	2,082	6.0	6,726	19.3
<b>FTE needed</b>	1,047	3.0	9,440	27.1	6,641	19.1	17,128	49.2
<b>Shortfall</b>	114	0.3	5,729	16.5	4,559	13.1	10,402	29.9

Source: WHO EMRO 2017.

Note: Calculation assumes that there are 225 working days per year with 11 consultations per day (WHO 2003). FTE = full-time equivalent.

a. Psychosocial care providers includes social workers and psychologists.



# DISCUSSION AND RECOMMENDATIONS

# 4

This paper used a need-based methodology to assess the potential shortfall of mental health workers in KSA needed to treat priority MNS conditions. The analysis employs an epidemiologic need-based model of MNS disorders in KSA to estimate the need for mental health workers.

## **A shortfall of 10,402 workers to treat mental health conditions is predicted in KSA.**

A total of 114 psychiatrists, 5,729 nurses, and 4,559 psychosocial care providers would be additionally needed (that is, above and beyond current levels) to address the priority mental health conditions. The shortfall is particularly severe for nurses and psychosocial workers who make up 98.9 percent of the shortfall. In addition, there is a lack of trained professionals to treat the unique needs of special populations (for example, children, adolescents, and the elderly) (Al-Habeeb et al. 2016). Due to data limitations this report does not allow for gender-specific analyses; however it is important to note that anecdotal evidence suggests that women in Saudi are more vulnerable to mental health disorders as well as face more access issues due to cultural barriers and stigma. Additionally, the scope of the report is limited to evaluation the shortfall of workers. Further studies are needed to cost the wage bill associated with such an expansion of human resources for mental health, which will likely need to be a phased expansion given its magnitude.

## **Nurse task shifting is a potential solution to addressing workforce shortfalls and demands.**

In countries that have implemented extensive task shifting, nurses can cover nearly an entire patient visit which has been demonstrably effective in expanding access to and continuity of care (Maier and Aiken, 2016). A systematic review of nurse task shifting for

the mental health specialists in primary care suggests nurses were able to perform the tasks typically performed specialists with higher qualifications with similar patient outcomes (Aurizki and Wilson, 2022). And nurse-delivered task shifting interventions were generally the most effective (Auriziki and Wilson, 2022). Short training modules that spanned a couple of hours or up to one week were effective for shifting a variety of tasks ranging from screening, therapy, to carrying out extensive interventions (Aurizki and Wilson, 2022; Engel et al., 2008). **This worker shortfall would probably be more severe if KSA were to focus only on Saudi nationals.** The majority (56 percent) of the health care workforce is foreign (Albejaidi and Nair 2019; Alsufyani et al. 2020). Saudis make up 29.5 percent of the physician workforce (Albejaidi and Nair 2019) and 38.8 percent of the nursing workforce (Alsufyani et al. 2020). This composition, moreover, has specific implications for mental health care providers when it comes to observing KSA-specific cultural customs and norms (Albougami 2015; Felemban et al. 2014). In addition, the extent to which patient/provider concordance, in terms of Saudi national status or gender, could assist with de-stigmatizing help-seeking for MNS disorders remains unclear. Whereas the estimates provided in this report assume a specific level of help-seeking for each condition, consideration of the composition of the health care workforce, as well as public health and

other efforts, could substantially affect help-seeking behavior for MNS disorders.

**There may be challenges to addressing the shortfall with Saudi health care workers due to stigmatized perceptions and burnout, which requires innovative training strategies.**

Changing the public perception of psychiatry and the perception of nursing as a profession are necessary to ensuring a sufficient supply of Saudi mental health care professionals to meet the current and future needs of the population (El-Gilany, Amr, and Iabal 2010). In addition, psychiatrists in other high-income country settings report relatively more burnout than do other specialties. One alternative, which is increasingly employed in high-income countries, involves training general practitioners to screen for, and treat, a subset of MNS disorders. Telemedicine is another innovative strategy that has been used with wide ranging success to address conditions during the global COVID-19 lockdowns (Alharthi et al., 2021; Omboni et al., 2022). This can be used to access difficult to reach populations, increase coverage, reduce hospitalizations, lost productivity, and increase cost effectiveness (Farabi et al., 2020). KSA may want to consider such innovative training strategies to address the shortfall of treatment options for the population with MNS disorders.

In addition, innovative strategies to train staff to screen for “hidden” conditions (e.g., alcohol use) would also have the potential to successfully identify and treat MNS disorders.

**The need-based estimate of worker shortfalls to treat MNS disorders in KSA relies on several assumptions, which likely result in a conservative estimate of the shortfall.**

Whereas these assumptions relate to each step of the model-building exercise, we call attention to three inputs that, if substantially altered, can substantially change shortfall estimates. First, prevalence estimates (table 2) may actually be greater than those used in this report, given that prevalence of MNS disorders are often under-reported. Second, a selection of target treatment service coverage for each MNS disorder depends on detectability and cultural-specific factors about willingness to seek care. Third, assumptions of worker productivity (that is, that a provider can treat 11 patients per day) may vary dramatically across country contexts. These inputs, as well as other aspects of the model-based estimates, should be carefully evaluated and refined by the KSA Ministry of Health. It is anticipated, however, that refinements to these inputs might yield an even greater shortfall of health care workers to treat MNS disorders than those reported here.



# Appendix A: Description of Data Sources

This appendix details the data sources, ranking, and prioritization used to arrive at the final prevalence estimates.

## WHO World Mental Health Surveys

The World Health Organization (WHO)'s World Mental Health Surveys use a multistage cluster household probability sample with case-control design. Respondents were recruited from the General Authority for Statistics 2010 census for Saudi Arabia. Trained interviewers carried out a fully structured diagnostic interview using the World Mental Health Composite International Diagnostic Interview (WMH-CIDI). In Part 1, a core diagnostic assessment was carried out to quantify the prevalence of mental health conditions of primary interest. Part 2 assessed correlates and disorders that were of secondary interest. Respondents who met criteria for any disorder in Part 1, plus a subsample of 25 percent of respondent controls who did not meet any criteria, were included in Part 2. Post-assessment weighting was applied to adjust survey results for sociodemographic and geographic variables.

When comparing the results of the Saudi World Mental Health Survey to other high-income countries, there are a few notable differences. The lifetime prevalence for mood disorders and drug abuse was higher at 6.8% and 1.4% vs. 5.2% and 0.5% for other high-income countries (Bromet et al., 2018). The higher prevalence of mood disorders can be attributed to bipolar disorder (Kessler et al., 2018). Alcohol use disorder was lower than for other high-income countries (Glantz et al., 2020).

## WHO Global Health Observatory

The WHO Global Health Observatory Mortality Database uses a combination of health service data, population surveys, civil registration, and vital statistics to produce country estimates of disease prevalence (WHO 2020a). We used the age-specific crude death rates (5- and 10-year groups) for suicide and applied these rates to the UN Department of Economic and Social Affairs (DESA) Population count estimate “weights” for Saudi Arabia (UN DESA 2019) to arrive at the count of age-specific deaths due to suicide for four age groupings (18–34, 35–49, 50–64, and 65+ years).

To assess the prevalence of suicide ideation and/or attempts, we multiplied the age-standardized rates of suicide by 20 (Bostwick et al. 2016). This multiplier coheres with the literature in which most persons with suicidal ideation and or those attempting suicides do not complete.

This dataset is not without its limitations. The lack of registration is exacerbated by the cultural and legal concerns that make suicide as a cause of death a particularly sensitive issue which can result in under-reporting and/or misclassification of deaths (WHO 2014, p. 26; WHO 2020a).

## World Alzheimer's Report

The burden of dementia is expected to increase as the population ages and mortality due to communicable diseases decreases. Current dementia estimates for developing countries suggest that the prevalence of dementia is

lower than in developed countries (Alzheimer's Disease International 2016). We used the World Alzheimer Group's regional Middle East and North Africa estimates. The estimates of prevalence were available in six age groups five 5-year age groups from age 60 to 84, plus 85 and older.

Since the risk of dementia increases with age, we used UN population estimates (UN DESA 2019) to calculate a standardized rate of dementia for individuals aged 65 and older. High-quality dementia prevalence studies were available in the World Alzheimer's report, primarily in Western countries. A meta-analysis was conducted to estimate regional prevalence, and in regions where high-quality studies were rare, expert consensus (from the Delphi Consensus and Dementia Working Group)

was also included. Few studies estimating dementia have been conducted in low- and middle-income countries (Alzheimer's Disease International 2016). For the Middle East and North Africa, only two empirical studies were considered.

## Global Burden of Disease

When estimates of prevalence using the above resources were not available or were not in line with prior workforce estimates, we used estimates from the GBD study. We used the Global Burden of Disease estimates for schizophrenia, child intellectual development disorders, childhood conduct and behavioral disorders, and childhood emotional disorders (IMHE 2020).

## Appendix B: Target Coverage and Estimates for Service Coverage, Utilization, and Staffing

As an update to Chisholm, Lund, and Saxena (2007), we consulted Dan Chisholm, an expert in health economics for the WHO, for an updated set of inputs for cost and impact of scaling up for mental health. In recent publications, treatment models were separated by basic, moderate, and intensive treatment of depression based on severity of the condition (Chisholm et al. 2016). After reviewing the two publications from 2007 and 2016, we noted that there were substantial changes to the categories of resource usage (for

example, inpatient, outpatient, residential care, and day care); estimates for service use inputs (for example, bed-days and visits/sessions), and estimated service coverage. At a minimum, the new inputs would yield workforce estimates that are substantially higher than prior estimates (Bruckner et al. 2016), which would not allow for a comparison of current and historical workforce projections. Therefore, we used the estimates, resource utilization, and service coverage from Chisholm, Lund, and Saxena (2007).

**TABLE B1** TARGET COVERAGE FOR TARGET POPULATIONS FOR PRIORITY CONDITIONS

Condition	Target Coverage Percent
Schizophrenia <sup>a</sup>	80
Depression <sup>a</sup>	33
Suicide <sup>b</sup>	80
Epilepsy <sup>c</sup>	80
Dementia <sup>d</sup>	80
Alcohol use disorder <sup>a</sup>	25
Other drug use disorders <sup>e</sup>	50
Childhood disabilities <sup>f</sup>	20

*Source:* a. Chisholm, Lund, and Saxena 2007; b. WHO 2014; c. Ding et al. 2008; d. Ferri et al. 2004; e. Bruckner et al. 2011; f. Taken from level attainable in developed countries (Belfer 2008; Kataoka, Zhang, and Wells 2002); g. Chisholm et al. 2016, using treatment coverage for anxiety disorders.

TABLE B2 TARGET ESTIMATES FOR SERVICE COVERAGE AND RESOURCE UTILIZATION

Service	Schizophrenia			Bipolar Disorder			Major Depression			Hazardous Alcohol Use		
	Service Coverage % <sup>a</sup>	Average Rate of Use <sup>b</sup>	Resource Use per Case <sup>c</sup>	Service Coverage % <sup>a</sup>	Average Rate of Use <sup>b</sup>	Resource Use per Case <sup>c</sup>	Service Coverage % <sup>a</sup>	Average Rate of Use <sup>b</sup>	Resource Use per Case <sup>c</sup>	Service Coverage % <sup>a</sup>	Average Rate of Use <sup>b</sup>	Resource Use per Case <sup>c</sup>
Inpatient and residential care <sup>d</sup>												
Mental hospital care (long stay)	2	90	1.8	1	90	0.9	0	0	0	0	0	0
Community residential care (long stay)	2.5	180	5	1.5	180	2.7	0.5	90	0.5	0	0	0
Community psychiatric unit (acute care)	15	28	4.2	10	28	2.8	2	14	0.3	2	5	0.1
Outpatient and day care <sup>e</sup>												
Day care services	7.5	100	7.5	3	100	3.0	1	50	0.5	0	0	0
Hospital outpatient service	50	12	6	40	12	4.8	20	7	1.4	10	2	0.2
Primary health care: treatment	30	6	1.8	30	6	1.8	30	7	2.1	0	0	0
Primary health care: screening <sup>f</sup>	0	0	0	0	0	0	7-14	1	n.a.	2-4	1	n.a.
Psychosocial treatment <sup>g</sup>	30	8	2.4	30	8	2.4	20	6	1	25	3	0.8

Source: Chisholm, Lund, and Saxena 2007.

Note: n.a. = not applicable.

a. Service coverage = percentage of patients in the population expected to use the service or resource over course of 1 year.

b. Average rate of use = mean rate of uptake per year among those expected to use the service or resource.

c. Resource use per "average" patient in the population = percentage of patients expected to use the resource (coverage) multiplied by the average rate of use.

d. Average rate of use in days.

e. Average rate of use in visits.

f. Refers to coverage in the total adult population (before diagnosis).

g. Index therapies used: family therapy (schizophrenia); problem-solving treatment (bipolar disorder); brief psychotherapy (depression); brief physician advice (alcohol use). Sessions last 40 minutes each, except brief interventions for alcohol use, which take 10 minutes.

TABLE B3 | STAFFING PROPORTIONS BY HEALTH CARE SETTING AND COUNTRY INCOME CLASSIFICATION

Occupation	Outpatient		Inpatient	
	Day Care	Acute and Primary Care	Acute Care	Long Stay/Residential Care
<b>Low-income countries</b>				
Psychiatrists/specialists	0.00%	1.67%	6.25%	7.69%
Nursing care provider	66.67%	20.83%	62.50%	61.54%
Psychosocial care provider	33.33%	77.50%	31.25%	30.77%
<b>TOTAL</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>
<b>Middle-income countries</b>				
Psychiatrists/specialists	0.00%	3.57%	10.00%	6.67%
Nursing care provider	62.50%	28.57%	60.00%	66.67%
Psychosocial care provider	37.50%	67.86%	30.00%	26.67%
<b>Total</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>

Source: Chisholm, Lund, and Saxena 2007.



## Appendix C: Comorbidity Adjustments

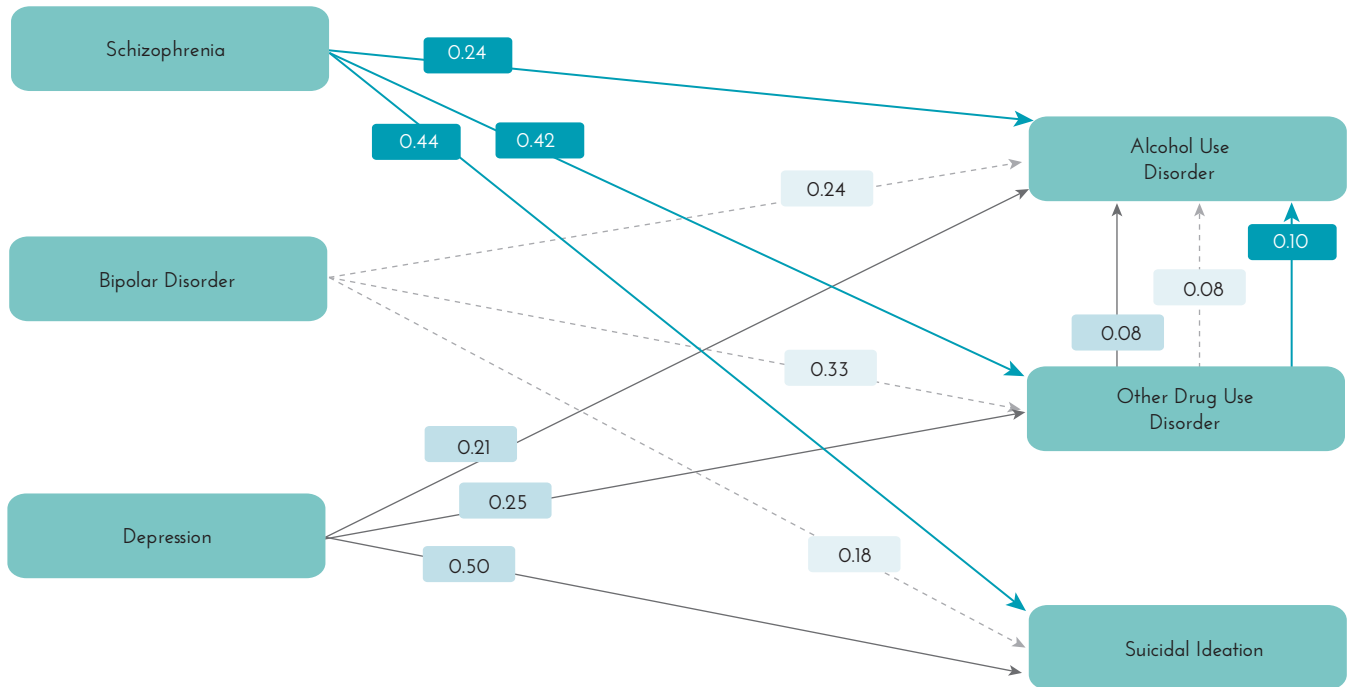
Bipolar disorder, depression, and schizophrenia have a high likelihood of comorbidity with alcohol and other drug use disorders (Hunt et al. 2016; Hunt et al. 2018; Hunt et al. 2020) and suicidality (Gomez-Duran et al. 2016). Co-occurrence of these mental, neurological, and substance use conditions does not necessarily mean that each condition requires a separate dedicated treatment model. Some therapies and treatment models, administered within single visits with health workers, can effectively address two co-occurring conditions (Hides, Samet, and Lubman 2010; Quello et al., 2005; Ziedonis et al. 2005). In the case of depression comorbid with alcohol or substance use, cognitive behavioral therapy and some medications can, within the same treatment model, address both conditions (Hides et al., 2010; Quello et al. 2005). The same holds for schizophrenia that co-occurs with substance use disorder (Ziedonis et al. 2005).

Figure C1 illustrates the conditions and the hypothesized temporal sequence of onset of comorbidities. This overview illustrates the possible co-occurrence of conditions. The numeric values represent the proportion of persons who have the comorbidity associated with the respective path that connects two conditions. To walk through an example, 41.7 percent of individuals with schizophrenia have comorbid substance use (Hunt 2018). This comorbidity is captured in figure C1 via the arrow connecting schizophrenia and other drug use disorders. The value 0.42 (rounded) means that 41.7 percent of individuals with schizophrenia have comorbid substance use.

When two conditions were comorbid with each other, we prioritized the condition with the higher target coverage. In the case of schizophrenia and other drug use disorders, we considered only other drug use disorders within schizophrenia (target coverage 80 percent) and not schizophrenia within other drug use disorders (target coverage 50 percent). After adjusting for comorbidities, we added a screening component to account for potential difficulties in screening for and detecting comorbid conditions within the target population. The primary measure considered was the positive predictive value. The positive predictive value is the likelihood that a standardized screening instrument is able to detect a comorbid condition within the target population.

To continue with the prior example, the detection of substance use in individuals with schizophrenia has a positive predictive value of 45 percent (Batalla et al. 2013). This means that, if the individuals with schizophrenia in our target population were all screened for substance use, there is a 45 percent chance that those who actually have comorbid substance use would be correctly identified or successfully screened. So, a 0.41 percent age-standardized prevalence of schizophrenia with 80 percent target coverage corresponds to 114,189 target cases within the total population. Within this group, we are assuming that 41.7 percent have comorbid substance use (Hunt 2017) and that 45 percent of this group can be identified for treatment (Batalla et al. 2013). This leaves us with 21,428 individuals with schizophrenia with

FIGURE C1 OVERVIEW OF COMORBIDITIES: ADJUSTMENTS AND DIRECTION OF ADJUSTMENT



Sources: Schizophrenia and alcohol use disorder (Hunt 2018); other drug use disorders (Hunt 2018); suicidal ideation (Pelizza et al. 2020). Bipolar disorder and alcohol use disorder (Hunt 2016); other drug use disorders (Hunt 2016); suicidal ideation (Borges et al. 2010). Depression and alcohol use disorder (Hunt 2020); other drug use disorders (Hunt 2020); suicidal ideation (Borges et al. 2010). Positive predictive values for schizophrenia and alcohol use disorder (0.55); other drug use disorders (0.45); suicidal intention (0.79); (Batalla et al. 2013; Cassidy, Schmitz, and Malla 2007; Uebelacker et al. 2011). Bipolar disorder and alcohol use disorder (0.35); other drug use disorders (0.35); suicidal intention (0.86); (Weiss et al. 1998; Uebelacker et al. 2011). Depression and alcohol use disorder (0.35); other drug use disorders (0.35); suicidal intention (0.86); (Currie et al. 2005; Uebelacker et al. 2011).

detectable other drug use disorders, which means that we can remove 21,428 patients from our “other drug use” treatment model and potentially treat them within the schizophrenia treatment model.

To address comorbidity of schizophrenia, bipolar disorder, and depression with alcohol and other drug use disorders, we added another level of adjustment for these conditions. For each condition, we identified comorbid other drug and alcohol use (Hunt et al. 2016; Hunt et al. 2018; Hunt et al. 2020). In figure C1, the three arrows leading from other drug use disorders to alcohol use disorder depict these comorbidities according to condition. Using the same methodology as before, we assigned the comorbidity to the condition with the larger treatment coverage, which in this case

was other drug use disorders (target coverage 50 percent, compared with 25 percent for alcohol use disorder). This means that alcohol use disorder can be treated under the other drug use treatment model. This effectively removes the double count of individuals with schizophrenia who have alcohol use disorder and other drug use disorders and allows us to independently assess alcohol use within schizophrenia.

Figure C2 walks through the example using schizophrenia and comorbid other drug and alcohol use disorder.

**Step 1:** Review treatment models for comorbidity of other drug use within schizophrenia that can be treated as part of schizophrenia treatment.



- 41.7 percent of individuals with schizophrenia have comorbid other drug use, and if screened, 45 percent of them can be successfully identified for follow-up.

**Step 2:** Quantify comorbidity of alcohol use disorder that can be treated within other drug use disorders. Remove from alcohol use disorder.

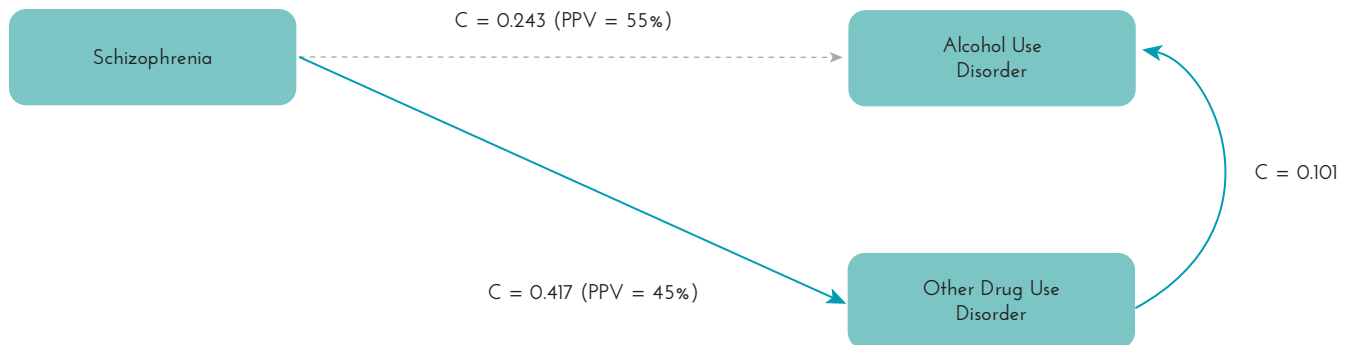
- 10.1 percent of individuals with schizophrenia with comorbid other

drug use are likely to have an alcohol use disorder.

**Step 3:** Remove comorbidity of alcohol use disorder from other drug use disorders (within individuals with schizophrenia).

- This 10.1 percent is removed from the individuals with schizophrenia with comorbid alcohol use population and assigned to individuals with schizophrenia with comorbid other drug use to avoid double count.

**FIGURE C2** EXAMPLE OF COMORBIDITY ADJUSTMENT AND POSITIVE PREDICTIVE VALUE FOR SCHIZOPHRENIA, ALCOHOL USE DISORDER, AND OTHER DRUG USE DISORDERS



*Note:* C = comorbidity; PPV = positive predictive value (probability that subjects with a positive screen test truly have the disease). → = does not include other drug use disorders.)

*Source:* Original figure for this publication.



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