

# Towards measuring effective treatment coverage: critical bottlenecks in quality- and user-adjusted coverage for major depressive disorder

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## Abstract

**Background**—Major depressive disorder (MDD) is a leading cause of morbidity and mortality. Shortfalls in treatment quantity and quality are well-established, but the specific gaps in pharmacotherapy and psychotherapy are poorly understood. This paper analyzes the gap in treatment coverage for MDD and identifies critical bottlenecks.

**Methods**—Seventeen surveys were conducted across 15 countries by the World Health Organization-World Mental Health Surveys Initiative. Of 35,012 respondents, 3,341 met DSM-IV criteria for 12-month MDD. The following components of effective treatment coverage were analyzed: (a) any mental health service utilization; (b) adequate pharmacotherapy; (c) adequate psychotherapy; and (d) adequate severity-specific combination of both.

**Results**—MDD prevalence was 4.8% [SE, 0.2]. 41.8% [SE, 1.1] received any mental health services, 23.2% [SE, 1.5] of which was deemed effective. This 90% gap in effective treatment is due to lack of utilization (58%) and inadequate quality or adherence (32%). Critical bottlenecks are underutilization of psychotherapy (26 percentage-points reduction in coverage), underutilization of psychopharmacology (13-point reduction), inadequate physician monitoring (13-point reduction), and inadequate drug-type (10-point reduction). High-income countries double low-income countries in any mental health service utilization, adequate pharmacotherapy, adequate psychotherapy, and adequate combination of both. Severe cases are more likely than mild-moderate cases to receive either adequate pharmacotherapy or psychotherapy, but less likely to receive an adequate combination.

**Conclusions**—Decision-makers need to increase utilization and quality of pharmacotherapy and psychotherapy. Innovations such as telehealth for training and supervision plus non-specialist or community resources to deliver pharmacotherapy and psychotherapy could address these bottlenecks.

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## INTRODUCTION

The disease burden caused by disorders affecting mental health is the most disabling of any disorder grouping for communities and individuals (Salomon et al., 2015; Vigo, Thornicroft, & Atun, 2016), and the associated economic burden results in the largest restriction of productivity of all non-communicable disorders (Bloom, Chen, & McGovern, 2018; Goetzl et al., 2004). The social burden in the form of stigma, discrimination, and caregiver burnout is also widely acknowledged (Lasalvia et al., 2013; Thornicroft, Brohan, Rose, Sartorius, & Leese, 2009). Hence, societal strategies to mitigate these burdens are of great importance. Cost-effective interventions to treat mental disorders have been tested in countries across income levels and are ready for global scaleup (Patel et al., 2016; Patel et al., 2018; Vigo, et al., 2019). Yet an under-spending on mental disorders continues to exist relative to other classes of disorders (Alonso et al., 2018; Degenhardt et al., 2017; Thornicroft et al., 2017; Vigo, Kestel, Pendakur, Thornicroft, & Atun, 2019).

It is important to identify where the gaps in effective coverage occur so that governments can move towards the Sustainable Development Goals (SDGs) (General Assembly of the United Nations, 2015). A well-established model is the effective coverage cascade based on the Tanahashi framework (Amouzou et al., 2019; Larson, Vail, Mbaruku, Mbatia, & Kruk, 2017; Levy-Bruhl et al., 1997; Tanahashi, 1978), which distinguishes between potential and actual coverage. Potential coverage refers to whether services are available (i.e., they exist), whether they are accessible (i.e., whether there are barriers to utilization, such as fees or distance), and whether they are acceptable to users (i.e., provided in a culturally safe and respectful manner). Actual coverage is composed of contact coverage (the percentage of people in need that get any services); and effective coverage (the percentage that get good care and obtain health benefits from it). Effective coverage can be considered a function of quality- and user-adjusted coverage: if people receive good quality care (with the right inputs and following guidelines) and adhere to it, a beneficial outcome can be expected. Figure 1 is a graphic representation of such a coverage cascade. A “bottleneck” in coverage is a large drop between two adjacent columns, and points to a critical deficit in the system.

Thornicroft *et al.* have examined the rates of “minimally adequate treatment” for major depressive disorder (MDD), defined as either of the following: 1 month of pharmacotherapy plus four physician visits, or eight sessions with any mental health provider (Thornicroft et al., 2017). In addition to quantifying utilization, an “effective coverage” indicator requires further adjustments for quality of care (i.e., inputs and process) and user adherence (i.e., to physician indications) (Amouzou et al., 2019; Larson et al., 2017). This paper develops both a quality adjustment by factoring in the adequacy of the human resources and the type of pharmacotherapy used; as well as an adherence adjustment that considers the dose of the drug that the patient acknowledges taking and whether the patient dropped out of psychotherapy before the minimum number sessions or against the advice of the provider. Our results are based on surveys from 15 countries across 4 continents (Brazil, Colombia, Lebanon, Mexico, Nigeria, Romania, Argentina, Belgium, France, Germany, Italy, Netherlands, Portugal, Spain, and the United States). Further, we also adjust our coverage indicator to different severity levels. Based on these results, we develop and analyze the effective coverage cascade for MDD, which causes the largest disease burden of all disorders affecting mental health. A granular understanding of the specific “bottlenecks” in coverage and of how they vary by severity will help decision-makers to design evidence-based approaches to health systems improvement, with the goal of achieving universal health coverage.

## METHODS

### Sample

The WHO World Mental Health (WMH) Survey Initiative carried out 17 community surveys with 35,012 adults across the 15 aforementioned countries, including 6 classified by the World Bank as low or middle income countries (LMICs) and 9 classified as high income countries (HICs). All samples were based on multi-stage clustered area probability household designs. Samples were nationally representative in 11 surveys, representative of all urbanized areas in two others, and representative of selected regions

or Metropolitan areas in the others (Table 1). Surveys were approved by the review boards of the coordinating organizations, which monitored adherence with procedures for informed consent.

Interviews were carried out face-to-face in respondents' homes by trained lay interviewers. Field training and quality control procedures are described elsewhere (Pennell et al., 2008). Respondents were aged 18+ in all surveys other than one (19+ in Medellin, Colombia) and had unrestricted upper age limits in most surveys. The average response rate weighted by sample size was 70.3% using the American Association for Public Opinion Research RR1w definition (American Association for Public Opinion Research, 2016).

To reduce respondent burden, interviews were divided into two parts. Part I, administered to all respondents, assessed core mental disorders. Part II assessed additional disorders and correlates and was administered to all respondents with any Part I disorder plus a probability subsample of other Part I respondents. Part II data were weighted to adjust for the under-sampling of Part I non-cases, making weighted Part II prevalence estimates identical to Part I estimates (Heeringa et al., 2008). 71,576 Part I and 35,012 Part II respondents were interviewed. Of these 35,012 respondents, 3,341 met DSM-IV criteria for 12-month MDD. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

### Measures and data analysis

The interview schedule used in WMH was the WHO Composite International Diagnostic Interview (CIDI) Version 3.0 (Kessler & Üstün, 2004), a fully-structured interview generating lifetime and 12-month prevalence estimates of common DSM-IV disorders that includes stringent protocols of translation, back-translation, adaptation, and harmonization across sites (Harkness et al., 2008). 12-month MDD was defined as a major depressive episode among respondents who did not have a lifetime history of bipolar spectrum disorder (Merikangas et al., 2011). Hence, anyone with a Major Depressive Episode that lasted for two weeks or longer within the past 12 months was included in this analysis, regardless of when their episode started, or of whether they had depressive episodes in previous years. Blinded clinical reappraisal interviews with the Structured Clinical Interview for DSM-IV had good concordance with diagnoses based on the CIDI (Demyttenaere et al., 2004; First, Spitzer, Gibbon, & Williams, 2002; Haro et al., 2006). Respondents with MDD were considered severe either if their depression resulted in severe role impairment (7-10 points) according to the Sheehan Disability Scale (SDS; Sheehan, Harnett-Sheehan, & Raj, 1996), moderate if they reported moderate role impairment in the SDS (4-6), and mild if they reported no or moderate role impairment (3 or less).

We classified health treatment providers into two categories: (1) *specialist mental health* (SMH; psychiatrist, psychologist, other mental health professional in any setting, social worker or counselor in a mental health specialized setting); and (2) *general medical* (GM; primary care doctor, other medical doctor, any other healthcare professional seen in a GM setting). Respondents were asked about number of visits with each type of provider in the past 12 months and, for medical providers, about whether they provided

psychotherapy, pharmacotherapy, or both. Specific type, dose, and duration were recorded for each psychotropic medication used in the past 12 months. Further details about the treatment variables are presented elsewhere (Wang et al., 2007).

A series of summary variables was created from these detailed reports. *Contact coverage* was defined as any contact with a specialist mental health or general medical provider for a mental health condition in the past 12-months. The summary measures about pharmacotherapy included two simple dichotomous measures of *any psychotropic medication* use and *any antidepressant* use. Two clinical psychiatrists with expertise in public health (DV, CSW) independently reviewed survey responses about types of medications used (which involved selecting from country specific medication lists including generic and brand names for all available drugs) and reconciled discrepancies by consensus. *Adequate medication control* for patients taking psychotropic medications was defined as at least four visits with a physician (Wang et al., 2007). *Medication adherence* was defined as missing the prescribed daily dose not more than three out of 30 days (Cramer & Rosenheck, 1998; Jeon-Slaughter, 2012; Osterberg & Blaschke, 2005). A summary measure of *adequate pharmacotherapy* was then defined as taking an antidepressant with adequate medication control and adherence. Given that a small fraction of people with MDD may be prescribed non-antidepressant psychotropics due to antidepressants' side effects, failed trials, or other reasons for off-label non-antidepressant drug use, we also considered interventions *adequate* if a non-antidepressant psychotropic was prescribed and adequately controlled by a psychiatrist with adequate patient adherence.

Among respondents with contact coverage, *any psychotherapy* was defined as having two or more visits to any specialty mental health provider (as defined above). This broad definition intends to capture the full range of psychological interventions delivered by a qualified provider. The *adequate number of sessions* was defined as at least 8 sessions (Wang et al., 2007). *Psychotherapy adherence* depended on whether the respondent prematurely ended treatment. *Adequate psychotherapy* was defined as complying with at least 8 sessions from an adequate provider or still being in treatment after 2 visits. Given that psychiatry visits would most likely be for medication control, to be considered as a psychotherapeutic intervention, these visits needed to last 30 minutes or more.

Given that severity is associated with different service needs (Ten Have, Nuyen, Beekman, & de Graaf, 2013; Wang et al., 2007), we defined a variable for *adequate combination of pharmacotherapy and psychotherapy* that required adequate pharmacotherapy and/or adequate psychotherapy for mild and moderate MDD, and a combination of both adequate pharmacotherapy and adequate psychotherapy for severe MDD. These composite variables were based on a review of the April 2018 National Institute for Health and Care Excellence Guidelines (National Institute for Health and Care Excellence, 2009), the 2016 Canadian Network for Mood and Anxiety Treatments guidelines (Kennedy et al., 2016; Parikh et al., 2016), the 2010 American Psychiatric Association Practice Guideline For The Treatment Of Patients With Major Depressive Disorder (Gelenberg et al., 2010), and the 2016 WHO mhGAP Intervention Guide (World Health Organization, 2016). All the coverage variables were defined before obtaining the results and were not modified afterwards.

Weights were used to adjust for differences in within-household probabilities of selection and residual discrepancies between sample and population distributions on census demographic-geographic variables (Heeringa et al., 2008). Analyses consisted of nested cross-tabulations designed to estimate the proportions of people with 12-month MDD who received treatment. Standard errors were estimated using the Taylor series linearization method (Wolter, 1985) implemented in the SUDAAN software system (Research Triangle Institute, 2002) to adjust for weighting and geographic clustering of data. The statistical significance of differences in conditional treatment prevalence estimates by disorder severity and country income level was evaluated with logistic regression models pooled across surveys with dummy control variables for survey. Significance tests for these subgroup differences were based on design-based methods that took into consideration the weighting and clustering of data. Significance was evaluated using .05-level two-sided tests.

## RESULTS

Twelve-month MDD prevalence was 4.8% [SE, 0.2] across countries. 41.8% [SE, 1.1] of prevalent cases had contact coverage. Table 2 shows the key components of our three composite variables by severity: adequate pharmacotherapy; adequate psychotherapy; and adequate combination of pharmacotherapy and psychotherapy. Table 3 shows the same components by country-income level.

If we consider all patients with MDD that received contact coverage: (a) 69.0% [SE, 1.8] received pharmacotherapy, but only 26.4% [SE, 1.5] received adequate pharmacotherapy; (b) 38.9% [SE, 1.6] received psychotherapy and slightly less (32.4% [SE, 1.6]) received adequate psychotherapy; (c) 23.2% [SE, 1.5] received a severity-adjusted adequate combination of pharmacotherapy and/or psychotherapy.

### Impact of severity and country-income level

Of note, the percentage of people with severe depression that received any services is 46.2% [SE, 1.4], versus 34.5% [SE, 1.7] of people with mild or moderate presentations ( $F=20.08$ ;  $p<.001$ ). The percentage of people that received any services that also received adequate medication control, adequate pharmacotherapy, and an adequate combination of pharmacotherapy and psychotherapy are all significantly different depending on severity (Table 2). People with severe clinical presentations that receive contact coverage tend to receive more adequate pharmacotherapy (29.5% [SE, 2.1] vs 19.5% [SE, 2.6];  $F=4.34$ ;  $p=0.038$ ) than mild to moderate presentations. However, only 17.9% [SE, 1.8] of severely affected patients receive adequately combined psychotherapy and pharmacotherapy, whereas 34.8% [SE, 3.3] of mild to moderately affected patients receive adequate care ( $F=22.67$ ;  $p<0.001$ ).

Higher country-income level is significantly associated with increased contact coverage (52.0% [SE, 1.5] vs. 26.5% [SE, 1.7]), increased any pharmacotherapy and antidepressant use (see Table 3 for additional details), but not with adequate pharmacotherapy, psychotherapy or combination of both.

In HICs 27.6% [SE, 1.7] of people with contact coverage for MDD received adequate pharmacotherapy, 33.2% [SE, 1.7] adequate psychotherapy, and 23.6% [SE, 1.7] an adequate combination. In LMICs 22.3% [SE, 3.3] received adequate pharmacotherapy, 30.2% [SE, 3.4] adequate psychotherapy, and 21.7% [SE, 3.1] received an adequate combination.

### Main bottlenecks in coverage

How should these shortfalls in specific interventions be interpreted from a health systems perspective? Our modified Tanahashi framework indicates that the main bottleneck is in contact coverage: only 41.8% of people in need are receiving any mental health services (Figure 2). However, we cannot determine whether this bottleneck is mainly due to a genuine utilization gap (i.e., low demand), or if it's due to upstream service supply gaps in availability, accessibility, or acceptability of services (which is more likely in general, and certain for lower-income contexts).

The product of contact coverage and adequate combination treatment (i.e.,  $.418 \times .232$ ) indicates that 10% of MDD cases are receiving quality-and user-adjusted coverage. This represents a 90% treatment gap, which can be decomposed into 58.2% (100%-41.8%) due to lack of contact and 32% (90%-58%) due to inadequate quality and adherence.

In order to identify critical bottlenecks, we analyze the relative size of each gap in the context of the whole effective coverage cascade, and focus our analysis on gaps that represent a drop of 10 percentage points or more in overall coverage for MDD cases (see figure 2).

With respect to psychopharmacology, there are two main bottlenecks: any use of pharmacotherapy and inadequate physician monitoring: only 69% of help-seekers get any pharmacotherapy, and only 55% of the latter are being adequately monitored (which represent a drop of 13 percentage points each in coverage for all prevalent MDD cases). Next in magnitude, 65% of people receiving any pharmacotherapy are receiving an adequate drug, a drop of 10 percentage points in input-adjusted coverage for all MDD cases. The drop in user-adjusted coverage (i.e., lack of adherence) is comparatively minor.

With respect to psychotherapy, the bottleneck emerges at the input-level: of the 41.8% of people with MDD receiving any services, only 38.9% are receiving any psychotherapy, which represents a drop of 26 percentage points in input-adjusted coverage for all MDD cases. In terms of process and adherence, 83% of the psychotherapy provided is adequate, a drop of only 2 percentage points for all MDD cases.

Finally, the relative importance of the largest bottlenecks is different for different country-income levels. Our key coverage variables in HICs are between 2 and 2.5 times larger than in LMICs: as a percentage of total MDD cases, contact coverage is 52% vs. 27% ( $F=145.46$ ;  $p<0.001$ ); adequate pharmacotherapy 14% vs. 6% ( $F=26.20$ ;  $p<0.001$ ); adequate psychotherapy 17% vs. 8% ( $F=30.88$ ;  $p<0.001$ ); and adequate combination treatment 12% vs. 6% ( $F=17.95$ ;  $p<0.001$ ).

Several country-specific environmental and socio-economic characteristics, as well as health system arrangements and clinical practices may explain these variations: geographic



and demographic characteristics; insurance coverage, social security, and other forms of public benefits; the availability and distribution of the mental health workforce and pharmaceuticals; plus, culturally determined health-related attitudes and behaviors. The study of how these variables impact the bottlenecks identified here (which exceeds the scope of this work) can provide additional clarity for policy makers as to where the societal response should be focused. Appendix tables 1 and 3 provide additional contextual information about some of these variables at the country and the country-income levels.

## DISCUSSION

This is the first attempt, to our knowledge, to assess quality- and user-adjusted, severity-specific coverage of pharmacotherapy and psychotherapy (combined and separately) for a mental disorder, with the goal of identifying actionable bottlenecks in effective coverage. Our analyses are based on data from a diverse sample of 15 countries which, though not representative of the global context, include countries at all income levels from four continents (8 from Europe, 5 from the Americas, 1 from Africa, and 1 from Asia) (see table 1 and Appendix table 1 for details). The WMH surveys contain the largest and most granular primary cross-national database on MDD treatment. This allowed us to construct variables of clinical and public health interest about components of treatment. Diagnoses were obtained through a structured diagnostic tool administered by trained interviewers and validated against blinded clinical reappraisal interviews. We found that only 1 in 10 people with MDD received effective coverage, defined by an adequate combination of (and adherence with) psychotherapy and pharmacotherapy delivered by an adequate provider in adequate amounts. This gap is driven by specific bottlenecks: only 19% of MDD prevalent cases were prescribed an antidepressant; 16% were adequately monitored by a physician; and 16% received any psychotherapy. This picture highlights both the bottlenecks and the potential directions for improving quality of care and effective coverage, in line with the Sustainable Development Goal of achieving universal health coverage inclusive of mental health and wellbeing.

Limitations in this approach include that service utilization data relied on self-reports that may be biased. With respect to recall bias, we focused on 12-month treatment rather than over longer recall periods to minimize this risk. Social desirability bias could also affect some measures, such as when respondents are reluctant to acknowledge non-adherence. Despite this possibility, surveys have been widely used given that more stringent methods (e.g., blood samples, pill counts) are impractical for population-level investigations. 80% and 90% have been used in the past as adherence thresholds and a review found that in the US people took an average 65% of the antidepressant dose, with a range of 24% to 90% (Cramer & Rosenheck, 1998; Jeon-Slaughter, 2012; Osterberg & Blaschke, 2005). To compensate for this potential bias, we have used the most stringent threshold (taking the daily dose at least 90% of the time). Additionally, given that our surveys span 15 years (2001 to 2015) and all income levels, we have not included computer-, peer-, or community provider-delivered interventions due to their inconsistency across time and countries. Since the updated NICE guidelines allow for a fraction of people with mild depression to be sufficiently served by these delivery platforms, we may be overestimating the gap in countries where these services are widespread. Also, with respect to the time-span

covered by the surveys, our tests of significance include dummy control variables for survey. This approach controls for year of survey because a separate dummy variable existed for each survey, which means that results are pooled within-survey results. With respect to the potential existence of time trends, we re-ran the analyses including a continuous time variable. We found no significant interaction in our effective coverage indicator (Appendix Table 2). We did find a couple of significant interactions of time with substantive results for two of our intermediate indicators, and a closer look showed that they reflect differences in sample composition rather than time. So, for example, the difference between HIC and LMIC was stronger in later than earlier years when surveys were implemented, but this seems to be due to the fact that the few surveys in LIC carried out in recent years were in especially poorly-resourced settings. Since time trends cannot be estimated reliably, we compare pooled within-country analysis results between high- and lower-income countries controlling for, but not interacting with, time. Similarly, with this sample of countries it is not possible to establish the relative importance of the many environmental, socioeconomic, health system, and other variables that determine the utilization patterns we found. Hence, our conclusions result from pooled within-country analyses and their external validity is defined by the kinds of countries in the analysis. Also, national level analyses could yield relevant results that differ from the current income-level aggregation, though they escape the scope of this publication.

Another limitation is that the diversity of therapeutic practices cannot be fully captured by standardized indicators that include, for example, a single number-of-visits threshold. Some providers of pharmacotherapy and of psychotherapy will deliver effective care in less than the prescribed number of sessions, so interpretation of these results should be cautious. Also, our study did not focus on the difference between care provided in general vs. specialist medical settings, nor on the different subtypes of psychotherapy, which are also promising areas of analysis. Similarly, practices vary across countries, which is why we included guidelines intended both for high income (such as NICE and CANMAT guidelines) and low-income settings (such as the mh-GAP). Finally, it is likely that some respondents qualified for comorbid mental disorders, and it can't be ruled out that the comorbid disorder was the main focus of the psychotherapy and/or pharmacotherapy. In practice though, clinicians treat people, rather than specific diagnoses. So, CIDI-diagnosed MDD can be expected to be a key component of most comorbid clinical presentations that include it. In order for MDD to be completely overshadowed by the second disorder to the extent that it is excluded from the focus of care, then the comorbid disorder should be extremely severe and/or the care quite deficient. Hence, this study works under the assumption that the type of quality- and adherence-adjusted care we focused on would, in people that screen positive for MDD through a structured interview (WHO-CIDI), address MDD as a meaningful component of comorbid clinical presentations.

Despite these limitations, our findings have policy implications for diverse settings. For our set of HICs, contact coverage reaches more than half the population in need, so accounting for help-seeking behaviors and considering upstream gaps (in availability, accessibility, and acceptability of services), utilization is already high. Indeed, studies indicate that up to 20% of people with MDD recover on their own, indicating that not accessing medical care or seeking alternatives to it may represent rational decisions (Boerema et al., 2017).

This may be especially true of people with mild MDD, and some mental health systems may choose to encourage self-care or other non-clinical services for a fraction of people with MDD. Hence, the key amenable bottlenecks seem to be downstream: nearly 40% of help-seekers with MDD are being prescribed psychotropics, but only half of them are being adequately monitored. Also, only 20% are receiving any psychotherapy. Considering the well-established economic burden of depression (Bloom et al., 2018; Goetzel et al., 2004), as well as the cost-effectiveness of both pharmacotherapy and psychotherapy (Chisholm et al., 2016; Patel et al., 2016), HICs should consider available steps to improve the quality of medication control by physicians and increase referral for psychotherapy. Notable efforts to improve quality of physician services and to scale up psychotherapeutic services have been successfully implemented in the UK and are currently under way in other jurisdictions such as France and Canada (Clark et al., 2018; Clark et al., 2009; British Columbia Ministry of Mental Health and Addictions, 2019).

For our set of LMICs, contact coverage is low at 26.5%, only 15% of people in need are prescribed any medication through the health system, 10% receive any psychotherapy, and 1 in 20 gets effective coverage. So, the key bottlenecks are upstream in service supply: the lack of available, accessible, and acceptable services imposes a low ceiling on utilization. Furthermore, less than a third of help-seekers receive potentially adequate psychotherapy, and only a fifth adequate pharmacotherapy. Training community members and non-specialists, as well as leveraging telemedicine have been posited as reasonable and feasible policies to expand capacity in low income settings (Joshi et al., 2014; Shigekawa, Fix, Corbett, Roby, & Coffman, 2018). As part of a task-sharing stepped-care approach, telemedicine would enhance training and supervision; trained community members would raise awareness, decrease stigma and increase utilization; and trained non-specialists would increase availability and accessibility of quality coverage.

In summary: Based on these data, increasing the quantity and improving quality of pharmacotherapy (with a focus on improving medication control) and psychotherapy (with a focus on expanding capacity) appear as high-priority goals for decision-makers. Potentially suitable innovations have been proposed for people with MDD: the use of telehealth for training and supervision; and leveraging community resources and non-specialists to deliver pharmacotherapy and psychotherapy.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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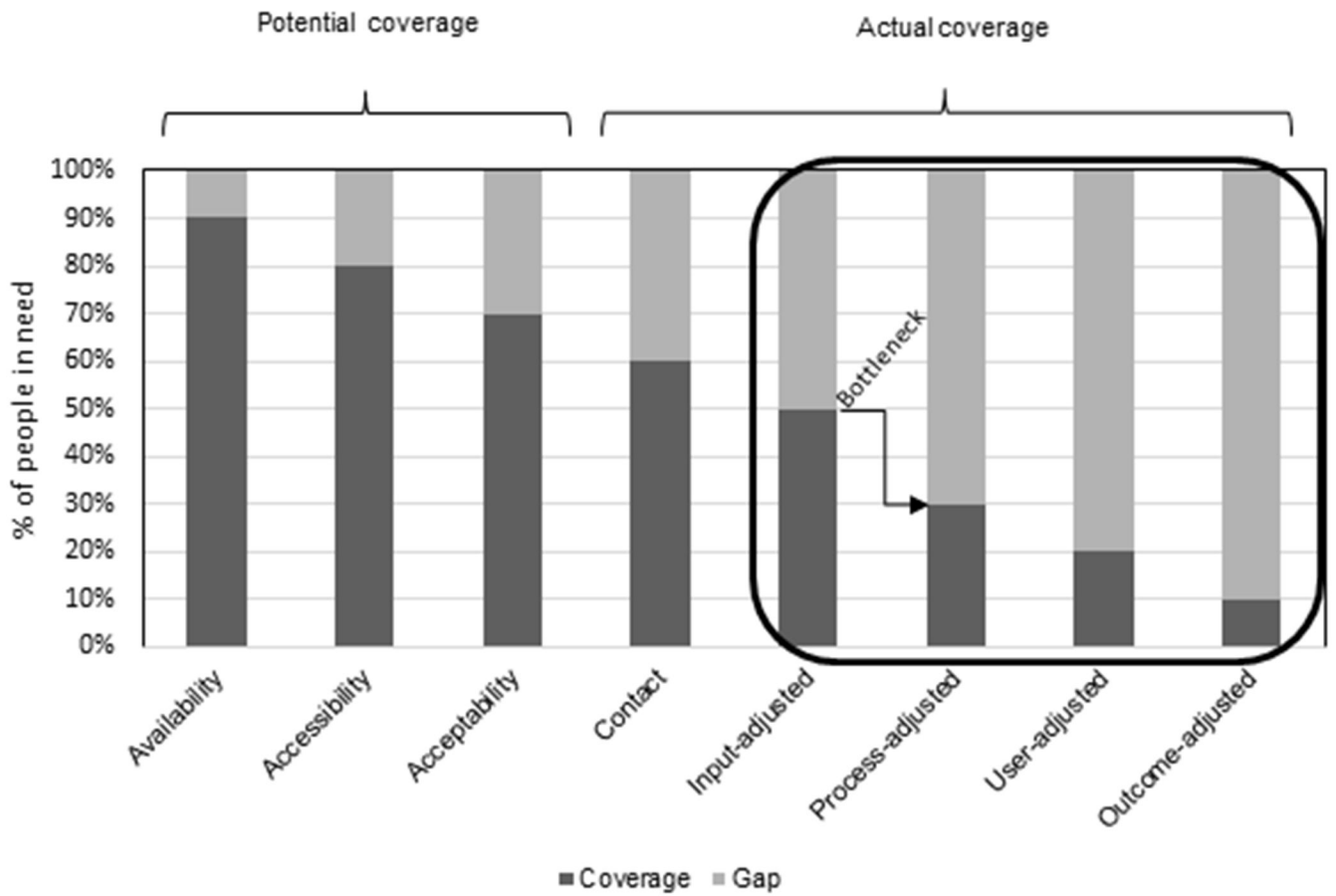
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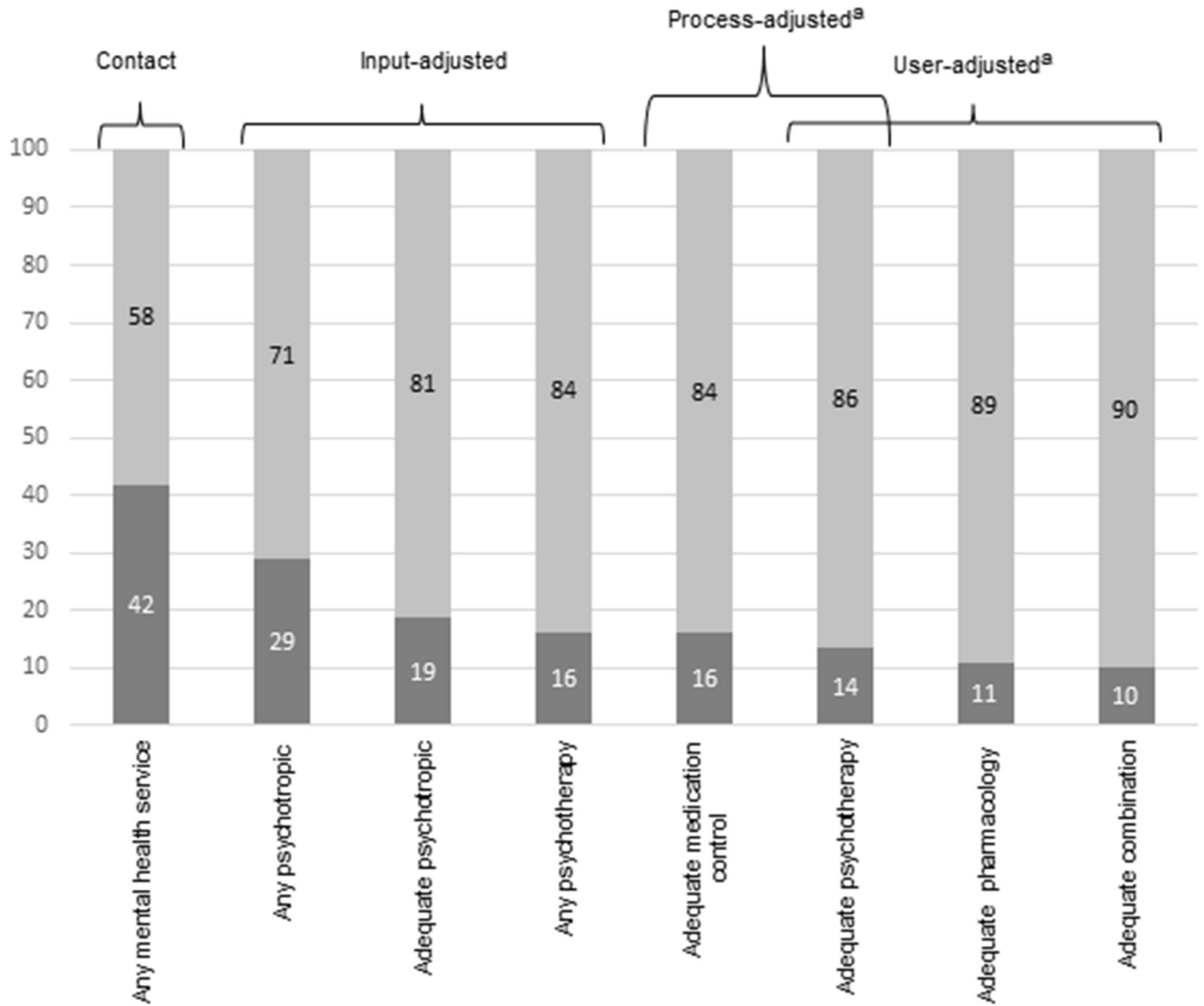




**Figure 1.**

The effective coverage cascade\*

<sup>a</sup>Percentages were chosen arbitrarily to reflect a 10% drop between each adjacent column, with the exception of a 20% drop in process-adjusted coverage to highlight a “bottleneck”. Potential coverage includes availability, accessibility, and acceptability coverage. Actual coverage includes contact coverage and effective coverage. Effective coverage (rounded rectangle) includes quality-adjusted (i.e., % receiving adequate inputs and process), user-adjusted (i.e., % compliant with indications), and outcome-adjusted coverage (i.e., % that obtains a benefit).



**Figure 2.**

Contact coverage, quality-adjusted (input and process), and user-adjusted coverage for MDD  
 Abbreviations: MDD, major depressive disorder.

<sup>a</sup>“Adequate psychotherapy” includes adjustments both for process and user compliance (8 sessions or ongoing care, non-dropout).

Y axis: percentage of people with a diagnosis of MDD receiving coverage. X axis: specific type of coverage. Columns show percentage of people with coverage (green) and without coverage (shades of red).

Table 1.

WMH sample characteristics by World Bank income categories<sup>a</sup>

Country	Survey <sup>b</sup>	Sample characteristics <sup>c</sup>	Field dates	Age range	Sample size		Response rate <sup>d</sup>
					Part I	Part II	
<b>I. Low and Middle-income countries</b>							
Brazil - São Paulo	São Paulo Megacity	São Paulo metropolitan area	2005-8	18-93	5,037	2,942	81.3
Colombia	NSMH	All urban areas of the country (approximately 73% of the total national population).	2003	18-65	4,426	2,381	87.7
Colombia - Medellín	MMHS	Medellin metropolitan area	2011-12	19-65	3,261	1,673	97.2
Lebanon	LEBANON	Nationally representative.	2002-3	18-94	2,857	1,031	70.0
Mexico	M-NCS	All urban areas of the country (approximately 75% of the total national population).	2001-2	18-65	5,782	2,362	76.6
Nigeria	NSMHW	21 of the 36 states in the country, representing 57% of the national population. The surveys were conducted in Yoruba, Igbo, Hausa and Efik languages.	2002-4	18-100	6,752	2,143	79.3
Romania	RMHS	Nationally representative.	2005-6	18-96	2,357	2,357	70.9
Total					(30,472)	(14,889)	80.1
<b>II. High-income countries</b>							
Argentina	AMHES	Eight largest urban areas of the country (approximately 50% of the total national population)	2015	18-98	3,927	2,116	77.3
Belgium	ESEMeD	Nationally representative. The sample was selected from a national register of Belgium residents.	2001-2	18-95	2,419	1,043	50.6
France	ESEMeD	Nationally representative. The sample was selected from a national list of households with listed telephone numbers.	2001-2	18-97	2,894	1,436	45.9
Germany	ESEMeD	Nationally representative.	2002-3	19-95	3,555	1,323	57.8
Italy	ESEMeD	Nationally representative. The sample was selected from municipality resident registries.	2001-2	18-100	4,712	1,779	71.3
Netherlands	ESEMeD	Nationally representative. The sample was selected from municipal postal registries.	2002-3	18-95	2,372	1,094	56.4
Portugal	NMHS	Nationally representative.	2008-9	18-81	3,849	2,060	57.3
Spain	ESEMeD	Nationally representative.	2001-2	18-98	5,473	2,121	78.6
Spain - Murcia	PEGASUS- Murcia	Murcia region. Regionally representative.	2010-12	18-96	2,621	1,459	67.4
United States	NCS-R	Nationally representative.	2001-3	18-99	9,282	5,692	70.9
Total					(41,104)	(20,123)	64.4

Country	Survey <sup>b</sup>	Sample characteristics <sup>c</sup>	Field dates		Age range		Sample size		Response rate <sup>d</sup>
			Part I	Part II	Part I	Part II	Part I	Part II	
III. Total <sup>e</sup>			(71,576)	(35,012)			(71,576)	(35,012)	70.3

<sup>a</sup>The World Bank (2012) Data. Accessed May 12, 2012 at: <http://data.worldbank.org/country>. Some of the WMH countries have moved into new income categories since the surveys were conducted. The income groupings above reflect the status of each country at the time of data collection. The current income category of each country is available at the preceding URL.

<sup>b</sup>NSMH (The Colombian National Study of Mental Health); MMHHS (Medellin Mental Health Household Study); LEBANON (Lebanese Evaluation of the Burden of Ailments and Needs of the Nation); M-NCS (The Mexico National Comorbidity Survey); NSMHW (The Nigerian Survey of Mental Health and Wellbeing); RMHS (Romania Mental Health Survey); AMHES (Argentina Mental Health Epidemiologic Survey); ESEMeD (The European Study Of The Epidemiology Of Mental Disorders); NMHS (Portugal National Mental Health Survey); PEGASUS-Murcia (Psychiatric Enquiry to General Population in Southeast Spain-Murcia);NCS-R (The US National Comorbidity Survey Replication).

<sup>c</sup>Most WMH surveys are based on stratified multistage clustered area probability household samples in which samples of areas equivalent to counties or municipalities in the US were selected in the first stage followed by one or more subsequent stages of geographic sampling (e.g., towns within counties, blocks within towns, households within blocks) to arrive at a sample of households, in each of which a listing of household members was created and one or two people were selected from this listing to be interviewed. No substitution was allowed when the originally sampled household resident could not be interviewed. These household samples were selected from Census area data in all countries other than France (where telephone directories were used to select households) and the Netherlands (where postal registries were used to select households). Several WMH surveys (Belgium, Germany, Italy, Spain-Murcia) used municipal, country resident or universal health-care registries to select respondents without listing households. 10 of the 17 surveys are based on nationally representative household samples.

<sup>d</sup>The response rate is calculated as the ratio of the number of households in which an interview was completed to the number of households originally sampled, excluding from the denominator households known not to be eligible either because of being vacant at the time of initial contact or because the residents were unable to speak the designated languages of the survey. The weighted average response rate is 70.3%.

<sup>e</sup>The following surveys, included in Thornicroft et al, 2016,<sup>10</sup> were excluded from this study due to lack of data on the specific drug taken and on adherence to prescribed dosage: Beijing/Shanghai, Bulgaria, Iraq, Israel, Japan, and Peru .

**Table 2.**

Coverage for major depressive disorder by severity

Numerator	Coverage Denominator	Severe		Mild/Moderate		Any severity		Significance test	
		%	(SE)	%	(SE)	%	(SE)	F	(p-value)
<i>Contact coverage</i>	<i>People with 12-month MDD (n=3,341)</i>	46.2	(1.4)	34.5	(1.7)	41.8	(1.1)	20.08*	(<.001)
<i>Any psychotropic medication</i>	<i>People with contact coverage (n=1,398)</i>	71.8	(2.0)	62.7	(3.3)	69.0	(1.8)	2.61	(0.11)
<i>Antidepressants</i>		47.6	(2.3)	39.8	(3.2)	45.1	(1.9)	2.31	(0.13)
<i>Adequate medication control</i>		42.8	(2.3)	28.2	(3.0)	38.3	(1.7)	8.83*	(0.003)
<i>Adequate pharmacotherapy</i> <sup>†</sup>		29.5	(2.1)	19.5	(2.6)	26.4	(1.5)	4.34*	(0.038)
<i>Any psychotherapy</i>		40.5	(2.1)	35.4	(3.2)	38.9	(1.6)	1.33	(0.25)
<i>Adequate psychotherapy</i>		34.1	(2.1)	28.6	(3.2)	32.4	(1.5)	1.28	(0.26)
<i>Adequate combination</i>		17.9	(1.8)	34.8	(3.3)	23.2	(1.5)	22.67*	(<.001)

Abbreviations: MDD, major depressive disorder; SE, standard error.

\* Significant at the .05 level, two-sided test

<sup>†</sup> Adequate pharmacotherapy: taking an antidepressant with adequate medication control by any physician and adequate adherence; or taking any non-antidepressant psychotropic with adequate medication control by a psychiatrist and adequate patient adherence.

**Table 3.**

Coverage for major depressive disorder by country income level

Numerator	Coverage Denominator	HICs		LMICs		Significance test	
		%	(SE)	%	(SE)	F	(p-value)
<i>Contact coverage</i>	<i>People with 12-month MDD (HICs:n=1,991;LMICs:n=1,350)</i>	52.0	(1.5)	26.5	(1.3)	145.46*	(<.001)
<i>Any psychotropic medication</i>	<i>People with contact coverage (HICs:n=1,043;LMICs:n=355)</i>	72.9	(2.2)	57.4	(2.9)	17.99*	(<.001)
<i>Antidepressants</i>		48.6	(2.2)	35.0	(3.6)	9.75*	(0.002)
<i>Adequate medication control</i>		39.1	(2.0)	35.8	(3.4)	0.70	(0.40)
<i>Adequate pharmacotherapy †</i>		27.6	(1.7)	22.3	(3.3)	1.67	(0.20)
<i>Any psychotherapy</i>		38.8	(1.7)	39.2	(3.6)	0.01	(0.93)
<i>Adequate psychotherapy</i>		33.2	(1.7)	30.2	(3.4)	0.57	(0.45)
<i>Adequate combination</i>		23.6	(1.7)	21.7	(3.2)	0.19	(0.66)

Abbreviations: HICs, high income countries; LMICS, low or middle income countries; SE, standard error; MDD, major depressive disorder.

\* Significant at the .05 level, two-sided test

† Adequate pharmacotherapy: taking an antidepressant with adequate medication control by any physician and adequate adherence; or taking any non-antidepressant psychotropic with adequate medication control by a psychiatrist and adequate patient adherence..