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Human resources for mental health: workforce shortages in low- and middle-income countries

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Abbreviations and acronyms

AFR	WHO African Region
AMR	WHO Region of the Americas
AIC	Akaike's Information Criterion
CHOICE	CHOosing Interventions that are Cost Effective
EMR	WHO Eastern Mediterranean Region
EUR	WHO European Region
FTE	Full-Time Equivalent (staff)
ICD-10	International Classification of Disease
LIC	Low-Income Countries
LMIC	Low- and Middle-Income Countries
mhGAP	mental health Gap Action Programme
MIC	Middle-Income Countries
MNS	Mental, Neurological and Substance use
SEAR	WHO South-East Asia Region
WHO AIMS	WHO Assessment Instrument for Mental Health Systems
WPR	WHO Western Pacific Region

Executive summary

Mental, neurological and substance use (MNS) disorders account for an estimated 14% of the global burden of disease, yet mental health routinely receives a low funding priority from governments. While evidence indicates there are insufficient numbers of mental health workers in low- and middle-income countries (LMIC) to meet the population needs, there are no rigorous estimates of the size of the mental health workforce shortage and the wage bill that would be required to remove the shortage.

This report aims to fill that gap by estimating the number of mental health workers required to treat MNS conditions. The workforce shortage is estimated based on comparing this needed number of mental health workers with the supply. The wage bill required to remove the shortage is based on mental health worker wages.

The principal datasets include the *2005 WHO Assessment Instrument for Mental Health Systems (WHO-AIMS)* and the *2004 WHO Global Burden of Disease Report*. The data were available for 58 LMIC and we extrapolate our results from these countries to all 144 LMIC. The results are for 2005, the latest year with reliable data, as well as for 2015, the target year of the United Nations Millennium Development Goals.

For each of the 58 LMIC, we estimated the number of mental health workers needed by applying service delivery models to the prevalence in each country of the following eight priority MNS conditions identified by the WHO *Mental Health Gap Action Programme (mhGAP)* report: depression; schizophrenia and other psychotic disorders; suicide; epilepsy; dementia; disorders due to the use of alcohol; disorders due to the use of illicit drugs; and mental disorders in children. Second, we subtracted the number of workers needed from the 2005 supply of mental health workers to estimate a shortage (or surplus). We repeated these steps for 2015. Third, we multiplied the shortages by annual wages to estimate the wage bill required to remove the shortages in 2005 and 2015.

In 2005, for the 144 LMIC, we found a shortage of 1.18 million workers, including 55,000 psychiatrists, 628,000 nurses in mental health settings and 493,000 psychosocial care providers. The annual wage bill to remove this shortage would be about US\$ 4.4 billion (2009 dollars).¹

In 2015, if the supply of mental health workers were to remain unchanged from 2005, and using population projections to update the number of workers that would be needed, the mental health worker shortage would increase from an estimated 1.18 million workers in 2005 to an estimated 1.71 million workers in 2015, representing a 45% increase. The annual wage bill to remove this shortage would be about US\$ 6.4 billion (2009 dollars).

To meet the treatment needs for MNS disorders, our analysis provides benchmarks for human resources for mental health well into the future. The workforce represents one key component of the mental health system. However, to address the three main shortcomings of mental health care in most LMIC – scarcity, inequity and inefficiency – governments will need to take a comprehensive approach. Such a strategy will require, at the minimum, the allocation of health budgets towards MNS disorders. This is more likely if MNS disorders are destigmatized, there is a well-trained mental health workforce, and concerted efforts are made to increase the productivity of mental health workers.

¹ Dollars are stated in 2009 dollars and are based on the average inflation rate between the year of the data and 2009.

Introduction

Mental, neurological and substance use (MNS) disorders account for an estimated 14% of the global burden of disease (1). Up to 30% of the population has some form of MNS disorder each year (2). These disorders result in direct economic costs of mental healthcare and indirect economic costs of lost productivity, impaired functioning and premature death (3).

Several reports suggest cost-effective strategies to reduce the disability associated with MNS disorders (4). Despite the availability of these strategies, the number of people with mental disorders who receive adequate treatment remains disturbingly low (5). This gap between need and availability of treatment is especially wide in low-income countries (LIC) and middle-income countries (MIC), collectively referred to as LMIC (low- and middle-income countries). In these countries, treatment rates for mental disorders range from 35–50% (5,6,7).

Mental health routinely receives a low funding priority from governments. Based on a 2001 survey conducted by WHO as part of Project Atlas, 32% of 191 countries did not have a specific mental health budget (8). Of the 89 countries that reported budget information within the survey, 36% spent less than 1% of their health budget on mental health.

The evidence indicates a considerable gap between the global burden of MNS disorders and the financial and human resources being made available for their treatment and prevention. The magnitude of this public health problem poses a crucial question: do health systems meet the needs of those with MNS disorders? To strengthen the global mental health workforce – as part of mental health system development agenda – it is essential to know whether the current mental health workforce is able to meet the needs of those with MNS disorders. This report is designed to help us make that assessment.

Given the inadequacy of mental health resources, researchers, policy-makers and international agencies have asked governments to “scale up” their health services and systems devoted to mental health (9, 10, 11, 12). Psychiatrists, nurses in mental health settings and psychosocial health workers² provide the foundation for an effective mental health system. Without sufficient health workers, it will remain difficult for LMIC to adequately treat their populations. Mental health services depend primarily on trained human resources rather than sophisticated equip-

ment or supplies; there can be no scale up in resources unless the workforce is bolstered.

Since approximately 2000, several reports have listed the labour force as a key component in developing mental health systems. *The World Health Report 2001 – Mental Health: New Understanding, New Hope* proposed staffing be segmented: primary care for initial care; and specialty care for a wider range of services (9). Specialty care teams include health and allied health professionals, such as psychiatrists, psychologists, nurses, social workers, physical therapists, occupational therapists, law enforcement officers, clergy and traditional healers. In addition, the *World Health Report 2006 – Working Together for Health*, noted that the shift from institution- to community-based care requires innovative and multidisciplinary methods (13). Moreover, the 2007 Lancet series on global mental health said that resources allocated for mental health systems remained insufficient, inequitably distributed and inefficiently used (14). A survey of international mental health experts and leaders concluded that a shortage of trained mental health workers was one of five key barriers to improving mental health services in LMIC (15). The WHO mental health Gap Action Programme (*mhGAP*), endorsed by the 55th World Health Assembly in 2002, called for the distribution of health professionals to be more closely aligned with the global burden of MNS disorder (16). The *mhGAP* report is an important step in assessing the global landscape of mental health resources.

Increasing the mental health workforce of LMIC has been recommended for more than 30 years (17,9), but progress has been slow. The lack of progress may arise, in part, from the absence of clear, quantitative benchmarks to guide the prudent allocation of human resources in mental health.

This report aims to provide government officials, educators, health care planners and policy-makers with quantitative estimates of the human resources required to adequately treat populations in LMIC. Specifically, this report estimates the gap between the supply and the number of mental health workers needed for 58 LMIC as of 2005, the latest year with the most reliable data. Second, for each LMIC, we estimate what this gap might be in 2015, the target year for the achievement of the United Nations’ Millennium Development Goals (18). Third, we estimate the annual wage bill required to fill these resource gaps by country. Fourth, we extrapolate the results from these 58 LMIC to all 144 LMIC. For further information on this approach, refer to the study, *The Mental Health Workforce Gap in Low and Middle Income Countries: A Needs-Based Approach* (19).

² Nursing care providers include general nurses working in mental health settings and psychiatric nurses. Psychosocial care providers include psychologists, medical officers, social/rehabilitation workers, occupational therapists, community mental health workers, primary care workers and counsellors. We did not include neurologists in this classification. Although mental health disorders are sometimes diagnosed and treated in primary care settings, we did not include primary care workers because our focus was on mental health specialists.

Structure of the report

In the second section, (methodology), we use the prevalence of MNS disorders, along with demographic variables, to estimate the proportion of the population in low- and middle-income countries requiring mental health treatment. The third section (estimate of needed mental health workers based on treatment needs) applies service delivery estimates to the treated population to arrive at the number of mental health workers needed to provide the care. The fourth section (mental health workforce shortages and wage bill to remove them) compares the number of needed workers with the supply of workers to estimate the mental health workforce shortage (or surplus); this section includes estimates of the annual wage bill required to remove the shortage. This section also provides forecasts of the need, shortage and wage bill estimates for 2015. The fifth section (summary and results for all low- and middle income countries), integrates and discusses the quantitative findings, and presents them by WHO region. It extrapolates the results from the 58 LMIC to all 144 LMIC. The sixth section provides a policy discussion and conclusions.

Methodology

In 2008, WHO published the *Mental Health Gap Action Programme (mhGAP) (16)*. This report was a planning guide for LMIC to scale up care for MNS disorders. The *mhGAP* specifies eight disorders that treatment planners should prioritize. To meet the priority definition, the condition must impose substantial disability, morbidity or mortality, lead to high economic costs or be associated with violations of human rights.³ Based on these criteria, WHO identified the following eight priority conditions: depression; schizophrenia and other psychotic disorders; suicide; epilepsy; dementia; disorders due to the use of alcohol; disorders due to the use of illicit drugs; and mental disorders in children.⁴

Our report focuses on the eight priority conditions identified in *mhGAP*, which account for an estimated 75% of the total global burden of MNS disorders.⁵ Many of these conditions have cost-effective interventions (20,21). To calculate the overall burden of mental disorders in LMIC, we used information from the most reliable sources available (discussed below). In the following pages, we outline each step of this process.

We focused our analysis on those LMIC with sufficient data to permit estimates of the need and supply of mental health workforces. To meet this standard, the country required the following characteristics:

- World Bank designation as a low- or middle- income country
- Up-to-date population estimates from a census
- Prevalence estimates of eight mhGAP priority MNS conditions
- Participation in 2005–2008 WHO-AIMS assessment instrument, which contains several indicators on the existing mental health workforce

In 2005, 58 countries met these criteria. Table 1 (page 3) lists the participating countries. These countries cover all six designated WHO geographic regions and 11 of the 14 subregions.

³ Disability represents the largest proportion of the burden of MNS disorders, although premature mortality is also substantial. The economic burden associated with MNS disorders includes, but is not limited to: loss of employment; loss of income; and the cost of medications and social services.

⁴ For a description of the burden, costs, and human rights violations associated with these conditions, we refer the reader to Annex 1 (page 28) of (16)

⁵ This estimate is based on DALY (disability-adjusted life year) estimates from the 2004 WHO *Global Burden of Disease Report*, which found that in LMIC, the eight *mhGAP* priority conditions account for about 75% of the global burden of neuropsychiatric disorders.

Table 1. LMIC included in analysis (n=58), by geographic region

Country	Income classification	Population (2005)
African		
Benin	LIC	7,869,000
Burundi	LIC	7,377,000
Eritrea	LIC	4,475,000
Ethiopia	LIC	75,662,000
Nigeria	LIC	140,881,000
Uganda	LIC	28,701,000
Congo	MIC	3,416,000
South Africa	MIC	48,073,000
Americas		
Argentina	MIC	38,732,000
Belize	MIC	283,000
Bolivia	MIC	9,183,000
Chile	MIC	16,298,000
Costa Rica	MIC	4,330,000
Dominican Republic	MIC	9,536,000
Ecuador	MIC	13,065,000
El Salvador	MIC	6,060,000
Guatemala	MIC	12,710,000
Guyana	MIC	761,000
Honduras	MIC	6,891,000
Jamaica	MIC	2,666,000
Nicaragua	MIC	5,454,000
Panama	MIC	3,229,000
Paraguay	MIC	5,906,000
Suriname	MIC	497,000
Uruguay	MIC	3,327,000
Eastern Mediterranean		
Afghanistan	LIC	24,507,000
Pakistan	LIC	165,816,000
Somaliland	LIC	8,353,000
Djibouti	MIC	804,000
Egypt	MIC	77,155,000
Iran	MIC	70,768,000
Iraq	MIC	28,240,000
Jordan	MIC	5,565,000
Morocco	MIC	30,493,000
Sudan	MIC	38,699,000
Tunisia	MIC	9,878,000
European		
Tajikistan	LIC	6,538,000
Uzbekistan	LIC	26,320,000
Albania	MIC	3,112,000
Armenia	MIC	3,065,000
Azerbaijan	MIC	8,444,000
Georgia	MIC	4,464,000
Kyrgyzstan	MIC	5,224,000
Latvia	MIC	2,292,000
Republic of Moldova	MIC	3,756,000
Ukraine	MIC	46,935,000
South-East Asia		
Bangladesh	LIC	153,121,000
Nepal	LIC	27,221,000
Bhutan	MIC	649,000
India-Uttarakhand	MIC	9,073,000
Maldives	MIC	293,000
Sri Lanka	MIC	19,532,000
Thailand	MIC	65,945,000
Timor-Leste	MIC	991,000
Western Pacific		
Viet Nam	LIC	84,074,000
China-Hunan	MIC	6,325,999
Mongolia	MIC	2,549,000
Philippines	MIC	85,495,000
Total		1,481,078,999

LIC – low-income country.

MIC – middle-income country.

LMIC – low- and middle-income countries.

Figure 1 describes the analytic process to estimate the number of individuals, by MNS disorder and country, who need treatment. We used schizophrenia in Sudan as an example. The first step to quantify workforce needs was to identify in each LMIC the population with MNS disorders. Ideally, this

process would use population-based surveys for each LMIC to estimate the prevalence of MNS disorders. Prevalence for each disorder would then be multiplied by the population at risk of the disorder to yield the estimated number of cases. This step would be repeated for the eight *mhGAP* priority conditions.

Figure 1. Step-by-step process to estimate persons with a mental disorder requiring treatment: schizophrenia in Sudan as an example

Step 1 Estimate prevalence of schizophrenia in Sudan.

3.6 cases per 1,000 persons

Step 2 Multiply prevalence by the population of adults in Sudan to yield the number of persons with schizophrenia

3.6 cases per 1,000 persons X 22,946,000 = 81,897

Step 3 Multiply number of persons with schizophrenia by a target coverage rate accepted by the peer-reviewed literature

81,897 X 80% coverage = 65,517

Target number of persons with schizophrenia in Sudan needing treatment: 65,517

Sources

Step 1: WHO Global Burden of Disease, 2004.

Step 2: United Nations Population Reference Bureau, 2008 Revision.

Step 3: Chisholm et al., *Br J Psych* 2007;191: 528-35.

In many LMIC, however, population-level prevalence data are not available. In the absence of such, we estimated prevalence from two reliable sources. First, the 2004 WHO Global Burden of Disease Project has developed prevalence estimates for each WHO subregion, based on comprehensive reviews and syntheses of the available epidemiological evidence.^{6, 7} We applied those subregional estimates to the 58 countries. As a second source, for MNS disorders not included in the 2004 Global Burden of Disease Project (i.e., illicit substance-use

disorders (25), childhood mental disorders⁸), we based our estimates on the best available prevalence data from the peer-reviewed epidemiologic literature.⁹

Table 2 (page 17) displays the prevalence estimates of the eight *mhGAP* priority conditions for each LMIC.¹⁰ As reflected in the table, we further classified illicit substance-use disorders and childhood mental disorders by subcategory, as each subcategory requires distinct treatments and human resource levels. The prevalence estimates indicate the number of cases per population per year that meet the International Classification of Disease (ICD-10) case definition for that disorder.¹¹

⁶ We used the 2004 GBD estimates for six disorders: schizophrenia, bipolar disorder, depression, alcohol use disorder, dementia, epilepsy, and suicide. The 2004 GBD estimates are a reasonable substitute for the 2005 estimates, because the prevalences are stable over this short time period. Regarding suicide estimates, we incorporated suicidal ideation by multiplying suicide death rates by a factor of 20 (the estimated number of ideations per suicide), consistent with the literature (22,23,24).

⁷ We refer the reader to the WHO technical appendix for a detailed description of the prevalence estimation for each cause: Available under "Cause-Specific Documentation" at: http://www.who.int/healthinfo/global_burden_disease/data_sources_methods/en/index.html.

⁸ The prevalence of childhood mental disorders reflects WHO expert panel opinion, based on an extensive review of the literature.

⁹ As a sensitivity analysis to estimate the needed number of mental health workers, we increased and decreased the prevalence of each of the eight *mhGAP* priority conditions by 20% (see Table 8 Confidence interval, page 28).

¹⁰ Disease and injury regional estimates for 2004. *prev 6_2004.XLS* table downloaded at: http://www.who.int/healthinfo/global_burden_disease/estimates_regional/en/index.html

¹¹ Please refer to Table 2 Footnotes (page 17) for a list of the case definitions used.

Population and target coverage rates

The next step to identify the population needing mental health treatment was to apply each country's population size to the prevalence of MNS disorders. With the exception of China (Hunan province) and India (Uttarakhand state),¹² 2005 population census estimates for LMIC were taken from the population database of the United Nations Population Division (see Table 1, page 3).¹³ We then multiplied the prevalence by population size, taking into account the age groups affected by each disorder. For example, with child MNS disorders, we multiplied only the child population size (age, less than 15 years) by the prevalence of child disorders to yield the total number of child cases.

In LMIC with limited health resources, it is unreasonable to expect that all MNS disorders in the population will receive treatment. Some individuals may not seek treatment, while screening the entire population to identify disorder is not feasible. Given these circumstances, the target rates of coverage for each disorder were determined from the literature and by consultation with international mental health experts.¹⁴ Table 3 (page 5) reports target coverage rates for the *mhGAP* priority conditions and their sources. These normative rates reflect both disability severity and the ability of public health systems to identify and treat cases. Target coverage ranges from 80% (severely disabling conditions such as schizophrenia and bipolar disorder) to 20% of cases (e.g., childhood intellectual disability).¹⁵

Target population needing treatment

Table 4 (page 20) shows the target population in each LMIC that requires treatment for mental disorders. An estimated 38 million people in the 58 countries require treatment for at

¹² China-Hunan population estimates were derived from age proportions in the government-sponsored, province-specific 2005 China 1% Population Survey, extrapolated to the total province population. India-Uttarakhand population estimates were derived from projected population (based on the India 2001 Census) and age proportions in the WHO country report *Health Sector Reforms in India: Initiatives from Nine States* (2004).

¹³ United Nations, Department of Economic and Social Affairs (DESA) Population Division, Population Estimates and Projections Section. World Population Prospects: The 2008 Revision Population Database. Data available at: <http://esa.un.org/unpp/>. Accessed on July 15, 2009.

¹⁴ As a sensitivity analysis to estimate the needed number of mental health workers, the target coverage rates were increased and decreased by 20% (see Table 8 Confidence interval, page 28).

¹⁵ The 20% target coverage for childhood disorders reflects the highest coverage rate that is currently attained in developed countries (26). Moreover, the 20% target is low because coverage is focused on children with severe cases.

Table 3. Target coverage rates for *mhGAP* conditions, LMIC

Conditions	%
Schizophrenia ¹	80
Depression ¹	33
Suicide	80
Epilepsy ²	80
Dementia ³	80
Alcohol use ¹	25
Drug use	50
Opioid use	50
Other drug use	50
Childhood disabilities ⁴	20

¹ Chisholm D et al, 2007 (21).

² Ding D et al, 2008 (51).

³ Ferri C et al, 2004 (52).

⁴ Taken from level attainable in developed countries. See Kataoka SH et al, 2002 (26); Belfer ML, 2008 (53).

least one of the eight *mhGAP* priority conditions. Table 5 (page 23) shows the share of the total cases requiring treatment for each of the eight *mhGAP* priority conditions. This table allows countries to compare their burden of mental disorders with other LMIC. Childhood disorders account for the largest proportion of cases in LIC (32%) and the second largest in MIC (22%, second to depression). In MIC, dementia accounts for 3.6% of all cases, whereas in LIC it accounts for only 1.9% of cases. The reason for this almost two-fold difference in the proportionate burden of dementia is that dementia is more prevalent in older people and MIC have more older people.¹⁶ Notably, the European Region has the largest proportion of MNS cases requiring treatment for alcohol-use disorders (23%).

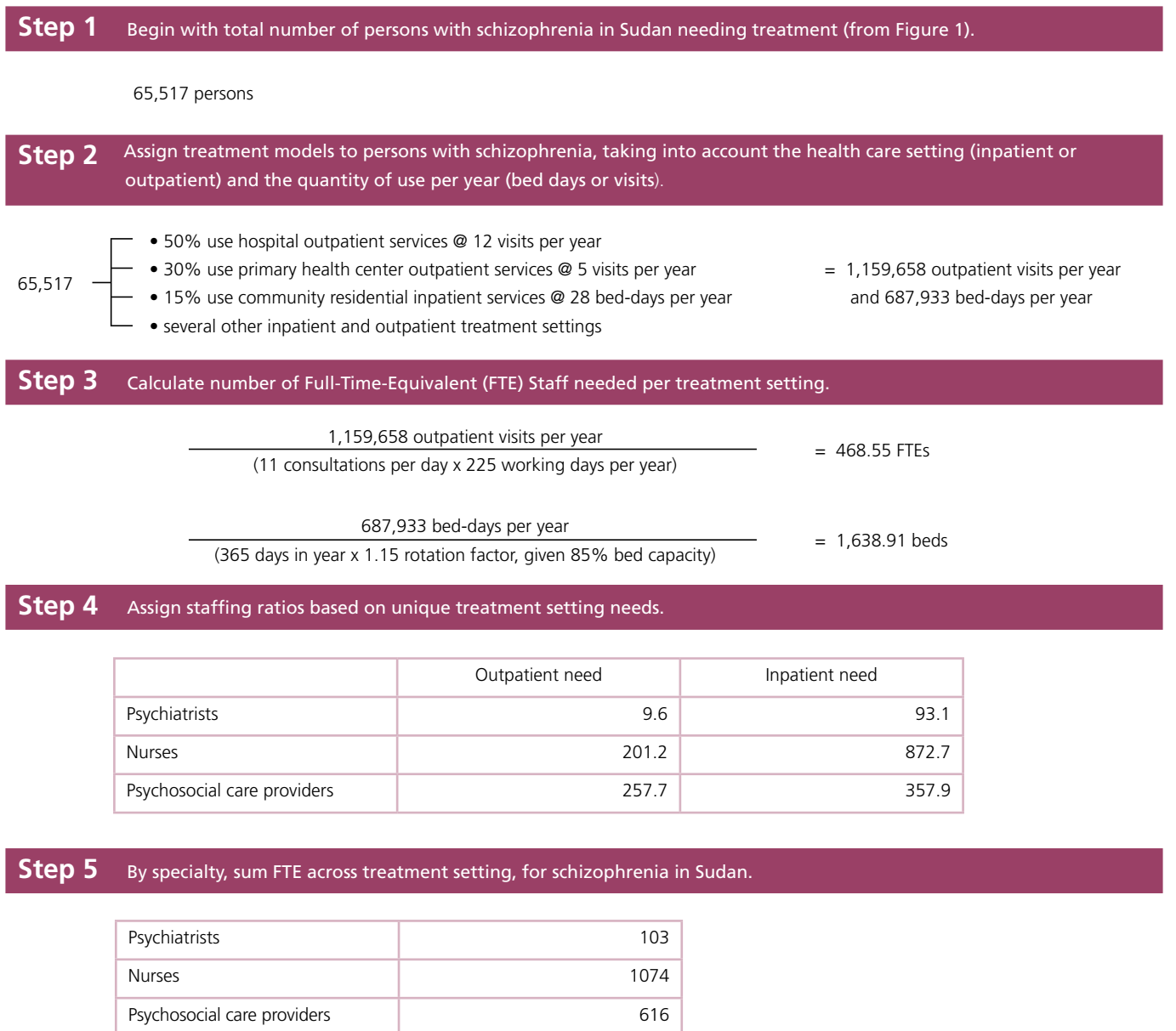
¹⁶ 6.2% of the population in MIC report >65 years of age, compared with only 3.7% in LIC.

Estimate of needed mental health workers based on treatment needs

The health care service delivery models for the *mhGAP* conditions outline the level of human resources required to deliver mental health interventions in LMIC. Each service intervention consists of essential care and treatment for the target populations identified in section 2. The intervention packages vary by condition. Each of the eight *mhGAP* priority conditions calls for a specific mix of health care workers, rate

of use and facility type. For instance, the treatment model for most people with alcohol-use disorder includes eight sessions of outpatient psychosocial care per year. In contrast, a subset of those with schizophrenia should receive long-term inpatient residential care, with stays lasting for more than 90 days. These diverse service models by MNS disorder emphasize the different human resource requirements (20,21).

Figure 2. Step-by-step process to estimate baseline workforce need for mental health: schizophrenia in Sudan as an example



Sources

Steps 1 & 2: Chisholm D (unpublished). Target norms for service coverage and resource utilisation - Six disorders.
 Step 3: Rispel L, Price M and Cabral J, 1996. Confronting need and affordability: Guidelines for primary health care services in South Africa. Johannesburg: Centre for Health Policy.
 Step 4: Chisholm D, Lund C, Saxena S. Br J Psychiatry. 2007 Dec;191:528-35.

We applied treatment models for each of the eight *mhGAP* priority conditions. Figure 2 (page 6) continues to describe the step-by-step process that began in Figure 1, using schizophrenia in Sudan as an example, by which we estimated the human resources needs for mental health. These treatment models are based on rigorous cost-effectiveness studies and input from WHO experts who developed the service delivery packages.¹⁷ The key components of the treatment packages include the percentage of cases needing care in each setting, the average number of visits per person per year and whether the visit requires a bed (i.e., inpatient or outpatient). In addition, for the *mhGAP* conditions that comprise several distinct disorders with unique service delivery models, we calculated health service need separately for each disorder and then added these values to yield an aggregate estimate.¹⁸ Table 6 (page 26) summarizes the total annual outpatient visits and inpatient bed days expected for the target population needing mental health treatment. Table 6 (page 26) indicates that, relative to MIC, outpatient visits in LIC account for a greater percentage of overall visits. Also, the rate of per capita inpatient bed days in MIC is greater than that in LIC.

Previous analyses of LMIC have identified the number of staff required per patient for each inpatient bed and outpatient visit (28,29,21). We applied results from these staffing patterns, shown in Table 7 (page 7), to the case population in need. This calculation assumes 225 working days per year

and 11 consultations per day for the staff schedule (30). Consistent with earlier methodology, we classified mental health workers into one of three categories: psychiatrists; nurses in mental health settings; and psychosocial care providers.¹⁹

Table 7. 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
Low-income countries				
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%
TOTAL	100.00%	100.00%	100.00%	100.00%
Middle-income countries				
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%
TOTAL	100.00%	100.00%	100.00%	100.00%

* Staffing proportions derived from Table 2 (page 17) in: Chisholm D, Lund C, Saxena S. Cost of scaling up mental healthcare in low- and middle-income countries. *Br J Psychiatry*. 2007 191:528-35.

¹⁷ Depression, bipolar disorder, schizophrenia and alcohol-use disorder (19); and epilepsy (20). Suicide: Used the same model for depression, excluding any pharmacological treatment provisions. Illicit drug use disorders: Separate models were developed for opioid use and other drug-use disorders. Childhood mental disorders – Intellectual disabilities: three models were developed based on severity (mild, moderate and severe), service type (initial assessment and follow-up care) and outpatient setting (hospital outpatient setting and primary health care setting). A weighted average of resource use per case was derived from the three intellectual disabilities models. Conduct disorders: The Lund et al (27) report was based on the South African children and adolescent mental health service sector. The resource use per case is a weighted average of three disorders from the Lund data: ADHD, Conduct Disorder and ODD. Emotional disorders: Used the same service models developed for adults for children also. Thus, given adequate prevalence data, the disorders accounted for in this sub-category are depression, bipolar disorder, schizophrenia and epilepsy. As a sensitivity analysis to estimate the number of mental health workers needed, we increased and decreased the inpatient and outpatient treatment services by 20% (see Table 8 confidence interval, page 28).

¹⁸ Based on the epidemiology and cost-effectiveness literature, we calculated separate intervention service models based on the distinct conditions that fall into the following categories: disorders due to use of illicit drugs (opioid use, other drug use disorders); mental disorders in children (intellectual disabilities, conduct disorders, emotional disorders).

Table 8 (page 28) displays the country-level estimates of mental health care providers needed to treat persons with one or more of the eight *mhGAP* priority conditions. The confidence intervals for each worker category reflect the range of expected need based on varying the case load and the intensity of treatment services. The estimated total number of workers needed across the LMIC is 362,000, which represents 22.3 workers per 100,000 population in low-income countries and 26.7 workers per 100,000 population in middle-income countries. Nurses in mental health settings account for the majority (54%) of all workers needed, whereas psychiatrists represent only 6% of total need. The remaining 41% represents psychosocial care providers.²⁰

¹⁹ We classified psychologists, social workers and occupational therapists under one worker category, psychosocial care providers, because in LMIC, these workers often perform the same tasks (e.g., delivering psychosocial interventions). We note that high-income countries have a more distinct division of tasks across these professions.

²⁰ The percentages do not total 100% because of rounding.

With this table, LMIC can compare the number of needed mental health workers relative to countries within the same region and income classification. For example, we find that Sri Lanka and Thailand, two MIC in the WHO South-East Asia Region, share almost identical needs for psychiatrists (1.46 and 1.47 per 100,000 population respectively).

Mental health workforce shortages and the wage bill to remove them

In this section, we estimate the 2005 and 2015 shortages (or surpluses) of mental health workers in the 58 LMIC, based on the needed number of workers estimated in the previous section. We also estimate the annual wage bill for the required additional mental health workers.

The shortage (or surplus) of mental health workers is calculated for each LMIC in 2005 as the difference between the number of needed mental health workers reported in Table 8 (page 28) (prevalence-based need estimates) and the supply of mental health workers. Workforce supply data were retrieved from 58 countries that completed a WHO-AIMS assessment. WHO-AIMS records information on mental health professionals by specialty from 2005 or the most recent year available. Consistent with previous sections, we consider three specialties of mental health workers: psychiatrists; nurses that work in mental health settings; and psychosocial care providers.²¹

Table 9 (page 31) shows the needs-based shortage of mental health workers, by specialty for each of the 58 LMIC, to treat the eight *mhGAP* priority conditions. Except for Latvia,²² all of the LMIC experience a shortage of mental health workers in at least one of the three types of workers analysed, including 39 countries for psychiatrists, 55 for nurses in mental health settings and 46 for psychosocial care providers. The shortage amounts to about 239,000 workers, including 11,000 psychiatrists, 128,000 nurses in mental health settings and 100,000 psychosocial care providers. All LIC, except for Uzbekistan, have a shortage of psychiatrists, ranging from just 0.26 psychiatrists per 100,000 population in Tajikistan to 1.70 per 100,000 population in Viet Nam. In 44 MIC, 26 have a psychiatrist shortage, ranging from 0.09 psychiatrists per 100,000 population in Iran to 1.33 in Mongolia.

²¹ We were able to estimate the number of nurses that work in mental health settings because WHO-AIMS Version 2.2 includes estimates of the number of nurses that work in or for mental health facilities or private practice (31).

²² Latvia does not have an estimated shortage in any of the three worker categories, primarily because of its supply of mental health workers is higher than average.

Nurse shortages in mental health settings in LMIC are more critical. Except in three countries (Pakistan, Latvia and Timor-Leste), all LMIC have a shortage. In Ukraine there are just 0.82 nurses per 100,000 population, and in Uruguay, 22.2 per 100,000 population. Similarly, for psychosocial care providers, all LIC have shortages, ranging from 4.12 per 100,000 population in Tajikistan to 11.52 per 100,000 population in Viet Nam. About 73% of MIC (32 countries) do not have an adequate level of psychosocial care providers.

WHO-AIMS reports the number of medical doctors who do not specialize in psychiatry but work in mental health settings (hereafter, referred to as “other medical doctors”). We did not include other medical doctors in the mental health workforce estimates because we focused on mental health professionals. Including these doctors in our calculations could potentially inflate the supply counts, thereby underestimating the true shortage of psychiatrists and other mental health professionals. Nevertheless, we note that in several countries, these doctors represent a large proportion of the physicians (i.e., psychiatrists and other medical doctors) working in mental health settings. Table A1 (page 43) in the appendix shows, by country, the number of other medical doctors per 100,000 population in mental health settings, the number of psychiatrists per 100,000 population and the estimated shortage of psychiatrists per 100,000 population. Countries with higher shortages of psychiatrists per 100,000 population have a higher proportion of other medical doctors, suggesting these doctors are practising in roles normally filled by psychiatrists. In Viet Nam, for example, there are 0.90 other medical doctors per 100,000 population in mental health settings, while there are only 0.35 psychiatrists per 100,000 population. In Mongolia, the contrast is greater: 4.74 other medical doctors per 100,000 population in mental health settings, and only 0.51 psychiatrists per 100,000 population.

For our shortages estimates, we assumed worker surpluses in one country do not offset worker shortages in other countries, and assumed worker surpluses within a specialty within a country do not offset shortages within other specialties for that country. Table 10 (page 9) relaxes this assumption and calculates shortages using two alternative methods. The method above is presented first (labelled the No-Offset Method). Alternative Method I allows for surpluses in one specialty to offset shortages in another specialty within a country, using a one-for-one substitution, but does not allow for surpluses in one country to offset shortages in another country. The resulting shortage is about 215,000 workers across 51 countries.²³

²³ This method is similar to the method used by WHO in its report World Health Report 2006 - Working Together for Health (13). Health professional workforce surpluses in one country did not offset shortages in other countries. However, that report did not include a separate estimate for each workforce cadre – doctors, nurses and midwives – so each cadre implicitly could be substituted for the others.

Alternative Method II allows for surpluses in one specialty to offset shortages in another specialty within a country or across countries, using a one-for-one substitution. The resulting shortage is about 172,000 workers. We chose the No-Offset Method; that is, to assume worker surpluses do not offset

worker shortages, because of the different training requirements among worker specialties and because cross-country migration will not likely occur at the level required, and evidence of this movement is lacking.

Table 10. Shortage calculations by surplus offset method for 58 LMIC, 2005

Surplus offset method	Psychiatrists	Nurses in mental health settings	Psychosocial care providers	Total
No-offset method: Surpluses do not offset shortages				
Need	19,996	194,502	147,436	361,935
Supply	8,775	66,928	47,180	122,883
Shortage	11,222	127,575	100,256	239,052
Countries with shortages	39	55	46	57
Alternative method I: Allow surpluses to offset shortages within a country (a)				
Need	19,996	194,502	147,436	361,935
Supply	14,270	80,003	52,756	147,028
Shortage	5,726	114,500	94,680	214,906
Countries with shortages				51
Alternative method II: Allow surpluses to offset shortages within and across countries (b)				
Need	19,996	194,502	147,436	361,935
Supply	17,443	80,237	92,615	190,296
Shortage	2,553	114,265	54,821	171,639

- (a) Compared with the No-offset method, the supply of mental health workers increased, because surpluses in one specialty were allowed to offset shortages in another specialty within a country using a one-for-one substitution. This decreased the number of countries with shortages from 57 to 51.
- (b) Compared with Alternative method I, the supply of mental health workers increased, because surpluses in one specialty were allowed to offset shortages in another specialty within a country or across countries using a one-for-one substitution. The number of countries with remaining shortages would depend on which countries the workers migrated to.

Table 11 (page 34) provides the annual estimated wage costs of scaling-up mental health workers to eliminate shortages in treatment for the eight *mhGAP* priority conditions in 2005. The wage costs were estimated for each country by multiplying the shortage of workers by specialty and the annual wage by specialty. The wage data are from WHO's CHOICE project (CHOosing Interventions that are Cost Effective), an initiative designed to provide evidence of the health interventions that are most cost-effective.²⁴ As part of the initiative, health-care wage datasets were collected in 2000-2001 across 14 epidemiological subregions of the world. Using these data, wages for five education levels were estimated within each country using a multivariate regression model.²⁵ The education levels ranged from lower secondary education (level 1),

to post-secondary, non-tertiary education or, alternatively, the first stage of tertiary education (level 3), to the second stage of tertiary education with specialized training (level 5). The final model specification was based on Akaike's Information Criterion (AIC) or a pseudo R-squared. The independent variables included: a country's gross domestic product per worker; government health spending as a percentage of total spending; region of the world; whether the country was English-speaking; and interaction terms. We assigned the following education levels for each provider type within our study: psychiatrists (level 5); nurses in mental health settings (level 3); and psychosocial care providers (level 3). Level 3 was chosen for the category of psychosocial care providers (which includes psychologists, social workers and occupational therapists) as most psychosocial care and support is commonly expected in LMIC to be provided by health workers without an advanced degree. All wages were converted to 2005 United States dollars using buying power parity conversion rates.

²⁴ The WHO CHOICE Project can be found at <http://www.who.int/choice/en/>.

²⁵ WHO unpublished report, Determinants of Variation in Health Sector Wages Across Countries. For a copy of the report, contact Dan Chisholm at chisholmd@who.int.

Table 11 (page 34) shows that the annual wage costs to remove the mental health workforce shortages in the 58 LMIC would have been in 2005 about US\$ 814 million (US\$ 894 million in 2009 dollars). This US\$ 814 million includes US\$ 80 million for psychiatrists, US\$ 420 million for nurses in mental health settings and US\$ 314 million for psychosocial care providers. These costs vary considerably by country and specialty. For example, annual wages required to remove the shortages range from US\$ 30,000 for Timor-Leste to US\$ 118 million for Nigeria.

Forecasts of shortages and scaling-up costs of mental health workers in 2015

We forecast future shortages of mental health workers, by specialty, in LMIC in 2015, the target year of the United Nations Millennium Development Goals. We also estimate the annual wage costs to remove the shortages in that year. We calculate shortages by subtracting the 2005 supply level of mental health workers from the prevalence-based need estimates for the eight *mhGAP* priority conditions in 2015. Table 12 (page 36) updates the need estimates, based on how each country's age distribution is expected to change between 2005 and 2015. The table shows the total need across the 58 LMIC increases from 362,000 workers to 440,000 workers, a 21% increase. Most of this increase is because of projected population growth from 1.5 billion to 1.7 billion. The number of needed workers per 100,000 population increases by 3%, from 24.4 workers per 100,000 population in 2005, to 25.3 workers per 100,000 population in 2015.

To estimate shortages (or surpluses) in 2015, we assumed the supply of workers in 2015 would be the same as the supply in 2005. This assumption provides a starting point that shows

what the ramifications would be in 2015 if a country's mental health workforce supply were to remain unchanged. We used the same methodology to estimate shortages for 2005; that is, we assumed that worker surpluses in one country do not offset worker shortages in other countries, and that worker surpluses within a specialty within a country do not offset shortages within other specialties in that country. Based on this method, we project that from 2005 to 2015, shortages will increase from 239,000 workers to 347,000 workers, a 45% increase (see Table 13, page 38). Based on 2005 levels, all countries, except Latvia, are estimated to experience a shortage in one or more mental health specialties. All LIC, except Uzbekistan, and about a half of MIC are projected to have continued shortages of per-capita psychiatrists in 2015. LMIC, except Pakistan, Latvia and Timor-Leste, are expected to have nurse shortages in mental health settings ranging from 1.8 to 23.6 per 100,000 population. All LIC and most MIC are expected to have shortages in psychosocial care providers.

The annual wage bill to remove the projected mental health workforce shortages for the eight *mhGAP* priority conditions in 2015 in the 57 LMIC with shortages is estimated in 2005 dollars to be US\$ 1.2 billion, equivalent to US\$ 1.3 billion in 2009 dollars (see Table 14, page 41). The US\$ 1.2 billion is 45% higher than the annual wage bill required in 2005 to remove the shortages for the eight *mhGAP* priority conditions in the 57 LMIC. By specialty, the annual wage bill to remove shortages is US\$ 113 million for psychiatrists, US\$ 583 million for nurses in mental health settings and US\$ 489 million for psychosocial care providers (all stated in 2005 dollars). As with 2005 estimates, the cost of increasing worker levels varies considerably by country and specialty. For example, annual wages required to remove the projected shortages range from US\$ 89,000 in Timor-Leste to US\$ 186 million in Nigeria.

Summary and results for all low- and middle-income countries

Analysis of human resources for mental health in 58 low- and middle-income countries reveals substantial shortages in the mental health workforce and that the situation will worsen by 2015 if the additional workers are not trained and hired. Based on other studies, a similar situation exists for health professionals in general, including doctors, nurses and midwives (13,32,33,34). About 93% of LIC and 59% of MIC experience a needs-based shortage of psychiatrists. All but three of the 58 countries have insufficient numbers of nurses in mental health settings devoted to mental health care. In addition, 79% of LMIC show a workforce gap in psychosocial care providers. Although the shortage varies substantially by country, the widest gaps occur in LIC.

This section presents the 2005 results in two summary tables by WHO region and also includes adjustments to account for all MNS disorders across all 144 LMIC. For the 58 LMIC we analysed for the eight *mhGAP* priority conditions, we estimate a shortage of 11,000 psychiatrists, 128,000 nurses in mental health settings and 100,000 psychosocial care providers, totaling 239,000 mental health workers in 2005 (Table 15, page 12). By specialty, the supply met 44% of the psychiatrist need, 34 % of the nurse need in mental health settings and 32 % of the psychosocial care -provider need. Overall, the supply met 34 % of the mental health worker need. On a per capita basis, the shortage is highest in the WHO Western Pacific Region, with a 26.6 mental health worker shortage per 100,000 population, followed by the South-East Asia Region, with a shortage of 21.1 mental health workers per 100,000 population. The results show that the 2005 levels of mental health workers do not meet the treatment needs of persons with priority MNS disorders. Failure to adequately treat these disorders implies: a large number of overall disability-adjusted life years lost; reductions in employment and productivity; and an increased strain on related social services.

The eight *mhGAP* priority conditions we studied comprise about 75% of all MNS disorders in LMIC,²⁶ while the LMIC we examined represent 27% of the total population living

in all 144 LMIC.²⁷ If we view the mental health burden in our study of the eight *mhGAP* priority conditions in the 58 LMIC as representative of all MNS disorders in all 144 LMIC²⁸, we estimate a workforce gap of 1.18 million mental health professionals in 2005 (see Table 15, page 12).²⁹ This shortage comprises 55,000 psychiatrists, 628,000 nurses in mental health settings and 493,000 psychosocial care providers. The parallel estimate for all MNS disorders in all 144 LMIC in 2015 is a shortage of 1.71 million workers, including 78,000 psychiatrists, 866,000 nurses in mental health settings and 764,000 psychosocial care providers.

Table 16 (page 12) shows the annual wage bill required to remove the mental health workforce shortages by WHO region. The annual cost to remove the shortage based on the eight *mhGAP* priority conditions in the 58 LMIC is US\$ 814 million (in 2005 dollars), and is highest in the Eastern

Mediterranean Region (US\$ 227 million) and African Region (US\$ 207 million). Applying the same methodology to include all MNS disorders in all 144 LMIC, the annual cost would be US\$ 4 billion in 2005 dollars or US\$ 4.4 billion in 2009 dollars. The parallel estimate for all MNS disorders in all 144 LMIC in 2015 is an annual cost of US\$ 5.8 billion (in 2005 dollars) or \$6.4 billion (in 2009 dollars). These costs represent only a fraction of the total costs required to scale up the mental health workforce. They do not include the cost of training, support staff and new workers' facilities, equipment, supplies and medication. Nor do they include the costs to scale up cadres, who work in primary-care settings where mental health disorders are sometimes diagnosed and treated, or where patients are assessed and referred to specialists in mental health settings.

²⁶ This estimate is based on DALY estimates from the 2004 *WHO Global Burden of Disease Report*, which found that in LMIC, the eight *mhGAP* priority conditions account for about 75% of the global burden of neuropsychiatric disorders. To account for this percentage, we increased the worker shortage estimates by 1.33 (or 1/0.75). This was a conservative approach, because we could have increased the worker-need estimates by 1.33, which would have resulted in the worker shortage estimates increasing by more than a factor of 1.33, if the worker supply were unchanged. However, because the nature of the remaining neuropsychiatric disorders is not well specified, there may be additional supply of mental health workers available to treat these disorders.

²⁷ Note that we only used a province of China (Hunan) and a state of India (Uttarakhand) in our need and supply estimates; therefore, most of these countries' populations were excluded from the analysis.

²⁸ In this projection, we assume that all characteristics of the 58 LMIC (overall prevalence of disorder, service delivery model, target coverage rate, etc) are representative of the 144 LMIC.

²⁹ United Nations, Department of Economic and Social Affairs (DESA) Population Division, Population Estimates and Projections Section. World Population Prospects: The 2008 Revision Population Database. Data available at: <http://esa.un.org/unpp/> Accessed on 1 May, 2010. 144 LIC, Lower MIC, and Upper MIC included.

Table 15. FTE shortage of mental health workers by WHO Region, 2005

WHO Region	Psychiatrists		Nurses in mental health settings		Psychosocial care providers		Total	
	per 100,000 population	N	per 100,000 population	N	per 100,000 population	N	per 100,000 population	N
AFR	0.8	2,668	6.4	20,279	7.2	22,900	14.5	45,848
AMR	0.1	203	11.7	16,229	2.9	4,096	14.8	20,528
EMR	0.6	2,885	5.7	26,440	6.5	29,710	12.8	59,035
EUR	0.0	17	5.4	5,912	1.9	2,039	7.2	7,968
SEAR	1.1	3,010	11.3	31,270	8.7	24,011	21.1	58,291
WPR	1.4	2,439	15.4	27,445	9.8	17,500	26.6	47,383
Total for 58 LMIC, 8 MNS Disorders	0.8	11,222	8.6	127,575	6.8	100,256	16.1	239,052
Total for 58 LMIC, All MNS Disorders		14,962		170,100		133,674		318,736
Total for 144 LMIC, All MNS Disorders		55,223		627,822		493,380		1,176,425

Table 16. Annual wage bill to remove shortage of mental health workers by WHO Region, 2005 (millions \$US 2005)

WHO Region	Psychiatrists	Nurses in mental health settings	Psychosocial care providers	Total
AFR	29	74	104	207
AMR	2	102	20	125
EMR	21	107	99	227
EUR	0	9	2	11
SEAR	16	69	51	136
WPR	12	59	37	109
Total for 58 LAMIC, 8 MNS disorders	80	420	314	814
Total for 58 LAMIC, All MNS disorders	107	559	419	1,085
Total for 144 LAMIC, All MNS disorders	396	2,065	1,545	4,005

Notes:

Totals may not add due to rounding.

LIC – low-income country

MIC – middle-income country

LMIC – low- and middle-income countries.

Policy discussion and conclusions

According to Saxena et al (14), resources for mental health in LMIC remain grossly inadequate. In this report, we provide benchmarks for LMIC to redress this problem by increasing their mental health workforce. The rapid scaling up of a well-trained workforce requires a sizeable investment immediately. Population forecasts show that doing nothing will worsen the mental health treatment gap for decades to come. This treatment gap will not only increase disability, but hinder economic productivity and drain resources from other government programmes.

Government budgets and private spending in most LMIC, particularly LIC, are insufficient to scale up the mental health workforce to required levels. Mental health care providers and policy-makers should consider how task shifting and worker incentives might improve productivity (35). Task shifting involves delegating tasks to existing or new cadres with either less training or narrowly focused training to increase access to lower-cost services. Task shifting can include delegating tasks to professionals with less training and even to non-professionals, or a combination of these (36). In a mental health setting, task shifting might include transferring tasks from a psychiatrist to a non-specialist medical doctor, which seems to be occurring in some countries where there are psychiatrist shortages (see appendix). Task shifting might also include developing a new cadre. For example, female community health workers who were trained in cognitive behaviour techniques in the Lady Health Worker Programme in Pakistan demonstrated their ability to significantly lower depression prevalence among new mothers (37). Successful task shifting requires good management and supervision. Higher-skilled mental health workers and/or professionals outside of mental health will need to acquire these management and supervision skills. Governments will also need to do more to help develop informal resources, such as family and consumer associa-

tions, which play a key role in the care and rehabilitation of people with mental disorders. Increasing worker incentives can also improve productivity. The primary financial incentive is the payment system in the form of fees for services, capitation or salary (38). Health-care payment systems are increasingly being augmented with pay-for-performance programmes, which use financial and non-financial incentives to better align provider and payer objectives, where the payer could be the government, a private insurer or a patient (39,40,41). For example, Rwanda's pay-for-performance programme included a fee-for-service payment for specific maternal and child-health services, and the payment was adjusted based on quality-of-care indicators (42). Facilities with the programme had a higher probability of institutional deliveries and of children aged 0–23 months receiving a preventative care visit, and better prenatal care quality when compared with health care facilities without the programme. Pay-for-performance programmes are less common in mental health, but the United Kingdom's Quality and Outcomes Framework pay-for-performance programme, for example, includes mental health quality-of-care measures, including whether a practice can produce a registry of people with schizophrenia, bipolar disorder and other psychoses, and whether these patients have had a review in the preceding 15 months (43).

The workforce represents one key component of the mental health system. However, to address the three main shortcomings of mental health care in most LMIC – scarcity, inequity and inefficiency – governments will need to take a comprehensive approach. Such a strategy will require, at the minimum, the allocation of health budgets towards MNS disorders. This is more likely if MNS disorders are destigmatized, there is a well-trained mental health workforce, and concerted efforts are made to increase the productivity of mental health workers.

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Appendix 1. Country-level supplemental tables

The following supplemental tables include the country-level statistics that were used to create the tables in the main report.

Table 2. Prevalence (%) of mental, neurological and substance use disorders identified in mhGAP report, LMIC (n=58)

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression ¹	Suicidal ideation ¹	Epilepsy ¹	Dementia ¹	Alcohol use ¹	Illicit substance use		Prevalence of Childhood Disorders (per 100,000 child population)		
		Schizophrenia ¹	Bipolar ¹						Opioid use ²	Other drug use ²	Intellectual disabilities ³	Conduct/behavioral ³	Emotional ³
Low income countries													
Benin	AFR	0.28	0.37	2.18	0.08	1.04	0.09	0.52	0.09	0.46	1.50	4.25	4.25
Burundi	AFR	0.28	0.37	2.18	0.18	1.04	0.09	0.52	0.01	0.14	1.50	4.25	4.25
Eritrea	AFR	0.28	0.37	2.18	0.10	1.04	0.09	0.52	0.01	0.14	1.50	4.25	4.25
Ethiopia	AFR	0.28	0.37	2.18	0.12	1.04	0.09	0.52	0.01	0.14	1.50	4.25	4.25
Nigeria	AFR	0.28	0.37	2.18	0.10	1.04	0.09	0.52	0.09	0.46	1.50	4.25	4.25
Uganda	AFR	0.28	0.37	2.18	0.14	1.04	0.09	0.52	0.01	0.14	1.50	4.25	4.25
Afghanistan	EMR	0.36	0.41	2.79	0.13	0.55	0.12	0.21	0.41	0.14	1.50	4.25	4.25
Pakistan	EMR	0.36	0.41	2.79	0.21	0.55	0.12	0.21	0.41	0.14	1.50	4.25	4.25
Somaliand	EMR	0.36	0.41	2.79	0.50	0.55	0.12	0.21	0.41	0.14	1.50	4.25	4.25
Tajikistan	EUR	0.50	0.49	2.83	0.04	0.42	0.51	4.01	0.09	0.09	1.50	4.25	4.25
Uzbekistan	EUR	0.50	0.49	2.83	0.12	0.42	0.51	4.01	0.09	0.09	1.50	4.25	4.25
Bangladesh	SEAR	0.37	0.43	2.88	0.25	0.58	0.17	1.28	0.15	0.10	1.50	4.25	4.25
Nepal	SEAR	0.37	0.43	2.88	0.20	0.58	0.17	1.28	0.15	0.10	1.50	4.25	4.25
Viet Nam	WPR	0.44	0.51	2.84	0.20	0.39	0.33	2.77	0.02	0.34	1.50	4.25	4.25
Middle income countries (lower middle and upper middle)													
Congo	AFR	0.28	0.37	2.18	0.12	1.04	0.09	0.52	0.01	0.14	1.50	4.25	4.25
South Africa	AFR	0.28	0.37	2.18	0.28	1.04	0.09	0.52	0.01	0.14	1.50	4.25	4.25
Argentina	AMR	0.42	0.45	2.80	0.19	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Belize	AMR	0.42	0.45	2.80	0.17	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Bolivia	AMR	0.42	0.45	2.80	0.04	1.26	0.34	2.68	0.07	0.43	1.50	4.25	4.25
Chile	AMR	0.42	0.45	2.80	0.22	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Costa Rica	AMR	0.42	0.45	2.80	0.17	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Dominican Republic	AMR	0.42	0.45	2.80	0.11	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Ecuador	AMR	0.42	0.45	2.80	0.16	1.26	0.34	2.68	0.07	0.43	1.50	4.25	4.25
El Salvador	AMR	0.42	0.45	2.80	0.15	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Guatemala	AMR	0.42	0.45	2.80	0.06	1.26	0.34	2.68	0.07	0.43	1.50	4.25	4.25
Guyana	AMR	0.42	0.45	2.80	0.67	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25

Table 2 (continued)

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression ¹	Suicidal ideation ¹	Epilepsy ¹	Dementia ¹	Alcohol use ¹	Illicit substance use		Prevalence of Childhood Disorders (per 100,000 child population)		
		Schizophrenia ¹	Bipolar ¹						Opioid use ²	Other drug use ²	Intellectual disabilities ³	Conduct/behavioral ³	Emotional ³
Middle income countries (lower middle and upper middle)													
Honduras	AMR	0.42	0.45	2.80	0.13	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Jamaica	AMR	0.42	0.45	2.80	0.08	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Nicaragua	AMR	0.42	0.45	2.80	0.22	1.26	0.34	2.68	0.07	0.35	1.50	4.25	4.25
Panama	AMR	0.42	0.45	2.80	0.13	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Paraguay	AMR	0.42	0.51	2.80	0.10	1.26	0.34	2.68	0.03	0.34	1.50	4.25	4.25
Suriname	AMR	0.42	0.45	2.80	0.39	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Uruguay	AMR	0.42	0.45	2.80	0.33	1.26	0.34	2.68	0.03	0.35	1.50	4.25	4.25
Djibouti	EMR	0.36	0.41	2.79	0.09	0.55	0.12	0.21	0.41	0.14	1.50	4.25	4.25
Egypt	EMR	0.36	0.41	2.79	0.03	0.55	0.12	0.21	0.41	0.14	1.50	4.25	4.25
Iran	EMR	0.36	0.41	2.79	0.12	0.55	0.12	0.21	0.55	0.02	1.50	4.25	4.25
Iraq	EMR	0.36	0.41	2.79	0.31	0.55	0.12	0.21	0.41	0.14	1.50	4.25	4.25
Jordan	EMR	0.36	0.41	2.79	0.00	0.55	0.12	0.21	0.55	0.02	1.50	4.25	4.25
Morocco	EMR	0.36	0.45	2.79	0.04	0.55	0.12	0.21	0.41	0.43	1.50	4.25	4.25
Sudan	EMR	0.36	0.41	2.79	0.15	0.55	0.12	0.21	0.41	0.14	1.50	4.25	4.25
Tunisia	EMR	0.36	0.41	2.79	0.06	0.55	0.12	0.21	0.55	0.02	1.50	4.25	4.25
Albania	EUR	0.50	0.49	2.83	0.15	0.42	0.51	4.01	0.09	0.09	1.50	4.25	4.25
Armenia	EUR	0.50	0.49	2.83	0.08	0.42	0.51	4.01	0.09	0.09	1.50	4.25	4.25
Azerbaijan	EUR	0.50	0.49	2.83	0.03	0.42	0.51	4.01	0.09	0.09	1.50	4.25	4.25
Georgia	EUR	0.50	0.49	2.83	0.04	0.42	0.51	4.01	0.09	0.09	1.50	4.25	4.25
Kyrgyzstan	EUR	0.50	0.49	2.83	0.23	0.42	0.51	4.01	0.09	0.09	1.50	4.25	4.25
Latvia	EUR	0.50	0.49	2.83	0.52	0.42	0.51	4.01	0.19	0.04	1.50	4.25	4.25
Republic of Moldova	EUR	0.50	0.51	2.83	0.35	0.42	0.51	4.01	0.19	0.34	1.50	4.25	4.25
Ukraine	EUR	0.50	0.49	2.83	0.54	0.42	0.51	4.01	0.19	0.04	1.50	4.25	4.25
Bhutan	SEAR	0.37	0.43	2.88	0.27	0.58	0.17	1.28	0.15	0.10	1.50	4.25	4.25
India-Uttarakhand	SEAR	0.37	0.43	2.88	0.34	0.58	0.17	1.28	0.15	0.10	1.50	4.25	4.25
Maldives	SEAR	0.37	0.43	2.88	0.27	0.58	0.17	1.28	0.15	0.10	1.50	4.25	4.25
Sri Lanka	SEAR	0.37	0.43	2.88	0.56	0.58	0.17	1.28	0.04	0.10	1.50	4.25	4.25

Table 2 (continued)

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression ¹	Suicidal ideation ¹	Epilepsy ¹	Dementia ¹	Alcohol use ¹	Illicit substance use		Prevalence of Childhood Disorders (per 100,000 child population)		
		Schizophrenia ¹	Bipolar ¹						Opioid use ²	Other drug use ²	Intellectual disabilities ³	Conduct/behavioral ³	Emotional ³
Middle income countries (lower middle and upper middle)													
Thailand	SEAR	0.37	0.43	2.88	0.20	0.58	0.17	1.28	0.04	0.10	1.50	4.25	4.25
Timor-Leste	SEAR	0.37	0.43	2.88	0.14	0.58	0.17	1.28	0.15	0.10	1.50	4.25	4.25
China-Hunan	WPR	0.44	0.51	2.84	0.34	0.39	0.33	2.77	0.02	0.34	1.50	4.25	4.25
Mongolia	WPR	0.44	0.41	2.84	0.23	0.39	0.33	2.77	0.02	0.14	1.50	4.25	4.25
Philippines	WPR	0.44	0.49	2.84	0.03	0.39	0.33	2.77	0.02	0.04	1.50	4.25	4.25

¹ WHO Global Burden of Disease Estimates for 2004.

² Comparative Risk Assessment <http://www.who.int/publications/cra/chapters/volume1/1109-1176.pdf>.

³ WHO Expert Panel on Child Disorders.

Case definitions used:

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

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

Depression (unipolar depressive disorders and bipolar affective disorder): Major depressive episode or bipolar disorder meeting ICD-10 criteria.

Suicide (suicide attempt): Global Burden of Disease self-inflicted injury death rate multiplied by a factor of 20 (22,23,24).

Epilepsy: cases meeting International League Against Epilepsy definition (excluding epilepsy secondary to other diseases or injury).

Dementia: Global Burden of Disease Estimate of Alzheimer disease and dementia multiplied by a correction factor of 0.5 to remove Alzheimer disease and mild dementia cases (45). Given the strong age-dependence of dementia, we then apply a correction factor that weights prevalence by the age structure of the population (older populations receive a greater weight).

Alcohol-use disorder: cases meeting ICD-10 criteria for alcohol dependence and harmful use (F10.1 and F10.2), excluding cases with comorbid depressive episode.

Opioid-use disorder: cases meeting ICD-10 criteria for opioid dependence and harmful use (F11.1 F11.2), excluding cases with comorbid depressive episode.

Other drug-use disorders: cases meeting ICD-10 criteria for cocaine dependence and harmful use (F14.1 and F14.2) or amphetamine use.

Childhood intellectual disabilities: moderate and severe forms of mental retardation, based on international estimates of prevalence (46,47,48).

Conduct/behavioral disorders: prevalence of severe aggression, disobedience and irritability based on WHO expert panel estimates.

Childhood emotional disorders: WHO-based estimate of children that meet criteria for major depression or anxiety-related disorders (49,50).

Table 4. Target population in 58 LMIC that requires treatment for MNS disorders*

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression	Suicidal ideation	Epilepsy	Dementia	Alcohol use	Illicit substance Use			Childhood Disorders			Total Target Cases	Total cases per 100,000 total population
		Schizophrenia	Bipolar						Opioid use	Other Drug Use	Intellectual Disabilities	Conduct/Behavioral	Emotional			
Low-income countries																
Benin	AFR	9,964	12,960	31,872	2,724	36,768	1,946	5,746	1,993	10,096	10,323	29,249	29,249	182,889	2,324	
Burundi	AFR	9,721	12,644	31,094	6,380	35,871	1,691	5,606	216	2,938	9,171	25,985	25,985	167,301	2,268	
Eritrea	AFR	5,855	7,616	18,728	2,059	21,606	860	3,377	130	1,769	5,619	15,921	15,921	99,460	2,223	
Ethiopia	AFR	94,966	123,519	303,758	39,906	350,426	17,821	54,766	2,110	28,697	100,380	284,410	284,410	1,685,171	2,227	
Nigeria	AFR	180,432	234,681	577,128	64,595	665,795	34,139	104,053	36,082	182,815	182,097	515,942	515,942	3,293,699	2,338	
Uganda	AFR	32,726	42,565	104,676	15,962	120,758	5,300	18,873	727	9,889	42,474	120,343	120,343	634,637	2,211	
Afghanistan	EMR	37,224	42,274	119,978	13,047	57,403	4,309	6,987	26,726	9,126	34,410	97,495	97,495	546,474	2,230	
Pakistan	EMR	290,937	330,399	937,716	167,840	448,651	57,714	54,609	208,883	71,326	191,766	543,337	543,337	3,846,514	2,320	
Somaliand	EMR	13,206	14,997	42,563	18,511	20,364	1,884	2,479	9,481	3,238	11,184	31,688	31,688	201,283	2,410	
Tajikistan	EUR	15,754	15,668	37,003	1,362	13,376	3,567	39,665	1,782	1,742	7,734	21,913	21,913	181,481	2,776	
Uzbekistan	EUR	70,357	69,973	165,253	16,836	59,737	19,534	177,141	7,958	7,781	25,905	73,398	73,398	767,271	2,915	
Bangladesh	SEAR	298,937	350,258	962,542	204,239	473,157	65,475	325,246	75,982	50,655	155,436	440,402	440,402	3,842,729	2,510	
Nepal	SEAR	49,006	57,419	157,793	26,241	77,567	11,126	53,319	12,456	8,304	31,839	90,211	90,211	665,491	2,445	
Viet Nam	WPR	211,230	245,201	557,334	95,016	185,984	118,769	412,696	5,953	101,208	73,620	208,590	208,590	2,424,192	2,883	
Total for low-income countries		1,320,314	1,560,175	4,047,440	674,718	2,567,464	344,135	1,264,561	390,479	489,584	881,958	2,498,881	2,498,881	18,538,590	2,436	
Middle income countries (lower-middle and upper-middle)																
Congo	AFR	4,519	5,877	14,453	1,934	16,674	1,066	2,606	100	1,365	4,224	11,968	11,968	76,754	2,247	
South Africa	AFR	73,910	96,133	236,409	73,047	272,730	18,562	42,623	1,642	22,335	45,684	129,438	129,438	1,141,951	2,375	
Argentina	AMR	96,598	102,679	264,221	42,730	288,417	70,771	191,610	4,287	50,297	30,462	86,309	86,309	1,314,690	3,394	
Belize	AMR	595	632	1,627	240	1,776	164	1,180	26	310	321	910	910	8,691	3,071	
Bolivia	AMR	19,216	20,426	52,561	1,642	57,375	6,155	38,117	1,990	12,280	10,494	29,733	29,733	279,720	3,046	
Chile	AMR	41,390	43,996	113,212	21,228	123,580	23,775	82,100	1,837	21,551	12,159	34,451	34,451	553,730	3,398	
Costa Rica	AMR	10,485	11,145	28,680	4,107	31,306	4,325	20,798	465	5,460	3,684	10,438	10,438	141,332	3,264	
Dominican Republic	AMR	21,596	22,955	59,070	5,648	64,480	8,538	42,837	958	11,245	9,441	26,750	26,750	300,267	3,149	
Ecuador	AMR	29,762	31,636	81,407	11,517	88,863	12,447	59,036	3,082	19,019	12,780	36,210	36,210	421,969	3,230	

Table 4 (continued)

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression	Suicidal ideation	Epilepsy	Dementia	Alcohol use	Illicit substance Use			Childhood Disorders			Total Target Cases	Total cases per 100,000 total population
		Schizophrenia	Bipolar						Other Drug Use	Opioid use	Intellectual Disabilities	Conduct/Behavioral	Emotional			
Middle income countries (lower-middle and upper-middle)																
El Salvador	AMR	13,298	14,135	36,372	4,784	39,703	6,205	26,377	590	6,924	6,378	18,071	18,071	190,907	3,150	
Guatemala	AMR	24,422	25,959	66,799	3,670	72,917	7,435	48,442	2,529	15,606	16,455	46,623	46,623	377,479	2,970	
Guyana	AMR	1,775	1,886	4,854	2,834	5,298	711	3,520	79	924	708	2,006	2,006	26,600	3,495	
Honduras	AMR	14,018	14,900	38,341	4,306	41,853	4,109	27,805	622	7,299	8,232	23,324	23,324	208,132	3,020	
Jamaica	AMR	6,179	6,568	16,901	1,161	18,449	3,351	12,256	274	3,217	2,514	7,123	7,123	85,116	3,193	
Nicaragua	AMR	9,688	12,191	31,225	1,105	14,940	1,189	1,818	6,956	7,329	6,183	17,519	17,519	127,661	2,341	
Panama	AMR	7,602	8,081	20,793	3,911	22,698	3,203	15,079	787	3,958	2,940	8,330	8,330	105,713	3,274	
Paraguay	AMR	12,818	13,624	35,059	3,953	38,270	4,353	25,425	569	6,674	6,342	17,969	17,969	183,024	3,099	
Suriname	AMR	1,176	1,250	3,217	1,083	3,512	486	2,333	52	612	447	1,267	1,267	16,704	3,361	
Uruguay	AMR	8,575	9,115	23,456	6,763	25,604	8,257	17,010	381	4,465	2,370	6,715	6,715	119,426	3,590	
Djibouti	EMR	1,413	1,605	4,555	372	2,180	220	265	1,015	347	927	2,627	2,627	18,152	2,258	
Egypt	EMR	146,847	166,766	473,303	13,043	226,452	34,225	27,563	105,432	36,001	77,175	218,663	218,663	1,744,132	2,261	
Iran	EMR	148,709	168,880	479,303	50,832	229,323	38,892	27,913	143,226	5,208	56,058	158,831	158,831	1,666,005	2,354	
Iraq	EMR	46,915	53,279	151,212	40,210	72,348	8,344	8,806	33,684	11,502	35,427	100,377	100,377	662,479	2,346	
Jordan	EMR	9,979	11,333	32,164	106	15,389	1,801	1,873	9,611	350	6,210	17,595	17,595	124,006	2,228	
Morocco	EMR	75,428	68,934	199,019	39,032	66,413	45,299	147,370	2,126	14,881	27,702	78,489	78,489	843,181	2,765	
Sudan	EMR	65,517	74,404	211,169	28,398	101,034	11,728	12,298	47,039	16,062	47,259	133,901	133,901	882,709	2,281	
Tunisia	EMR	20,969	23,814	67,586	3,696	32,336	7,270	3,936	20,196	734	7,602	21,539	21,539	231,217	2,341	
Albania	EUR	9,106	9,057	21,389	2,783	7,732	4,674	22,928	1,030	1,007	2,469	6,996	6,996	96,166	3,090	
Armenia	EUR	9,520	9,468	22,361	1,528	8,083	6,688	23,969	1,077	1,053	2,016	5,712	5,712	97,187	3,171	
Azerbaijan	EUR	24,654	24,519	57,906	1,274	20,932	9,788	62,072	2,789	2,727	6,741	19,100	19,100	251,601	2,980	
Georgia	EUR	14,485	14,406	34,022	1,127	12,299	12,245	36,470	1,638	1,602	2,469	6,996	6,996	144,755	3,243	
Kyrgyzstan	EUR	14,286	14,208	33,555	6,694	12,130	4,896	35,969	1,616	1,580	4,899	13,881	13,881	157,594	3,017	
Latvia	EUR	7,798	7,755	18,315	8,223	6,621	7,544	19,632	1,862	392	996	2,822	2,822	84,780	3,699	
Republic of Moldova	EUR	10,797	12,040	28,487	820	9,506	5,144	21,094	304	609	2,139	6,061	6,061	103,062	2,744	
Ukraine	EUR	159,336	158,468	374,247	172,315	135,286	149,819	401,168	38,048	8,010	20,652	58,514	58,514	1,734,378	3,695	

Table 4 (continued)

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression	Suicidal ideation	Epilepsy	Dementia	Alcohol use	Illicit substance Use			Childhood Disorders			Total Target Cases	Total cases per 100,000 total population
		Schizophrenia	Bipolar						Other Drug Use	Opioid use	Intellectual Disabilities	Conduct/Behavioral	Emotional			
Middle income countries (lower-middle and upper-middle)																
Bhutan	SEAR	1,260	1,476	4,057	925	1,994	340	1,371	320	214	666	1,887	1,887	16,398	2,527	
India-Uttarakhand	SEAR	17,134	20,076	55,170	15,683	27,120	5,181	18,642	4,355	2,903	9,799	27,763	27,763	231,589	2,553	
Maldives	SEAR	581	681	1,872	430	920	120	632	148	99	288	816	816	7,403	2,526	
Sri Lanka	SEAR	43,444	50,902	139,884	66,442	68,763	17,862	47,267	2,945	7,362	14,427	40,877	40,877	541,050	2,770	
Thailand	SEAR	149,951	175,694	482,824	83,179	237,342	64,407	163,148	10,164	25,409	45,381	128,580	128,580	1,694,658	2,570	
Timor-Leste	SEAR	1,573	1,843	5,064	603	2,489	259	1,711	400	267	1,374	3,893	3,893	23,369	2,358	
China- Hunan	WPR	18,245	21,179	48,140	13,929	16,064	16,861	35,646	514	8,742	3,551	10,062	10,062	202,996	3,209	
Mongolia	WPR	7,217	7,471	16,951	5,137	6,127	3,322	18,170	1,723	3,084	2,205	6,248	6,248	83,903	3,292	
Philippines	WPR	186,196	226,877	509,294	46,227	555,933	70,651	369,334	8,263	93,645	91,230	258,485	258,485	2,674,620	3,128	
Total for middle-income countries		1,588,982	1,768,325	4,600,510	798,671	3,103,260	712,681	2,170,220	466,750	444,656	651,480	1,845,860	1,845,860	19,997,256	2,777	
Total for low and middle-income countries		2,909,297	3,328,501	8,647,950	1,473,389	5,670,724	1,056,815	3,434,781	857,229	934,240	1,533,438	4,344,741	4,344,741	38,535,846	2,602	

* All calculations take into account the age structure of the country's population.

Table 5. Percentage of target cases within 58 LMIC attributable to specific MNS disorders*

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression	Suicidal ideation	Epilepsy	Dementia	Alcohol Use	Illicit Substance Use		Childhood Disorders		
		Schizophrenia	Bipolar						Opioid Use	Other Drug Use	Intellectual Disabilities	Conduct/Behavioral	Emotional
Low-income countries													
Benin	AFR	5.4	7.1	17.4	1.5	20.1	1.1	3.1	1.1	5.5	5.6	16.0	16.0
Burundi	AFR	5.8	7.6	18.6	3.8	21.4	1.0	3.4	0.1	1.8	5.5	15.5	15.5
Eritrea	AFR	5.9	7.7	18.8	2.1	21.7	0.9	3.4	0.1	1.8	5.6	16.0	16.0
Ethiopia	AFR	5.6	7.3	18.0	2.4	20.8	1.1	3.2	0.1	1.7	6.0	16.9	16.9
Nigeria	AFR	5.5	7.1	17.5	2.0	20.2	1.0	3.2	1.1	5.6	5.5	15.7	15.7
Uganda	AFR	5.2	6.7	16.5	2.5	19.0	0.8	3.0	0.1	1.6	6.7	19.0	19.0
Afghanistan	EMR	6.8	7.7	22.0	2.4	10.5	0.8	1.3	4.9	1.7	6.3	17.8	17.8
Pakistan	EMR	7.6	8.6	24.4	4.4	11.7	1.5	1.4	5.4	1.9	5.0	14.1	14.1
Somaliand	EMR	6.6	7.5	21.1	9.2	10.1	0.9	1.2	4.7	1.6	5.6	15.7	15.7
Tajikistan	EUR	8.7	8.6	20.4	0.8	7.4	2.0	21.9	1.0	1.0	4.3	12.1	12.1
Uzbekistan	EUR	9.2	9.1	21.5	2.2	7.8	2.5	23.1	1.0	1.0	3.4	9.6	9.6
Bangladesh	SEAR	7.8	9.1	25.0	5.3	12.3	1.7	8.5	2.0	1.3	4.0	11.5	11.5
Nepal	SEAR	7.4	8.6	23.7	3.9	11.7	1.7	8.0	1.9	1.2	4.8	13.6	13.6
Viet Nam	WPR	8.7	10.1	23.0	3.9	7.7	4.9	17.0	0.2	4.2	3.0	8.6	8.6
Average for low-income countries		7.1	8.4	21.8	3.6	13.8	1.9	6.8	2.1	2.6	4.8	13.5	13.5
Middle-income countries (lower-middle and upper-middle)													
Congo	AFR	5.9	7.7	18.8	2.5	21.7	1.4	3.4	0.1	1.8	5.5	15.6	15.6
South Africa	AFR	6.5	8.4	20.7	6.4	23.9	1.6	3.7	0.1	2.0	4.0	11.3	11.3
Argentina	AMR	7.3	7.8	20.1	3.3	21.9	5.4	14.6	0.3	3.8	2.3	6.6	6.6
Belize	AMR	6.8	7.3	18.7	2.8	20.4	1.9	13.6	0.3	3.6	3.7	10.5	10.5
Bolivia	AMR	6.9	7.3	18.8	0.6	20.5	2.2	13.6	0.7	4.4	3.8	10.6	10.6
Chile	AMR	7.5	7.9	20.4	3.8	22.3	4.3	14.8	0.3	3.9	2.2	6.2	6.2
Costa Rica	AMR	7.4	7.9	20.3	2.9	22.2	3.1	14.7	0.3	3.9	2.6	7.4	7.4
Dominican Republic	AMR	7.2	7.6	19.7	1.9	21.5	2.8	14.3	0.3	3.7	3.1	8.9	8.9
Ecuador	AMR	7.1	7.5	19.3	2.7	21.1	2.9	14.0	0.7	4.5	3.0	8.6	8.6
El Salvador	AMR	7.0	7.4	19.1	2.5	20.8	3.3	13.8	0.3	3.6	3.3	9.5	9.5

Table 5 (continued)

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression	Suicidal ideation	Epilepsy	Dementia	Alcohol Use	Illicit Substance Use		Childhood Disorders		
		Schizophrenia	Bipolar						Opioid Use	Other Drug Use	Intellectual Disabilities	Conduct/Behavioral	Emotional
Middle-income countries (lower-middle and upper-middle)													
Guatemala	AMR	6.5	6.9	17.7	1.0	19.3	2.0	12.8	0.7	4.1	4.4	12.4	12.4
Guyana	AMR	6.7	7.1	18.2	10.7	19.9	2.7	13.2	0.3	3.5	2.7	7.5	7.5
Honduras	AMR	6.7	7.2	18.4	2.1	20.1	2.0	13.4	0.3	3.5	4.0	11.2	11.2
Jamaica	AMR	7.3	7.7	19.9	1.4	21.7	3.9	14.4	0.3	3.8	3.0	8.4	8.4
Nicaragua	AMR	7.6	9.5	24.5	0.9	11.7	0.9	1.4	5.4	5.7	4.8	13.7	13.7
Panama	AMR	7.2	7.6	19.7	3.7	21.5	3.0	14.3	0.7	3.7	2.8	7.9	7.9
Paraguay	AMR	7.0	7.4	19.2	2.2	20.9	2.4	13.9	0.3	3.6	3.5	9.8	9.8
Suriname	AMR	7.0	7.5	19.3	6.5	21.0	2.9	14.0	0.3	3.7	2.7	7.6	7.6
Uruguay	AMR	7.2	7.6	19.6	5.7	21.4	6.9	14.2	0.3	3.7	2.0	5.6	5.6
Djibouti	EMR	7.8	8.8	25.1	2.1	12.0	1.2	1.5	5.6	1.9	5.1	14.5	14.5
Egypt	EMR	8.4	9.6	27.1	0.7	13.0	2.0	1.6	6.0	2.1	4.4	12.5	12.5
Iran	EMR	8.9	10.1	28.8	3.1	13.8	2.3	1.7	8.6	0.3	3.4	9.5	9.5
Iraq	EMR	7.1	8.0	22.8	6.1	10.9	1.3	1.3	5.1	1.7	5.3	15.2	15.2
Jordan	EMR	8.0	9.1	25.9	0.1	12.4	1.5	1.5	7.8	0.3	5.0	14.2	14.2
Morocco	EMR	8.9	8.2	23.6	4.6	7.9	5.4	17.5	0.3	1.8	3.3	9.3	9.3
Sudan	EMR	7.4	8.4	23.9	3.2	11.4	1.3	1.4	5.3	1.8	5.4	15.2	15.2
Tunisia	EMR	9.1	10.3	29.2	1.6	14.0	3.1	1.7	8.7	0.3	3.3	9.3	9.3
Albania	EUR	9.5	9.4	22.2	2.9	8.0	4.9	23.8	1.1	1.0	2.6	7.3	7.3
Armenia	EUR	9.8	9.7	23.0	1.6	8.3	6.9	24.7	1.1	1.1	2.1	5.9	5.9
Azerbaijan	EUR	9.8	9.7	23.0	0.5	8.3	3.9	24.7	1.1	1.1	2.7	7.6	7.6
Georgia	EUR	10.0	10.0	23.5	0.8	8.5	8.5	25.2	1.1	1.1	1.7	4.8	4.8
Kyrgyzstan	EUR	9.1	9.0	21.3	4.2	7.7	3.1	22.8	1.0	1.0	3.1	8.8	8.8
Latvia	EUR	9.2	9.1	21.6	9.7	7.8	8.9	23.2	2.2	0.5	1.2	3.3	3.3
Republic of Moldova	EUR	10.5	11.7	27.6	0.8	9.2	5.0	20.5	0.3	0.6	2.1	5.9	5.9
Ukraine	EUR	9.2	9.1	21.6	9.9	7.8	8.6	23.1	2.2	0.5	1.2	3.4	3.4
Bhutan	SEAR	7.7	9.0	24.7	5.6	12.2	2.1	8.4	2.0	1.3	4.1	11.5	11.5
India-Uttarakhand	SEAR	7.4	8.7	23.8	6.8	11.7	2.2	8.0	1.9	1.3	4.2	12.0	12.0
Maldives	SEAR	7.9	9.2	25.3	5.8	12.4	1.6	8.5	2.0	1.3	3.9	11.0	11.0

Table 5 (continued)

Country	WHO Region	Schizophrenia and other non-affective psychoses		Depression	Suicidal ideation	Epilepsy	Dementia	Alcohol Use	Illicit Substance Use		Childhood Disorders		
		Schizophrenia	Bipolar						Opioid Use	Other Drug Use	Intellectual Disabilities	Conduct/ Behavioral	Emotional
Middle-income countries (lower-middle and upper-middle)													
Sri Lanka	SEAR	8.0	9.4	25.9	12.3	12.7	3.3	8.7	0.5	1.4	2.7	7.6	7.6
Thailand	SEAR	8.8	10.4	28.5	4.9	14.0	3.8	9.6	0.6	1.5	2.7	7.6	7.6
Timor-Leste	SEAR	6.7	7.9	21.7	2.6	10.7	1.1	7.3	1.7	1.1	5.9	16.7	16.7
China-Hunan	WPR	9.0	10.4	23.7	6.9	7.9	8.3	17.6	0.3	4.3	1.7	5.0	5.0
Mongolia	WPR	8.6	8.9	20.2	6.1	7.3	4.0	21.7	2.1	3.7	2.6	7.4	7.4
Philippines	WPR	7.0	8.5	19.0	1.7	20.8	2.6	13.8	0.3	3.5	3.4	9.7	9.7
Average for middle-income countries		7.9	8.8	23.0	4.0	15.5	3.6	10.9	2.3	2.2	3.3	9.2	9.2
Average for low- and middle-income countries		7.5%	8.6%	22.4%	3.8%	14.7%	2.7%	8.9%	2.2%	2.4%	4.0%	11.3%	11.3%

* Derived from data in Table 3. The proportions are calculated within each LMIC (by row). Each row totals 100%.

Table 6. Total expected annual outpatient visits and inpatient days for target cases with MNS disorders in 58 LMIC

Country	WHO Region	Outpatient				Inpatient			
		Day care visits		Regular visits		Acute days		Community/res days	
		Visits	Visits per 100,000 total population	Visits	Visits per 100,000 total population	Days	Days per 100,000 total population	Days	Days per 100,000 total population
Low-income countries									
Benin	AFR	227,533	2,892	1,127,406	14,327	41,264	524	385,825	4,903
Burundi	AFR	210,684	2,856	1,021,948	13,853	40,257	546	321,345	4,356
Eritrea	AFR	125,776	2,811	609,921	13,630	24,248	542	187,373	4,187
Ethiopia	AFR	2,069,173	2,735	10,278,987	13,585	393,273	520	3,171,996	4,192
Nigeria	AFR	4,116,548	2,922	20,304,877	14,413	747,203	530	6,963,992	4,943
Uganda	AFR	725,895	2,529	3,837,450	13,370	135,524	472	1,090,488	3,799
Afghanistan	EMR	787,677	3,214	3,714,954	15,159	143,096	584	1,119,760	4,569
Pakistan	EMR	6,113,756	3,687	26,626,798	16,058	1,118,405	674	9,307,137	5,613
Somaliland	EMR	285,469	3,418	1,347,291	16,129	50,765	608	420,960	5,040
Tajikistan	EUR	282,297	4,318	977,914	14,957	56,561	865	438,550	6,708
Uzbekistan	EUR	1,259,933	4,787	4,117,843	15,645	252,594	960	2,049,365	7,786
Bangladesh	SEAR	6,071,443	3,965	23,536,423	15,371	1,168,551	763	9,362,100	6,114
Nepal	SEAR	1,003,846	3,688	4,058,976	14,911	191,565	704	1,550,946	5,698
Viet Nam	WPR	4,306,633	5,122	13,197,901	15,698	821,576	977	8,668,348	10,310
Average for LIC		1,970,476		8,197,049		370,349		3,217,013	
Population-weighted average for LIC			3,625		15,082		681		5,919
Middle-income countries (lower-middle and upper-middle)									
Congo	AFR	98,045	2,870	470,008	13,759	18,712	548	155,621	4,556
South Africa	AFR	1,586,135	3,299	7,030,452	14,625	306,077	637	2,572,867	5,352
Argentina	AMR	1,945,711	5,024	7,410,565	19,133	358,699	926	4,407,424	11,379
Belize	AMR	11,526	4,073	49,190	17,382	2,209	781	20,069	7,092
Bolivia	AMR	376,157	4,096	1,600,571	17,430	71,356	777	682,768	7,435
Chile	AMR	817,211	5,014	3,126,794	19,185	153,694	943	1,713,131	10,511
Costa Rica	AMR	203,202	4,693	800,601	18,490	38,935	899	387,972	8,960
Dominican Republic	AMR	419,451	4,399	1,701,944	17,848	80,192	841	789,923	8,284
Ecuador	AMR	588,271	4,503	2,407,091	18,424	110,517	846	1,139,062	8,718
El Salvador	AMR	262,289	4,328	1,079,048	17,806	49,378	815	514,767	8,495
Guatemala	AMR	483,357	3,803	2,154,043	16,948	90,685	713	866,079	6,814
Guyana	AMR	35,556	4,672	148,548	19,520	6,590	866	67,799	8,909
Honduras	AMR	272,691	3,957	1,178,312	17,099	52,051	755	479,451	6,958
Jamaica	AMR	121,725	4,566	482,046	18,081	22,944	861	249,568	9,361
Nicaragua	AMR	214,014	3,924	885,710	16,240	39,382	722	329,413	6,040
Panama	AMR	149,154	4,619	604,217	18,712	28,229	874	285,722	8,849
Paraguay	AMR	248,763	4,212	1,036,790	17,555	47,596	806	451,880	7,651
Suriname	AMR	23,170	4,662	93,982	18,910	4,368	879	44,368	8,927
Uruguay	AMR	178,562	5,367	668,468	20,092	31,843	957	447,327	13,445
Djibouti	EMR	29,319	3,647	126,828	15,775	5,433	676	43,040	5,353

Table 6 (continued)

Country	WHO Region	Outpatient				Inpatient			
		Day care visits		Regular visits		Acute days		Community/res days	
		Visits	Visits per 100,000 total population	Visits	Visits per 100,000 total population	Days	Days per 100,000 total population	Days	Days per 100,000 total population
Middle-income countries (lower-middle and upper-middle)									
Egypt	EMR	3,028,297	3,925	12,407,303	16,081	564,504	732	4,707,084	6,101
Iran	EMR	3,078,101	4,350	12,580,598	17,777	571,660	808	4,730,526	6,685
Iraq	EMR	997,955	3,534	4,516,096	15,992	180,349	639	1,500,348	5,313
Jordan	EMR	207,185	3,723	914,711	16,437	38,362	689	297,153	5,340
Morocco	EMR	1,384,912	4,542	4,531,227	14,860	259,852	852	2,871,661	9,417
Sudan	EMR	1,376,072	3,556	6,095,534	15,751	251,859	651	2,059,621	5,322
Tunisia	EMR	436,235	4,416	1,754,604	17,763	80,609	816	710,495	7,193
Albania	EUR	167,189	5,372	513,105	16,488	32,694	1,051	321,932	10,345
Armenia	EUR	177,604	5,795	517,331	16,879	34,179	1,115	382,309	12,473
Azerbaijan	EUR	442,434	5,240	1,348,880	15,974	88,512	1,048	786,935	9,319
Georgia	EUR	273,753	6,132	768,905	17,225	52,004	1,165	634,835	14,221
Kyrgyzstan	EUR	259,161	4,961	842,494	16,127	51,290	982	444,291	8,505
Latvia	EUR	153,971	6,718	460,104	20,074	27,995	1,221	374,359	16,333
Republic of Moldova	EUR	203,764	5,425	569,698	15,168	41,106	1,094	373,432	9,942
Ukraine	EUR	3,138,127	6,686	9,413,510	20,056	572,047	1,219	7,538,515	16,062
Bhutan	SEAR	25,803	3,976	100,192	15,438	4,925	759	41,301	6,364
India-Uttarakhand	SEAR	355,117	3,914	1,406,731	15,505	66,978	738	581,826	6,413
Maldives	SEAR	11,779	4,020	45,366	15,483	2,272	776	18,014	6,148
Sri Lanka	SEAR	894,301	4,579	3,165,927	16,209	169,823	869	1,594,982	8,166
Thailand	SEAR	3,012,829	4,569	10,091,324	15,303	586,161	889	5,397,358	8,185
Timor-Leste	SEAR	32,471	3,277	141,599	14,288	6,148	620	47,630	4,806
China-Hunan	WPR	386,420	6,108	1,093,757	17,290	70,963	1,122	927,511	14,662
Mongolia	WPR	139,841	5,486	458,015	17,968	26,438	1,037	269,208	10,561
Philippines	WPR	3,838,292	4,489	15,291,869	17,886	743,532	870	6,978,264	8,162
Average for MIC		729,225		2,774,638		137,344		1,346,315	
Population-weighted average for MIC			4,455		16,952		839		8,226
Average for LMIC		1,028,838		4,083,496		193,587		1,797,863	
Population-weighted average for LMIC			4,029		15,991		758		7,041

LIC – low-income country

MIC – middle-income country

LMIC – low- and middle-income countries

Table 8. Estimated full-time equivalent staff needed to treat mental disorders in 58 LMIC, 2005

Country	WHO Region	Psychiatrists			Nurses in mental health settings			Psychosocial Care Providers			Total FTE Staff Needed					
		FTE staff needed	Confidence interval*	per 100,000 population	FTE staff needed	Confidence interval*	per 100,000 population	FTE Staff Needed	Confidence Interval*	per 100,000 population	Total FTE Staff Needed	per 100,000 treated cases	Total per 100,000 population	Total per 100,000 treated cases		
Low-income countries																
Benin	AFR	81	(65-97)	1.0	44.1	746	(597-896)	9.5	408.1	679	(543-815)	8.6	371.1	1,506	19	823
Burundi	AFR	68	(55-82)	0.9	40.7	638	(511-766)	8.7	381.6	596	(477-715)	8.1	356.4	1,303	18	779
Eritrea	AFR	40	(32-48)	0.9	40.1	375	(300-450)	8.4	376.8	353	(282-423)	7.9	354.6	767	17	772
Ethiopia	AFR	674	(539-808)	0.9	40.0	6,312	(5,050-7,575)	8.3	374.6	5,942	(4,754-7,131)	7.9	352.6	12,928	17	767
Nigeria	AFR	1,456	(1,165-1,747)	1.0	44.2	13,473	(10,779-16,168)	9.6	409.1	12,240	(9,792-14,688)	8.7	371.6	27,169	19	825
Uganda	AFR	234	(187-280)	0.8	36.8	2,200	(1,760-2,640)	7.7	346.6	2,140	(1,712-2,568)	7.5	337.2	4,574	16	721
Afghanistan	EMR	239	(191-286)	1.0	43.7	2,254	(1,803-2,705)	9.2	412.5	2,134	(1,707-2,561)	8.7	390.5	4,627	19	847
Pakistan	EMR	1,950	(1,560-2,340)	1.2	50.7	18,211	(14,569-21,853)	11.0	473.4	16,323	(13,058-19,587)	9.8	424.3	36,484	22	948
Somalia	EMR	89	(71-107)	1.1	44.3	838	(671-1,006)	10.0	416.5	784	(627-941)	9.4	389.7	1,712	20	850
Tajikistan	EUR	90	(72-108)	1.4	49.8	836	(669-1,003)	12.8	460.6	683	(546-820)	10.4	376.4	1,609	25	887
Uzbekistan	EUR	418	(335-502)	1.6	54.5	3,844	(3,075-4,613)	14.6	501.0	3,038	(2,431-3,646)	11.5	396.0	7,301	28	951
Bangladesh	SEAR	1,943	(1,554-2,332)	1.3	50.6	18,054	(14,443-21,665)	11.8	469.8	15,407	(12,325-18,488)	10.1	400.9	35,404	23	921
Nepal	SEAR	323	(258-387)	1.2	48.5	3,002	(2,402-3,603)	11.0	451.2	2,601	(2,081-3,122)	9.6	390.9	5,927	22	891
Viet Nam	WPR	1,723	(1,379-2,068)	2.0	71.1	15,459	(12,367-18,551)	18.4	637.7	11,307	(9,045-13,568)	13.4	466.4	28,489	34	1,175
Population-weighted average or total for LIC		9,328		1.2	49.7	86,244		11.3	459.7	74,227		9.8	398.4	169,798	22	908
Middle-income countries (lower-middle and upper-middle)																
Congo	AFR	31	(24-37)	0.9	39.8	307	(246-369)	9.0	400.3	236	(189-284)	6.9	308.0	574	17	748
South Africa	AFR	494	(395-592)	1.0	43.2	4,983	(3,986-5,979)	10.4	436.3	3,699	(2,959-4,439)	7.7	323.9	9,175	19	803
Argentina	AMR	758	(607-910)	2.0	57.7	7,682	(6,146-9,219)	19.8	584.3	4,887	(3,910-5,865)	12.6	371.8	13,328	34	1,014
Belize	AMR	4	(3-4)	1.3	43.1	38	(30-45)	13.4	435.7	27	(22-33)	9.6	311.9	69	24	791
Bolivia	AMR	126	(101-151)	1.4	45.0	1,273	(1,018-1,528)	13.9	455.1	898	(719-1,078)	9.8	321.2	2,297	25	821
Chile	AMR	300	(240-360)	1.8	54.2	3,040	(2,432-3,649)	18.7	549.1	1,982	(1,585-2,378)	12.2	357.9	5,322	33	961
Costa Rica	AMR	70	(56-84)	1.6	49.4	707	(566-848)	16.3	500.2	478	(383-574)	11.1	338.5	1,255	29	888
Dominican Republic	AMR	143	(115-172)	1.5	47.7	1,450	(1,160-1,740)	15.2	482.8	995	(796-1,194)	10.4	331.4	2,588	27	862
Ecuador	AMR	205	(164-246)	1.6	48.7	2,077	(1,662-2,492)	15.9	492.2	1,418	(1,134-1,701)	10.9	355.9	3,700	28	877

Table 8 (continued)

Country	WHO Region	Psychiatrists			Nurses in mental health settings			Psychosocial Care Providers			Total FTE Staff Needed					
		FTE staff needed	Confidence interval*	per 100,000 population	FTE staff needed	Confidence interval*	per 100,000 population	FTE Staff Needed	Confidence Interval*	per 100,000 population	Total FTE Staff Needed	per 100,000 population	Total per 100,000 treated cases			
Middle-income countries (lower-middle and upper-middle)																
El Salvador	AMR	93	(74-111)	1.5	48.5	936	(749-1,124)	15.5	490.5	637	(510-765)	10.5	333.9	1,666	27	873
Guatemala	AMR	162	(129-194)	1.3	42.8	1,631	(1,305-1,957)	12.8	432.0	1,175	(940-1,409)	9.2	311.2	2,967	23	786
Guyana	AMR	12	(10-15)	1.6	46.2	124	(100-149)	16.3	467.6	86	(69-103)	11.3	323.0	223	29	837
Honduras	AMR	89	(72-107)	1.3	43.0	904	(723-1,085)	13.1	434.2	648	(518-777)	9.4	311.3	1,641	24	788
Jamaica	AMR	44	(35-53)	1.7	51.9	447	(358-537)	16.8	525.3	297	(237-356)	11.1	348.5	788	30	926
Nicaragua	AMR	63	(50-76)	1.2	49.4	639	(511-767)	11.7	500.7	471	(377-566)	8.6	369.2	1,174	22	919
Panama	AMR	52	(41-62)	1.6	48.8	522	(417-626)	16.2	493.6	356	(285-427)	11.0	336.9	930	29	879
Paraguay	AMR	83	(66-100)	1.4	45.4	840	(672-1,008)	14.2	459.0	589	(471-706)	10.0	321.6	1,512	26	826
Suriname	AMR	8	(6-10)	1.6	47.9	81	(65-97)	16.3	485.2	55	(44-66)	11.1	331.3	144	29	864
Uruguay	AMR	75	(60-90)	2.3	63.0	762	(609-914)	22.9	637.9	469	(375-562)	14.1	392.3	1,306	39	1,093
Djibouti	EMR	8	(7-10)	1.0	46.4	85	(68-102)	10.6	470.2	65	(52-78)	8.1	357.8	159	20	874
Egypt	EMR	897	(718-1,077)	1.2	51.4	9,099	(7,279-10,918)	11.8	521.7	6,663	(5,331-7,996)	8.6	382.0	16,659	22	955
Iran	EMR	904	(723-1,085)	1.3	54.3	9,169	(7,335-11,002)	13.0	550.3	6,734	(5,387-8,081)	9.5	404.2	16,807	24	1,009
Iraq	EMR	294	(235-353)	1.0	44.4	2,973	(2,379-3,568)	10.5	448.8	2,283	(1,826-2,739)	8.1	344.6	5,551	20	838
Jordan	EMR	59	(47-71)	1.1	47.5	596	(477-715)	10.7	480.3	460	(368-552)	8.3	371.1	1,115	20	899
Morocco	EMR	493	(394-592)	1.6	58.5	5,020	(4,016-6,024)	16.5	595.4	3,130	(2,504-3,757)	10.3	371.3	8,644	28	1,025
Sudan	EMR	403	(322-483)	1.0	45.6	4,075	(3,260-4,890)	10.5	461.6	3,108	(2,486-3,729)	8.0	352.1	7,585	20	859
Tunisia	EMR	133	(107-160)	1.3	57.6	1,351	(1,081-1,621)	13.7	584.3	968	(775-1,162)	9.8	418.9	2,453	25	1,061
Albania	EUR	56	(45-67)	1.8	58.0	569	(455-683)	18.3	591.7	355	(284-427)	11.4	369.7	980	32	1,019
Armenia	EUR	64	(51-77)	2.1	66.2	656	(525-788)	21.4	675.4	392	(314-470)	12.8	403.4	1,113	36	1,145
Azerbaijan	EUR	139	(111-167)	1.6	55.2	1,417	(1,133-1,700)	16.8	563.1	903	(723-1,084)	10.7	359.0	2,459	29	977
Georgia	EUR	105	(84-126)	2.4	72.5	1,071	(857-1,285)	24.0	739.6	621	(497-746)	13.9	429.2	1,797	40	1,241
Kyrgyzstan	EUR	80	(64-96)	1.5	50.6	813	(650-975)	15.6	515.6	534	(427-641)	10.2	338.9	1,426	27	905
Latvia	EUR	62	(49-74)	2.7	72.7	628	(503-754)	27.4	741.1	366	(293-439)	16.0	431.8	1,056	46	1,246
Republic of Moldova	EUR	65	(52-78)	1.7	62.8	662	(530-794)	17.6	642.3	408	(326-490)	10.9	395.9	1,135	30	1,101
Ukraine	EUR	1,245	(996-1,494)	2.7	71.8	12,684	(10,147-15,221)	27.0	731.3	7,421	(5,937-8,905)	15.8	427.9	21,350	45	1,231
Bhutan	SEAR	8	(6-9)	1.2	47.2	79	(63-94)	12.1	479.4	56	(45-67)	8.6	341.3	142	22	868

Table 8 (continued)

Country	WHO Region	Psychiatrists			Nurses in mental health settings			Psychosocial Care Providers			Total FTE Staff Needed					
		FTE staff needed	Confidence interval*	per 100,000 population	FTE staff needed	Confidence interval*	per 100,000 population	FTE Staff Needed	Confidence interval*	per 100,000 population	Total FTE Staff Needed	per 100,000 population	Total per 100,000 treated cases			
Middle-income countries (lower-middle and upper-middle)																
India-Uttarakhand	SEAR	109	(87-130)	1.2	46.9	1,103	(882-1,324)	12.2	476.3	785	(628-942)	8.7	338.9	1,997	22	862
Maldives	SEAR	3	(3-4)	1.2	46.2	35	(28-42)	11.8	468.8	25	(20-30)	8.5	337.6	63	22	853
Sri Lanka	SEAR	286	(229-344)	1.5	52.9	2,914	(2,331-3,497)	14.9	538.6	1,945	(1,556-2,334)	10.0	359.5	5,145	26	951
Thailand	SEAR	962	(769-1,154)	1.5	56.7	9,794	(7,835-11,752)	14.9	577.9	6,414	(5,131-7,697)	9.7	378.5	17,169	26	1,013
Timor-Leste	SEAR	9	(7-11)	0.9	40.1	95	(76-114)	9.6	405.3	72	(58-87)	7.3	309.2	176	18	755
China-Hunan	WPR	152	(122-183)	2.4	75.0	1,554	(1,243-1,864)	24.6	765.4	896	(717-1,075)	14.2	441.2	2,602	41	1,282
Mongolia	WPR	47	(38-56)	1.8	56.0	479	(383-574)	18.8	570.3	305	(244-366)	12.0	363.4	830	33	990
Philippines	WPR	1,274	(1,019-1,529)	1.5	47.6	12,896	(10,317-15,476)	15.1	482.2	8,894	(7,115-10,673)	10.4	332.5	23,065	27	862
Population-weighted average or total for MIC		10,669		1.5	52.7	108,258		15.0	534.8	73,209		10.2	365.8	192,136	27	953
Population-weighted average or total for LMIC		19,996		1.4	51.1	194,502		13.1	496.2	147,436		10.0	382.5	361,935	24	930

* Confidence interval was calculated by increasing and decreasing the inpatient and outpatient treatment services by 20%. The same confidence interval is produced if the MNS disorder prevalences were increased and decreased by 20%, or if target coverage rates were increased and decreased by 20%.

LIC - low income country

MIC - middle income country

LMIC - low and middle income countries.

Table 9. Shortage of mental health workers in 58 LMIC, 2005

Country	WHO Region	Psychiatrists				Nurses in mental health settings				Psychosocial Care Providers				Total FTE Staff			
		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE Staff Supply		Shortage		FTE Staff Supply		Shortage	
		per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N
Low-income countries																	
Benin	AFR	0.19	15	0.84	66	0.21	17	9.28	730	0.29	23	8.33	656	0.69	54	18.45	1,451
Burundi	AFR	0.01	1	0.91	67	0.42	31	8.23	607	1.13	83	6.95	513	1.57	116	16.09	1,187
Eritrea	AFR	0.06	2	0.84	37	0.33	15	8.04	360	0.44	20	7.44	333	0.83	37	16.31	730
Ethiopia	AFR	0.02	15	0.87	659	0.26	200	8.08	6,113	0.88	667	6.97	5,275	1.17	882	15.92	12,047
Nigeria	AFR	0.15	216	0.88	1,240	2.41	3,395	7.15	10,078	0.93	1,317	7.75	10,923	3.50	4,928	15.79	22,241
Uganda	AFR	0.08	23	0.73	211	0.79	226	6.88	1,974	0.27	77	7.19	2,063	1.14	326	14.80	4,247
Afghanistan	EMR	0.01	2	0.97	237	0.15	36	9.05	2,218	0.41	99	8.30	2,035	0.56	138	18.32	4,489
Pakistan	EMR	0.13	216	1.05	1,735	18.86	31,273	0.00	0	2.30	3,815	7.54	12,508	21.29	35,303	8.59	14,242
Somaliand	EMR	0.07	6	1.00	83	0.33	28	9.71	811	1.20	100	8.19	684	1.60	134	18.89	1,578
Tajikistan	EUR	1.12	73	0.26	17	1.93	126	10.86	710	6.33	414	4.12	269	9.38	613	15.23	996
Uzbekistan	EUR	3.56	936	0.00	0	6.54	1,722	8.06	2,122	6.37	1,676	5.17	1,362	16.47	4,335	13.24	3,484
Bangladesh	SEAR	0.07	112	1.20	1,831	0.20	301	11.59	17,753	0.22	340	9.84	15,066	0.49	752	22.63	34,651
Nepal	SEAR	0.13	35	1.06	288	0.27	75	10.76	2,928	0.19	52	9.36	2,549	0.59	162	21.18	5,765
Viet Nam	WPR	0.35	297	1.70	1,426	2.10	1,767	16.29	13,692	1.93	1,620	11.52	9,687	4.38	3,684	29.50	24,805
Population-weighted average for LIC		0.26	1,949	1.04	7,897	5.15	39,211	7.90	60,095	1.35	10,304	8.40	63,922	6.76	51,464	17.34	131,915
Total for LIC			1,949		7,897		39,211		60,095		10,304		63,922		51,464		131,915
Middle-income countries (lower-middle and upper-middle)																	
Congo	AFR	0.11	4	0.79	27	0.70	24	8.29	283	1.05	36	5.87	200	1.86	63	14.95	511
South Africa	AFR	0.28	133	0.75	361	10.08	4,848	0.28	135	1.58	762	6.11	2,937	12	5,742	7	3,433
Argentina	AMR	9.20	3,563	0.00	0	12.91	5,000	6.92	2,682	13.19	5,108	0.00	0	35	13,672	7	2,682
Belize	AMR	0.66	2	0.66	2	7.97	23	5.41	15	9.29	26	0.29	1	18	51	6	18
Bolivia	AMR	1.06	97	0.31	29	0.35	32	13.51	1,241	2.57	236	7.21	662	4	365	21	1,932
Chile	AMR	4.65	758	0.00	0	1.65	270	17.00	2,771	14.25	2,323	0.00	0	21	3,350	17	2,771
Costa Rica	AMR	3.06	132	0.00	0	4.13	179	12.20	528	12.22	529	0.00	0	19	840	12	528
Dominican Republic	AMR	2.08	198	0.00	0	1.61	154	13.59	1,296	8.01	764	2.42	231	12	1,116	16	1,527
Ecuador	AMR	2.51	328	0.00	0	0.93	122	14.97	1,956	5.84	763	5.01	655	9	1,212	20	2,610

Table 9 (continued)

Country	WHO Region	Psychiatrists				Nurses in mental health settings				Psychosocial Care Providers				Total FTE Staff			
		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE Staff Supply		Shortage		FTE Staff Supply		Shortage	
		per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N
Middle-income countries (lower-middle and upper-middle)																	
El Salvador	AMR	1.39	84	0.14	8	2.12	128	13.33	808	6.51	395	4.01	243	10	607	17	1,059
Guatemala	AMR	0.57	73	0.70	89	1.28	162	11.55	1,469	0.57	73	8.67	1,102	2	308	21	2,659
Guyana	AMR	0.53	4	1.09	8	0.40	3	15.94	121	8.66	66	2.63	20	10	73	20	150
Honduras	AMR	0.82	57	0.48	33	2.58	178	10.54	726	2.70	186	6.70	461	6	421	18	1,220
Jamaica	AMR	1.13	30	0.53	14	9.55	255	7.22	192	16.09	429	0.00	0	27	714	8	207
Nicaragua	AMR	0.91	49	0.25	14	1.71	93	10.01	546	5.37	293	3.27	179	8	435	14	738
Panama	AMR	3.47	112	0.00	0	4.38	141	11.78	380	8.83	285	2.20	71	17	538	14	451
Paraguay	AMR	1.31	77	0.10	6	1.58	93	12.65	747	3.96	234	6.01	355	7	404	19	1,108
Suriname	AMR	1.45	7	0.16	1	13.96	69	2.35	12	34.38	171	0.00	0	50	247	3	12
Uruguay	AMR	19.36	644	0.00	0	0.69	23	22.20	739	10.57	352	3.52	117	31	1,019	26	856
Djibouti	EMR	0.33	3	0.72	6	0.83	7	9.79	79	0.33	3	7.75	62	1	12	18	147
Egypt	EMR	1.44	1,113	0.00	0	2.60	2,010	9.19	7,089	1.03	796	7.60	5,867	5	3,919	17	12,956
Iran	EMR	1.19	839	0.09	65	7.82	5,536	5.13	3,633	52.17	36,922	0.00	0	61	43,296	5	3,698
Iraq	EMR	0.34	95	0.70	199	0.54	152	9.99	2,822	0.65	184	7.43	2,099	2	431	18	5,120
Jordan	EMR	1.14	63	0.00	0	3.95	220	6.75	376	1.94	108	6.33	352	7	391	13	728
Morocco	EMR	1.02	312	0.59	181	2.17	661	14.30	4,359	1.71	520	8.56	2,610	5	1,493	23	7,150
Sudan	EMR	0.06	23	0.98	380	0.01	5	10.52	4,070	0.75	290	7.28	2,818	1	318	19	7,267
Tunisia	EMR	1.53	151	0.00	0	3.71	367	9.97	984	2.97	293	6.84	675	8	811	17	1,660
Albania	EUR	3.20	100	0.00	0	7.00	218	11.28	351	3.93	122	7.49	233	14	440	19	584
Armenia	EUR	5.88	180	0.00	0	5.42	166	16.00	490	22.91	702	0.00	0	34	1,049	16	490
Azerbaijan	EUR	5.18	437	0.00	0	8.36	706	8.42	711	8.63	729	2.07	175	22	1,872	10	886
Georgia	EUR	5.90	263	0.00	0	7.71	344	16.28	727	22.88	1,022	0.00	0	36	1,629	16	727
Kyrgyzstan	EUR	3.41	178	0.00	0	9.24	483	6.32	330	13.57	709	0.00	0	26	1,370	6	330
Latvia	EUR	8.31	191	0.00	0	35.72	819	0.00	0	28.52	654	0.00	0	73	1,663	0	0
Republic of Moldova	EUR	4.78	180	0.00	0	15.35	577	2.27	85	29.51	1,109	0.00	0	50	1,865	2	85
Ukraine	EUR	8.66	4,066	0.00	0	26.20	12,299	0.82	385	42.47	19,935	0.00	0	77	36,300	1	385
Bhutan	SEAR	0.45	3	0.75	5	1.49	10	10.63	69	2.86	19	5.77	37	5	31	17	111
India-Uttarakhand	SEAR	0.08	7	1.12	101	4.78	434	7.38	669	2.87	260	5.78	525	8	701	14	1,295

Table 9 (continued)

Country	WHO Region	Psychiatrists				Nurses in mental health settings				Psychosocial Care Providers				Total FTE Staff			
		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE Staff Supply		Shortage		FTE Staff Supply		Shortage	
		per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N
Middle-income countries (lower-middle and upper-middle)																	
Maldives	SEAR	0.69	2	0.48	1	1.38	4	10.46	31	2.42	7	6.11	18	4	13	17	50
Sri Lanka	SEAR	0.18	35	1.29	251	1.91	372	13.01	2,542	3.55	693	6.41	1,252	6	1,101	21	4,045
Thailand	SEAR	0.66	438	0.79	524	3.81	2,515	11.04	7,278	2.81	1,856	6.91	4,559	7	4,809	19	12,361
Timor-Leste	SEAR	0.11	1	0.84	8	15.32	152	0.00	0	6.80	67	0.50	5	22	220	1	13
China-Hunan	WPR	1.41	89	1.00	63	3.19	202	21.37	1,352	4.13	261	10.03	634	9	552	32	2,050
Mongolia	WPR	0.51	13	1.33	34	7.62	194	11.15	284	8.49	216	3.47	89	17	424	16	407
Philippines	WPR	0.42	358	1.07	916	0.91	780	14.17	12,116	2.11	1,804	8.29	7,090	3	2,943	24	20,121
Population-weighted average for MIC		2.15		0.46		5.70		9.37		11.43		5.05		19.28		14.88	
Total for MIC			15,494		3,324		41,026		67,479		82,311		36,333		138,832		107,137
Population-weighted average for LMIC		1.18		0.76		5.42		8.61		6.25		6.77		12.85		16.14	
Total for LMIC			17,443		11,222		80,237		127,575		92,615		100,256		190,296		239,052

Notes:

When a country had a surplus of a particular type of health worker, the shortage was set equal to zero for that worker type.

When WHO-AIMS did not have supply data for a worker type, the WHO regional average per capita supply for that country's income level was used. Benin, Nigeria, Pakistan, Uzbekistan, Nepal, Paraguay, Uruguay, Egypt, Jordan, Armenia, Georgia, Bhutan, India Uttarakhand, Sri Lanka and China Hunan had missing values for at least one of psychosocial care providers. India Uttarakhand had a missing value for nurses.

LIC – low-income country

MIC – middle-income country

LMIC – low- and middle-income countries.

Table 11. Scaling-up cost (wage bill) estimates to remove current shortage of mental health workers in 58 LMIC in 2005 (In thousands of 2005 US dollars)

Country	WHO Region	Psychiatrists		Nurses in mental health settings		Psychosocial Care Providers		Total FTE Staff
		Annual average wage	Scale-up costs	Annual average wage	Scale-up costs	Annual average wage	Scale-up costs	Scale-up costs
Low-income countries								
Benin	AFR	7,435	489	3,059	2,233	3,059	2,006	4,728
Burundi	AFR	5,547	373	2,282	1,386	2,282	1,170	2,929
Eritrea	AFR	4,811	180	1,979	712	1,979	659	1,551
Ethiopia	AFR	3,741	2,465	1,539	9,410	1,539	8,120	19,996
Nigeria	AFR	11,961	14,834	4,921	49,595	4,921	53,754	118,183
Uganda	AFR	9,059	1,907	3,727	7,356	3,727	7,690	16,953
Afghanistan	EMR	3,525	835	1,450	3,217	1,450	2,951	7,002
Pakistan	EMR	7,080	12,283	2,913	0	2,913	36,437	48,720
Somaliland	EMR	2,700	225	1,111	900	1,111	760	1,885
Tajikistan	EUR	1,524	26	627	445	627	169	640
Uzbekistan	EUR	1,907	0	785	1,665	785	1,069	2,734
Bangladesh	SEAR	4,560	8,351	1,876	33,306	1,876	28,265	69,921
Nepal	SEAR	3,954	1,138	1,627	4,763	1,627	4,147	10,048
Viet Nam	WPR	3,846	5,484	1,582	21,665	1,582	15,327	42,475
Scale-up costs for 14 low-income countries			48,588		136,652		162,523	347,764
Middle-income countries (lower-middle and upper-middle)								
Congo	AFR	13,313	359	5,477	1,552	5,477	1,098	3,009
South Africa	AFR	24,153	8,715	9,938	1,340	9,938	29,187	39,243
Argentina	AMR	17,581	0	7,234	19,400	7,234	0	19,400
Belize	AMR	16,635	31	6,844	105	6,844	6	142
Bolivia	AMR	8,399	240	3,455	4,288	3,455	2,289	6,817
Chile	AMR	21,046	0	8,659	23,992	8,659	0	23,992
Costa Rica	AMR	16,448	0	6,767	3,574	6,767	0	3,574
Dominican Republic	AMR	16,137	0	6,639	8,605	6,639	1,534	10,139
Ecuador	AMR	13,786	0	5,672	11,092	5,672	3,713	14,805
El Salvador	AMR	13,020	108	5,357	4,329	5,357	1,301	5,738
Guatemala	AMR	14,191	1,257	5,839	8,575	5,839	6,432	16,263
Guyana	AMR	10,508	87	4,323	525	4,323	86	698
Honduras	AMR	9,415	310	3,874	2,812	3,874	1,788	4,910
Jamaica	AMR	17,752	249	7,304	1,406	7,304	0	1,655
Nicaragua	AMR	7,907	107	3,253	1,777	3,253	581	2,465
Panama	AMR	17,145	0	7,054	2,683	7,054	502	3,185
Paraguay	AMR	9,478	56	3,900	2,913	3,900	1,383	4,352
Suriname	AMR	15,876	13	6,532	76	6,532	0	89
Uruguay	AMR	18,217	0	7,495	5,537	7,495	877	6,414
Djibouti	EMR	5,986	35	2,463	194	2,463	153	382
Egypt	EMR	10,602	0	4,362	30,923	4,362	25,592	56,515
Iran	EMR	15,063	982	6,198	22,516	6,198	0	23,498

Table 11 (continued)

Country	WHO Region	Psychiatrists		Nurses in mental health settings		Psychosocial Care Providers		Total FTE Staff
		Annual average wage	Scale-up costs	Annual average wage	Scale-up costs	Annual average wage	Scale-up costs	Scale-up costs
Middle-income countries (lower-middle and upper-middle)								
Iraq	EMR	8,358	1,663	3,439	9,704	3,439	7,218	18,585
Jordan	EMR	14,427	0	5,936	2,231	5,936	2,091	4,322
Morocco	EMR	10,353	1,873	4,259	18,567	4,259	11,118	31,558
Sudan	EMR	7,497	2,846	3,085	12,554	3,085	8,691	24,092
Tunisia	EMR	15,622	0	6,428	6,327	6,428	4,340	10,667
Albania	EUR	8,661	0	3,563	1,251	3,563	831	2,082
Armenia	EUR	5,462	0	2,247	1,102	2,247	0	1,102
Azerbaijan	EUR	5,402	0	2,222	1,581	2,222	388	1,969
Georgia	EUR	5,032	0	2,070	1,504	2,070	0	1,504
Kyrgyzstan	EUR	1,754	0	722	238	722	0	238
Latvia	EUR	20,603	0	8,477	0	8,477	0	0
Republic of Moldova	EUR	2,520	0	1,037	89	1,037	0	89
Ukraine	EUR	5,778	0	2,377	916	2,377	0	916
Bhutan	SEAR	5,348	26	2,200	152	2,200	82	260
India-Uttarakhand	SEAR	5,763	583	2,371	1,587	2,371	1,244	3,414
Maldives	SEAR	8,717	12	3,586	110	3,586	64	186
Sri Lanka	SEAR	6,528	1,640	2,686	6,826	2,686	3,363	11,829
Thailand	SEAR	7,401	3,875	3,045	22,162	3,045	13,880	39,917
Timor-Leste	SEAR	2,871	24	1,181	0	1,181	6	30
China-Hunan	WPR	5,941	376	2,444	3,304	2,444	1,551	5,231
Mongolia	WPR	4,021	136	1,654	470	1,654	146	753
Philippines	WPR	6,817	6,242	2,805	33,984	2,805	19,886	60,112
Scale-up costs for 44 middle-income countries			31,845		282,871		151,423	466,139
Scale-up costs for 58 LMIC			80,433		419,523		313,947	813,903

Note:

When a country had a surplus of a particular type of health worker, the wage bill cost was set equal to zero for that worker type.

Table 12. Expected full-time equivalent staff needed to treat mental disorders for 58 LMIC, 2015

Country	WHO Region	Psychiatrists		Nurses in mental health settings		Psychosocial care providers		Total FTE staff needed	
		FTE staff needed	per 100,000 population	FTE staff needed	per 100,000 population	FTE staff needed	per 100,000 population	FTE staff needed	per 100,000 population
Low-income countries									
Benin	AFR	110	1.04	1,023	9.609	928	8.71	2,061	19.36
Burundi	AFR	92	0.97	858	9.115	788	8.37	1,738	18.46
Eritrea	AFR	54	0.90	510	8.488	478	7.95	1,042	17.34
Ethiopia	AFR	893	0.93	8,355	8.682	7,756	8.06	17,004	17.67
Nigeria	AFR	1,861	1.06	17,222	9.789	15,539	8.83	34,623	19.68
Uganda	AFR	325	0.82	3,065	7.719	2,978	7.50	6,368	16.04
Afghanistan	EMR	347	1.01	3,272	9.555	3,059	8.93	6,678	19.50
Pakistan	EMR	2,542	1.24	23,694	11.530	20,950	10.19	47,186	22.96
Somaliland	EMR	114	1.06	1,073	10.000	1,006	9.38	2,194	20.44
Tajikistan	EUR	114	1.47	1,055	13.600	849	10.94	2,019	26.01
Uzbekistan	EUR	507	1.72	4,655	15.803	3,611	12.26	8,773	29.78
Bangladesh	SEAR	2,604	1.49	23,914	13.648	19,489	11.12	46,007	26.26
Nepal	SEAR	414	1.28	3,852	11.853	3,275	10.07	7,542	23.20
Viet Nam	WPR	2,026	2.16	18,185	19.418	13,169	14.06	33,379	35.64
Population-weighted average for LIC			1.29		11.95		10.13		23.37
Total for LIC		12,005		110,734		93,874		216,613	
Middle-income countries (lower-middle and upper-middle)									
Congo	AFR	39	0.91	389	9.211	298	7.04	725	17.17
South Africa	AFR	559	1.08	5,642	10.917	4,112	7.96	10,312	19.95
Argentina	AMR	874	2.05	8,856	20.814	5,571	13.09	15,300	35.96
Belize	AMR	5	1.43	50	14.425	35	10.16	89	26.01
Bolivia	AMR	158	1.46	1,601	14.751	1,114	10.27	2,874	26.48
Chile	AMR	359	2.00	3,643	20.323	2,324	12.97	6,327	35.29
Costa Rica	AMR	87	1.76	882	17.797	584	11.79	1,554	31.34
Dominican Republic	AMR	173	1.59	1,749	16.093	1,184	10.89	3,106	28.58
Ecuador	AMR	248	1.70	2,515	17.229	1,682	11.52	4,445	30.45
El Salvador	AMR	108	1.69	1,090	17.087	726	11.37	1,924	30.14
Guatemala	AMR	215	1.33	2,174	13.396	1,552	9.57	3,941	24.29
Guyana	AMR	13	1.77	135	17.919	91	12.10	240	31.79
Honduras	AMR	117	1.39	1,181	14.079	834	9.94	2,131	25.41
Jamaica	AMR	48	1.72	485	17.408	320	11.50	853	30.62
Nicaragua	AMR	78	1.24	790	12.608	572	9.13	1,440	22.98
Panama	AMR	64	1.70	649	17.207	436	11.55	1,149	30.46
Paraguay	AMR	105	1.50	1,064	15.190	734	10.47	1,903	27.16
Suriname	AMR	9	1.70	94	17.202	63	11.61	167	30.51
Uruguay	AMR	77	2.25	782	22.788	483	14.09	1,342	39.13

Table 12 (continued)

Country	WHO Region	Psychiatrists		Nurses in mental health settings		Psychosocial care providers		Total FTE staff needed	
		FTE staff needed	per 100,000 population	FTE staff needed	per 100,000 population	FTE staff needed	per 100,000 population	FTE staff needed	per 100,000 population
Middle-income countries (lower-middle and upper-middle)									
Djibouti	EMR	11	1.13	109	11.428	81	8.51	201	21.07
Egypt	EMR	1,109	1.21	11,255	12.263	8,146	8.88	20,510	22.35
Iran	EMR	1,026	1.29	10,414	13.107	7,648	9.63	19,088	24.02
Iraq	EMR	389	1.08	3,933	10.960	2,996	8.35	7,318	20.39
Jordan	EMR	79	1.13	796	11.435	604	8.68	1,478	21.24
Morocco	EMR	584	1.70	5,952	17.338	3,666	10.68	10,202	29.72
Sudan	EMR	529	1.11	5,358	11.226	4,014	8.41	9,901	20.74
Tunisia	EMR	152	1.40	1,547	14.210	1,100	10.11	2,799	25.72
Albania	EUR	70	2.14	711	21.825	424	13.03	1,205	36.99
Armenia	EUR	66	2.09	671	21.362	401	12.78	1,137	36.23
Azerbaijan	EUR	159	1.69	1,625	17.238	1,030	10.93	2,814	29.86
Georgia	EUR	101	2.48	1,031	25.250	591	14.48	1,723	42.21
Kyrgyzstan	EUR	91	1.56	933	15.879	612	10.41	1,637	27.85
Latvia	EUR	62	2.83	633	28.804	364	16.56	1,059	48.19
Republic of Moldova	EUR	63	1.83	649	18.747	393	11.37	1,106	31.95
Ukraine	EUR	1,192	2.70	12,146	27.502	7,071	16.01	20,410	46.21
Bhutan	SEAR	10	1.28	100	12.984	70	9.09	180	23.35
India-Uttarakhand	SEAR	130	1.26	1,321	12.787	929	8.99	2,380	23.04
Maldives	SEAR	4	1.27	44	12.954	31	9.12	79	23.35
Sri Lanka	SEAR	323	1.52	3,283	15.512	2,162	10.22	5,769	27.25
Thailand	SEAR	1,048	1.50	10,680	15.271	6,947	9.93	18,675	26.70
Timor-Leste	SEAR	14	0.98	137	9.897	104	7.48	254	18.35
China-Hunan	WPR	175	2.57	1,783	26.204	1,014	14.90	2,971	43.67
Mongolia	WPR	56	1.96	571	20.010	359	12.58	987	34.55
Philippines	WPR	1,626	1.60	16,480	16.199	11,163	10.97	29,270	28.77
Population-weighted average for MIC			1.53		15.50		10.42		27.44
Total for MIC		12,406		125,932		84,636		222,974	
Population-weighted average for LMIC			1.40		13.61		10.26		25.27
Total for LMIC		24,410		236,667		178,510		439,587	

LIC – low-income country

MIC – middle-income country

LMIC – low- and middle-income countries

Table 13. Shortage of mental health workers in 58 LMIC, 2015

Country	WHO Region	Psychiatrists per 100,000				Nurses in mental health settings per 100,000				Psychosocial care providers per 100,000				Total FTE staff			
		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE staff supply		Shortage	
		per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N
Low-income countries																	
Benin	AFR	0.19	15	0.97	103	0.21	17	10.68	1,138	0.29	23	10.94	1,165	0.69	54	22.59	2,406
Burundi	AFR	0.01	1	1.07	101	0.42	31	9.82	925	1.13	83	9.46	890	1.57	116	20.35	1,915
Eritrea	AFR	0.06	2	0.97	58	0.33	15	9.40	565	0.44	20	9.96	598	0.83	37	20.33	1,221
Ethiopia	AFR	0.02	15	1.03	991	0.26	200	9.68	9,319	0.88	667	9.66	9,296	1.17	882	20.37	19,606
Nigeria	AFR	0.15	216	1.03	1,804	2.41	3,395	8.64	15,192	0.93	1,317	10.36	18,228	3.50	4,928	20.02	35,224
Uganda	AFR	0.08	23	0.88	349	0.79	226	8.39	3,333	0.27	77	10.10	4,010	1.14	326	19.37	7,692
Afghanistan	EMR	0.01	2	1.14	389	0.15	36	10.78	3,690	0.41	99	11.21	3,840	0.56	138	23.12	7,919
Pakistan	EMR	0.13	216	1.21	2,486	18.86	31,273	0.00	0	2.30	3,815	10.00	20,554	21.29	35,303	11.21	23,041
Somaliand	EMR	0.07	6	1.12	121	0.33	28	11.03	1,183	1.20	100	10.84	1,163	1.60	134	22.98	2,467
Tajikistan	EUR	1.12	73	0.45	35	1.93	126	12.72	987	6.33	414	6.66	517	9.38	613	19.83	1,539
Uzbekistan	EUR	3.56	936	0.00	0	6.54	1,722	10.08	2,968	6.37	1,676	7.49	2,206	16.47	4,335	17.56	5,174
Bangladesh	SEAR	0.07	112	1.50	2,621	0.20	301	14.31	25,078	0.22	340	12.59	22,059	0.49	752	28.40	49,757
Nepal	SEAR	0.13	35	1.24	404	0.27	75	12.58	4,088	0.19	52	11.84	3,849	0.59	162	25.66	8,340
Viet Nam	WPR	0.35	297	1.88	1,758	2.10	1,767	18.02	16,879	1.93	1,620	13.52	12,663	4.38	3,684	33.42	31,300
Population-weighted average for LIC		0.24		1.21		5.20		9.21		1.34		10.90		6.78		21.32	
Total for LIC			1,949		11,220		39,211		85,343		10,304		101,038		51,464		197,601
Middle-income countries (lower-middle and upper-middle)																	
Congo	AFR	0.11	4	0.95	40	0.70	24	9.84	416	1.05	36	7.98	337	1.86	63	18.77	793
South Africa	AFR	0.28	133	0.92	473	10.08	4,848	1.86	962	1.58	762	7.91	4,087	11.95	5,742	10.68	5,522
Argentina	AMR	9.20	3,563	0.00	0	12.91	5,000	8.73	3,715	13.19	5,108	1.14	485	35.30	13,672	9.87	4,200
Belize	AMR	0.66	2	0.88	3	7.97	23	7.56	26	9.29	26	2.52	9	17.92	51	10.96	38
Bolivia	AMR	1.06	97	0.52	57	0.35	32	15.57	1,690	2.57	236	9.44	1,024	3.98	365	25.53	2,771
Chile	AMR	4.65	758	0.00	0	1.65	270	19.40	3,477	14.25	2,323	0.00	0	20.56	3,350	19.40	3,477
Costa Rica	AMR	3.06	132	0.00	0	4.13	179	14.48	718	12.22	529	0.79	39	19.41	840	15.27	757
Dominican Republic	AMR	2.08	198	0.00	0	1.61	154	15.51	1,685	8.01	764	4.41	479	11.70	1,116	19.92	2,165

Table 13 (continued)

Country	WHO Region	Psychiatrists per 100,000				Nurses in mental health settings per 100,000				Psychosocial care providers per 100,000				Total FTE staff			
		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE staff supply		Shortage	
		per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N
Middle-income countries (lower-middle and upper-middle)																	
Ecuador	AMR	2.51	328	0.00	0	0.93	122	17.28	2,522	5.84	763	7.15	1,043	9.28	1,212	24.42	3,565
El Salvador	AMR	1.39	84	0.40	0	2.12	128	15.96	1,018	6.51	395	6.33	404	10.02	607	22.69	1,422
Guatemala	AMR	0.57	73	0.90	146	1.28	162	13.49	2,189	0.57	73	11.04	1,791	2.43	308	25.43	4,127
Guyana	AMR	0.53	4	1.34	10	0.40	3	18.41	139	8.66	66	4.78	36	9.59	73	24.53	185
Honduras	AMR	0.82	57	0.70	59	2.58	178	12.68	1,064	2.70	186	9.00	755	6.10	421	22.39	1,878
Jamaica	AMR	1.13	30	0.69	19	9.55	255	8.79	245	16.09	429	0.00	0	26.77	714	9.48	264
Nicaragua	AMR	0.91	49	0.45	29	1.71	93	12.01	753	5.37	293	5.42	340	7.98	435	17.89	1,121
Panama	AMR	3.47	112	0.00	0	4.38	141	13.77	520	8.83	285	4.14	156	16.68	538	17.91	676
Paraguay	AMR	1.31	77	0.31	22	1.58	93	14.71	1,031	3.96	234	8.15	571	6.84	404	23.17	1,623
Suriname	AMR	1.45	7	0.35	2	13.96	69	4.16	23	34.38	171	0.00	0	49.79	247	4.51	25
Uruguay	AMR	19.36	644	0.00	0	0.69	23	22.84	783	10.57	352	4.63	159	30.62	1,019	27.47	942
Djibouti	EMR	0.33	3	0.92	9	0.83	7	11.76	112	0.33	3	9.92	94	1.49	12	22.61	215
Egypt	EMR	1.44	1,113	0.00	0	2.60	2,010	10.74	9,856	1.03	796	9.46	8,679	5.08	3,919	20.19	18,535
Iran	EMR	1.19	839	0.20	0	7.82	5,536	6.13	4,867	52.17	36,922	0.00	0	61.18	43,296	6.32	4,867
Iraq	EMR	0.34	95	0.89	318	0.54	152	11.73	4,208	0.65	184	9.64	3,461	1.53	431	22.26	7,987
Jordan	EMR	1.14	63	0.11	0	3.95	220	8.61	599	1.94	108	8.42	586	7.03	391	17.14	1,185
Morocco	EMR	1.02	312	0.78	267	2.17	661	16.10	5,528	1.71	520	10.36	3,558	4.90	1,493	27.24	9,353
Sudan	EMR	0.06	23	1.18	565	0.01	5	12.47	5,954	0.75	290	9.54	4,553	0.82	318	23.20	11,073
Tunisia	EMR	1.53	151	0.00	0	3.71	367	11.26	1,226	2.97	293	8.28	901	8.21	811	19.54	2,127
Albania	EUR	3.20	100	0.00	0	7.00	218	15.55	506	3.93	122	10.18	331	14.13	440	25.72	838
Armenia	EUR	5.88	180	0.00	0	5.42	166	16.68	523	22.91	702	0.00	0	34.21	1,049	16.68	523
Azerbaijan	EUR	5.18	437	0.00	0	8.36	706	9.72	916	8.63	729	3.55	334	22.17	1,872	13.26	1,250
Georgia	EUR	5.90	263	0.00	0	7.71	344	18.14	741	22.88	1,022	0.00	0	36.49	1,629	18.14	741
Kyrgyzstan	EUR	3.41	178	0.00	0	9.24	483	7.62	448	13.57	709	0.00	0	26.22	1,370	7.62	448
Latvia	EUR	8.31	191	0.00	0	35.72	819	0.00	0	28.52	654	0.00	0	72.56	1,663	0.00	0
Republic of Moldova	EUR	4.78	180	0.00	0	15.35	577	3.99	138	29.51	1,109	0.00	0	49.65	1,865	3.99	138
Ukraine	EUR	8.66	4,066	0.00	0	26.20	12,299	1.82	802	42.47	19,935	0.00	0	77.34	36,300	1.82	802

Table 13 (continued)

Country	WHO Region	Psychiatrists per 100,000				Nurses in mental health settings per 100,000				Psychosocial care providers per 100,000				Total FTE staff			
		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE staff supply		Shortage		FTE staff supply		Shortage	
		N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000	N	per 100,000
Middle-income countries (lower-middle and upper-middle)																	
Bhutan	SEAR	0.45	3	0.93	7	1.49	10	12.46	96	2.86	19	7.67	59	4.79	31	21.07	162
India-Uttarakhand	SEAR	0.08	7	1.29	134	4.78	434	9.10	940	2.87	260	7.75	801	7.73	701	18.14	1,875
Maldives	SEAR	0.69	2	0.68	2	1.38	4	12.44	42	2.42	7	7.99	27	4.49	13	21.11	71
Sri Lanka	SEAR	0.18	35	1.44	304	1.91	372	14.46	3,060	3.55	693	7.94	1,680	5.64	1,101	23.83	5,044
Thailand	SEAR	0.66	438	0.91	638	3.81	2,515	12.18	8,517	2.81	1,856	8.19	5,730	7.29	4,809	21.28	14,885
Timor-Leste	SEAR	0.11	1	1.03	14	15.32	152	0.00	0	6.80	67	2.92	40	22.22	220	3.95	55
China-Hunan	WPR	1.41	89	1.22	83	3.19	202	23.57	1,603	4.13	261	11.61	790	8.73	552	36.40	2,476
Mongolia	WPR	0.51	13	1.54	44	7.62	194	13.24	378	8.49	216	5.36	153	16.62	424	20.14	575
Philippines	WPR	0.42	358	1.30	1,321	0.91	780	16.38	16,669	2.11	1,804	10.50	10,683	3.44	2,943	28.18	28,672
Population-weighted average for MIC		2.03		0.59		5.32		11.16		10.84		6.67		18.19		18.42	
Total for MIC			15,494		4,567		41,026		90,704		82,311		54,174		138,832		149,445
Population-weighted average for LMIC		1.08		0.92		5.26		10.12		5.77		8.92		12.11		19.96	
Total for LMIC			17,443		15,787		80,237		176,047		92,615		155,213		190,296		347,046

Notes:

When a country had a surplus of a particular type of health worker, the shortage was set equal to zero for that worker type.

When WHO-AIMS did not have supply data for a worker type, the WHO regional average per capita supply for that country's income level was used. Benin, Nigeria, Pakistan, Uzbekistan, Nepal, Paraguay, Uruguay, Egypt, Jordan, Armenia, Georgia, Bhutan, India Uttarakhand, Sri Lanka and China Hunan had missing values for at least one of psychosocial care providers. India Uttarakhand had a missing value for nurses.

LIC – low-income country

MIC – middle-income country

LMIC – low- and middle-income countries.

Table 14. Scaling-up cost (wage bill) estimates to remove shortage of mental health workers in 58 LMIC in 2015 (in thousands of 2005 US dollars)

Country	WHO Region	Psychiatrists	Nurses in mental health settings	Psychosocial care providers	Total FTE staff
Low-income countries					
Benin	AFR	769	3,480	3,564	7,812
Burundi	AFR	558	2,110	2,031	4,700
Eritrea	AFR	280	1,118	1,184	2,582
Ethiopia	AFR	3,708	14,345	14,310	32,363
Nigeria	AFR	21,577	74,759	89,703	186,040
Uganda	AFR	3,159	12,422	14,948	30,529
Afghanistan	EMR	1,373	5,352	5,569	12,295
Pakistan	EMR	17,605	0	59,878	77,483
Somaliland	EMR	325	1,314	1,292	2,931
Tajikistan	EUR	53	619	324	996
Uzbekistan	EUR	0	2,328	1,731	4,059
Bangladesh	SEAR	11,950	47,046	41,383	100,379
Nepal	SEAR	1,596	6,650	6,261	14,507
Viet Nam	WPR	6,762	26,707	20,036	53,505
Total for 14 LIC		69,715	198,252	262,214	530,180
Middle-income countries (lower-middle and upper-middle)					
Congo	AFR	536	2,277	1,846	4,659
South Africa	AFR	11,431	9,565	40,610	61,606
Argentina	AMR	0	26,873	3,507	30,380
Belize	AMR	51	178	59	288
Bolivia	AMR	478	5,839	3,539	9,855
Chile	AMR	0	30,105	0	30,105
Costa Rica	AMR	0	4,858	263	5,121
Dominican Republic	AMR	0	11,189	3,183	14,373
Ecuador	AMR	0	14,304	5,916	20,220
El Salvador	AMR	0	5,455	2,164	7,619
Guatemala	AMR	2,071	12,784	10,459	25,314
Guyana	AMR	106	600	156	862
Honduras	AMR	553	4,121	2,925	7,599
Jamaica	AMR	341	1,789	0	1,789
Nicaragua	AMR	225	2,449	1,105	3,780
Panama	AMR	0	3,666	1,101	4,767
Paraguay	AMR	207	4,019	2,226	6,452
Suriname	AMR	30	149	0	149
Uruguay	AMR	0	5,871	1,191	7,062
Djibouti	EMR	53	276	233	561
Egypt	EMR	0	42,994	37,858	80,852
Iran	EMR	0	30,165	0	30,165
Iraq	EMR	2,659	14,471	11,901	29,031
Jordan	EMR	0	3,556	3,476	7,032
Morocco	EMR	2,768	23,546	15,154	41,468

Table 14 (continued)

Country	WHO Region	Psychiatrists	Nurses in mental health settings	Psychosocial care providers	Total FTE staff
Middle-income countries (lower-middle and upper-middle)					
Sudan	EMR	4,238	18,367	14,045	36,650
Tunisia	EMR	0	7,880	5,791	13,671
Albania	EUR	0	1,804	1,181	2,985
Armenia	EUR	0	1,176	0	1,176
Azerbaijan	EUR	0	2,036	743	2,779
Georgia	EUR	0	1,533	0	1,533
Kyrgyzstan	EUR	0	323	0	323
Latvia	EUR	0	0	0	0
Republic of Moldova	EUR	0	143	0	143
Ukraine	EUR	0	1,907	0	1,907
Bhutan	SEAR	38	211	130	379
India-Uttarakhand	SEAR	771	2,229	1,899	4,899
Maldives	SEAR	20	150	97	267
Sri Lanka	SEAR	1,985	8,219	4,512	14,716
Thailand	SEAR	4,722	25,932	17,447	48,101
Timor-Leste	SEAR	41	0	48	89
China-Hunan	WPR	494	3,919	1,930	6,343
Mongolia	WPR	177	625	253	1,055
Philippines	WPR	9,004	46,754	29,964	85,721
Total for 44 MIC		42,997	384,307	226,912	653,846
Total for 58 LMIC		112,713	582,559	489,126	1,184,026

Notes:

When a country had a surplus of a particular type of health worker, the wage bill cost was set equal to zero for that worker type.

LIC – low-income country

MIC – middle-income country

LMIC – low- and middle-income countries.

Appendix 2. Other medical doctors in mental health settings

This appendix reports information about medical doctors who do not specialize in psychiatry but work in mental health settings (hereafter, referred to as “other medical doctors”). Table A1 shows, by country, the number of other medical doctors per 100,000 population in mental health settings, the number of psychiatrists per 100,000 population and the estimated shortage of psychiatrists per 100,000 population. The countries in the table are sorted by the proportion of

physicians (i.e., psychiatrists and other medical doctors) in mental health settings that are other medical doctors. For example, in Afghanistan, there are 0.24 other medical doctors per 100,000 population in mental health settings, while there are only 0.01 psychiatrists per 100,000 population; therefore, other medical doctors represent 97% of the physicians.

Table 17. Other medical doctors in mental health settings by country

Country	WHO Region	Income classification	Other medical doctors per 100,000 population	Psychiatrists per 100,000 population	Other medical doctors / total (1)	Shortage of psychiatrists per 100,000 population
Afghanistan	EMR	LIC	0.24	0.01	97%	0.97
Timor-Leste	SEAR	MIC	1.40	0.11	93%	0.84
Mongolia	WPR	MIC	4.74	0.51	90%	1.33
Iran	EMR	MIC	10.74	1.19	90%	0.09
Sri Lanka	SEAR	MIC	0.62	0.18	78%	1.29
Nigeria	AFR	LIC	0.49	0.15	76%	0.88
Viet Nam	WPR	LIC	0.90	0.35	72%	1.70
Bangladesh	SEAR	LIC	0.18	0.07	71%	1.20
Burundi	AFR	LIC	0.03	0.01	67%	0.91
South Africa	AFR	MIC	0.45	0.28	62%	0.75
Sudan	EMR	MIC	0.09	0.06	60%	0.98
Eritrea	AFR	LIC	0.06	0.06	50%	0.84
Maldives	SEAR	MIC	0.69	0.69	50%	0.48
Ethiopia	AFR	LIC	0.02	0.02	46%	0.87
Honduras	AMR	MIC	0.67	0.82	45%	0.48
El Salvador	AMR	MIC	1.07	1.39	43%	0.14
Morocco	EMR	MIC	0.70	1.02	41%	0.59
Congo	AFR	MIC	0.07	0.11	40%	0.79
Suriname	AMR	MIC	0.83	1.45	36%	0.16
Armenia	EUR	MIC	3.19	5.88	35%	0.00
Nepal	SEAR	LIC	0.06	0.13	33%	1.06
Jamaica	AMR	MIC	0.56	1.13	33%	0.53
Guyana	AMR	MIC	0.26	0.53	33%	1.09
Ukraine	EUR	MIC	3.95	8.66	31%	0.00
Uganda	AFR	LIC	0.04	0.08	31%	0.73
Jordan	EMR	MIC	0.50	1.14	30%	0.00
Nicaragua	AMR	MIC	0.39	0.91	30%	0.25
Somaliland	EMR	LIC	0.03	0.07	30%	1.00
Philippines	WPR	MIC	0.17	0.42	29%	1.07
Republic of Moldova	EUR	MIC	1.78	4.78	27%	0.00
Paraguay	AMR	MIC	0.48	1.31	27%	0.10

Table 17 (continued)

Country	WHO Region	Income classification	Other medical doctors per 100,000 population	Psychiatrists per 100,000 population	Other medical doctors / total (1)	Shortage of psychiatrists per 100,000 population
Thailand	SEAR	MIC	0.17	0.66	21%	0.79
Tajikistan	EUR	LIC	0.29	1.12	21%	0.26
Georgia	EUR	MIC	1.41	5.90	19%	0.00
Kyrgyzstan	EUR	MIC	0.77	3.41	18%	0.00
Bolivia	AMR	MIC	0.22	1.06	17%	0.31
Dominican Republic	AMR	MIC	0.37	2.08	15%	0.00
Azerbaijan	EUR	MIC	0.77	5.18	13%	0.00
Egypt	EMR	MIC	0.21	1.44	13%	0.00
Chile	AMR	MIC	0.68	4.65	13%	0.00
Costa Rica	AMR	MIC	0.43	3.06	12%	0.00
Latvia	EUR	MIC	1.11	8.31	12%	0.00
Albania	EUR	MIC	0.42	3.20	12%	0.00
Argentina	AMR	MIC	1.08	9.20	11%	0.00
Tunisia	EMR	MIC	0.17	1.53	10%	0.00
Uruguay	AMR	MIC	2.03	19.36	9%	0.00
Iraq	EMR	MIC	0.03	0.34	7%	0.70
Ecuador	AMR	MIC	0.18	2.51	7%	0.00
Uzbekistan	EUR	LIC	0.24	3.56	6%	0.00
Guatemala	AMR	MIC	0.03	0.57	5%	0.70
Benin	AFR	LIC	0.01	0.19	5%	0.84
Panama	AMR	MIC	0.16	3.47	4%	0.00
Belize	AMR	MIC	0.00	0.66	0%	0.66
Bhutan	SEAR	MIC	0.00	0.45	0%	0.75
India-Uttarakhand	SEAR	MIC	0.00	0.08	0%	1.12
Djibouti	EMR	MIC	0.00	0.33	0%	0.72

(1) Total is defined as the number of psychiatrists plus the number of other medical doctors working in mental health settings.

The practice of medical doctors working in mental health settings who do not specialize in psychiatry could be the result of psychiatrist shortages. To examine this relationship at the country level, we regressed the proportion of the physicians (i.e., psychiatrists and other medical doctors) represented by other medical doctors on the estimated shortage of psychiatrists per 100,000 population. The dependent variable was transformed with the arcsine function, because proportions violate the variance homogeneity assumption across observations (44). The results of the regression model were as follows:

$$\sin(\sqrt{OMD_proportion})^{-1} = 0.43 + 0.30 \text{ psychiatrist_shortage}$$

Variable definitions

OMD_proportion: other medical doctors proportion of all physicians (psychiatrists and other medical doctors) working in mental health settings

psychiatrist_shortage: estimated psychiatrist shortage per 100,000 population

$$R^2 = 0.18, F\text{-statistic} (p = 0.001), N = 56 \text{ countries}^{30}$$

³⁰ The regression would have included all 58 LMIC, but the number of other medical doctors was missing for China (Hunan) and Pakistan.

The parameter estimate for psychiatrist shortage per 100,000 population had a standard error of 0.09 and its p-value was less than 0.001. The results are consistent with a higher proportion of other medical doctors working in mental health settings as psychiatrist shortages increase. Because the proportion of other medical doctors was transformed, for ease of interpretation, Table A2 shows the predicted proportion of other medical doctors for different psychiatrist shortage levels, ranging from 0.0 per 100,000 population to 1.7 per 100,000 population, which is the psychiatrist shortage range among the countries reported in Table 9 (page 31). For example, countries without a shortage of psychiatrists are predicted to have 17% of the physicians (i.e., psychiatrists and other medical doctors) working in mental health settings being other medical doctors. At the other extreme, countries with a shortage of 1.7 psychiatrists per 100,000 population are predicted to have 65% of the physicians working in mental health settings being other medical doctors.

Table 18. Predicted proportion of other medical doctors

Shortage of psychiatrists per 100,000 population	Predicted proportion: other medical doctors / total (1) %
0.0	17
0.1	19
0.2	22
0.3	24
0.4	27
0.5	30
0.6	32
0.7	35
0.8	38
0.9	41
1.0	44
1.1	47
1.2	50
1.3	53
1.4	56
1.5	59
1.6	62
1.7	65

(1) Total is defined as the number of psychiatrists plus the number of other medical doctors working in mental health settings.

Mental, neurological and substance use (MNS) disorders account for an estimated 14% of the global burden of disease, yet mental health routinely receives a low funding priority from governments. While evidence indicates there are insufficient numbers of mental health workers in low- and middle-income countries (LMIC) to meet the population needs, there are no rigorous estimates of the size of the mental health workforce shortage and the wage bill that would be required to remove the shortage. This report aims to fill that gap by estimating the number of mental health workers required to treat MNS conditions. In 2005, for the 144 LMIC, there was an estimated shortage of 1.18 million workers, including 55,000 psychiatrists, 628,000 nurses in mental health settings and 493,000 psychosocial care providers. The annual wage bill to remove this shortage would be about US\$ 4.4 billion (2009 dollars). In 2015, if the supply of mental health workers were to remain unchanged from 2005, the shortage of mental health workers would increase by an estimated 45%. To meet the treatment needs for MNS disorders, our analysis provides benchmarks for human resources for mental health well into the future.

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