

Patterns and predictors of 12-month treatment of common anxiety, mood, and substance use disorders in the World Mental Health (WMH) surveys: treatment in the context of perceived need



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Abstract

Background Data from the World Mental Health (WMH) surveys on the coverage cascade has underscored the importance of perceived need for seeking treatment of mental disorders. However, little research has focused on treatment contact after adjusting for perceived need. We do so here in analysis of WMH data.

Methods The WMH data considered here come from 25 community surveys implemented between 2001 and 2019 across 21 countries. n = 12,508 of the n = 117,739 respondents in these surveys aged 18 and older met criteria for one or more 12-month DSM-IV anxiety, mood, or substance use disorders assessed across all these surveys. Information was obtained about 12-month treatment of each disorder. The predictors considered were disorder type, sociodemographics, and history of prior treatment.

Results Twelve-month treatment was obtained for 17.7% of the n = 18,702 12-month person-disorders in the sample, including 34.1% for the 46.5% with perceived need and 3.5% for the 54.5% without perceived need. After adjusting for perceived need, receiving treatment was most strongly associated with disorder characteristics (severity, and highest for major depressive, panic/agoraphobia, and generalized anxiety disorders; lowest for substance use disorders), health insurance, employment status (highest for students, the retired, and the unemployed/disabled), and several aspects of prior treatment. These associations were generally similar in cases with and without perceived need for treatment. 12-month treatment among cases who without perceived need and without history of prior treatment was rare (1.1%).

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Conclusions Findings highlight the critical importance of perceived need for obtaining 12-month treatment in the context of other significant predictors involving complexity and severity of disorders and socio-demographic factors. The importance of prior treatment history was quite striking, as was the finding that absence of both perceived need and prior treatment history were associated with a nearly complete absence of treatment. Policy recommendations emerging from these results include the need to increase health literacy, reduce the stigmatization of mental disorder, enhance access through health insurance, and improve the quality of care given the clear evidence that prior experiences with treatment play an important role in determining the likelihood of again seeking treatment for current problems.

Keywords Mental disorders, Mental health treatment, Perceived need for treatment

Introduction

Growing recognition of the burden of mental disorders [1] highlights the importance of increased treatment. This is especially important given significant advances in treatments and clear evidence that mental disorders can be treated effectively [2, 3]. Yet the World Mental Health Surveys show that only a small minority of people with mental disorders around the world receive treatment that conforms with established treatment guidelines [4]. Investigation of the pathways to care shows that this low rate of effective treatment coverage is due to several key bottlenecks in the coverage cascade, most strikingly that only a minority of people with mental disorders recognize that they have a problem that needs treatment, but also to several other bottlenecks involving initial treatment contact and quality. It is important to trace out the patterns and predictors of these bottlenecks given that remarkably little research has rigorously investigated patterns and predictors of obtaining treatment in the presence versus absence of perceived need [5, 6]. How best to differentially target individuals with and without perceived need to address bottlenecks in the coverage cascade consequently remains unclear. Here we build on previous work in the World Mental Health Surveys on the coverage cascade and predictors of the bottlenecks found in this cascade [4], aiming to assess patterns and predictors of 12-month treatment of mental disorders among individuals with and without perceived need for treatment. Given the previous conceptual and empirical literature on determinants of bottlenecks in the coverage cascade for medical and mental disorders, we focus on initial treatment contact [6-8] investigating individual-level predictors including disorder characteristics, socio-demographics (including information on health insurance), and history of prior treatment along with country-level predictors (indicators of human development, healthcare spending, availability of health care resources, and stigmatization of care).

Methods

Sample Data comes from 25 WMH surveys administered between 2001 and 2019 in 21 countries (see Supplementary Table 1). The combined sample size across surveys was n=117,739 respondents ages 18 and older. Ten of the 25 surveys were administered in countries classified by the World Bank as low- or middle-income (LMIC; a regional survey in São Paulo Brazil, two national surveys in Bulgaria, two in Colombia including one national survey and a regional survey in Medellin, Lebanon, Mexico, Nigeria, Peru, and Romania) and the others in countries classified as high-income (HIC; Argentina, Belgium, France, Germany, Israel, Italy, Japan, Netherlands, Northern Ireland, two national surveys in Poland, Portugal, two in Spain including one national survey and another in Murcia, and the United States). All surveys used multistage clustered area probability household sample designs. Japan is the only survey that was totally unclustered, as a random sample of individuals was selected from a household population registry in each of 11 metropolitan areas. Sixteen surveys were nationally representative (Belgium, two in Bulgaria, France, Germany, Israel, Italy, Lebanon, the Netherlands, Northern Ireland, two in Poland, Portugal, Romania, Spain, United States) and the others were representative of selected regions, metropolitan areas, or urbanized areas. Field dates ranged between 2001 and 2019. Response rates ranged between 45.9% and 97.2%, with a weighted (by sample size) average response rate across surveys of 69.3% using the American Association for Public Opinion Research RR1w definition [9].

The interview was divided into two parts, with Part I administered to all respondents and Part II to a probability subsample of Part I respondents. This two-part scheme was implemented to reduce burden for the many respondents who did not meet criteria for any of the disorders assessed in the surveys. Part I assessed core mental disorders. Part II was administered to 100% of the Part I respondents who met lifetime criteria for any of these disorders plus a probability subsample of the remaining

Part I respondents, with a total Part II sample size of n = 56,927 respondents. Part II assessed disorders of secondary interest as well as a wide range of correlates. Part II data were weighted to adjust for the under-sampling of Part I non-cases, thereby making the prevalence estimates of Part I disorders in the weighted Part II sample equivalent to the prevalence estimates in the Part I sample. A within-household probability of selection weight was also applied to adjust for the fact that respondents were randomly selected within households and the number of eligible potential respondents varied across households. Finally, a calibration weight was applied to the data within each survey to adjust for discrepancies between the joint sample and population distributions on a range of socio-demographic and geographic variables.

Measures

The interview: Trained lay interviewers administered a fully structured diagnostic interview, the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) [10], in all surveys face-to-face to respondents in their homes. The interview and training materials were developed in English and then translated into other languages following a standard translation protocol [11]. Interviewers were required to complete a standardized training course successfully before they could undertake fieldwork and collect data for the study. Consistent procedures were then used across surveys to check interviewer accuracy and ensure the use of consistent data cleaning and coding procedures [12]. Informed consent was obtained before starting the interview. Local institutional review committees approved and monitored the surveys to ensure protection of human subjects as per appropriate international and local guidelines. 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.

Disorders: The CIDI assesses lifetime and 12-month disorders using the definitions and criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). Blinded clinical reappraisal studies carried out in Asia [13, 14], Europe [15, 16], Latin America [17], the Middle East [18], and the US [19] found consistently good concordance between diagnoses based on the CIDI and diagnoses based on blinded clinical gold standard diagnostic interviews with the Structured Clinical Interview for DSM-IV [20]. As noted above in the subsection on samples, we consider here 12-month cases of the 11 DSM-IV disorders that were assessed in common across the WMH surveys. These disorders were collapsed into nine summary categories for analysis, including five anxiety disorders (generalized anxiety disorder [GAD], panic disorder and/or agoraphobia [Panic/AGO], specific phobia [SP], social phobia [SoP], post-traumatic stress disorder [PTSD]), two mood disorders (major depressive disorder [MDD], bipolar spectrum disorder [BD], where the latter includes either bipolar I disorder, bipolar II disorder, or subthreshold bipolar disorder; see ref. [21] for details), and two substance use disorders (alcohol use disorder [AUD] and drug use disorder [DUD], where each combines respondents who met criteria for either abuse or dependence). DSM-IV organic exclusion rules were applied but diagnostic hierarchy rules were not applied other than between major depressive disorder and bipolar spectrum disorder.

Twelve-month disorder severity at the person level was defined as either severe, moderate, or mild. Respondents were defined as having severe disorder either if they (i) met criteria for Bipolar-I disorder and/or substance use disorder with a physiological dependence syndrome; or (ii) if they made a suicide attempt in the 12 months before the interview; or (iii) if they reported having severe role impairment due to their mental or substance use disorders for at least one month in the past 12 months. If not severe, respondents were defined as moderate if they had 12-month substance dependence without a physiological dependence syndrome or reported having moderate role impairment for at least one month. All other respondents with 12-month disorders were defined as mild. Role impairment was assessed by asking about the extent to which disorders interfered with the respondent's ability to carry out daily activities in both productive roles (i.e., job, school, housework) and social roles (i.e., social and personal life).

Perceived need for treatment: We assessed perceived need differently for WMH respondents who did versus did not receive 12-month treatment. Respondents who received treatment were asked: When you went to see a professional about your emotions or substance use in the past year, was this something you wanted to do, or did you go only because someone else was putting pressure on you? Those who said they themselves wanted to obtain professional help were coded as having perceived need. In addition, those who replied that it was others that pressured them were asked the follow-up question: Which of these statements best describes why you didn't want to see a professional: You didn't think you had a problem, you thought you had a problem but could handle it on your own or you thought you needed help but didn't believe professional treatment would be helpful? Respondents who said they recognized they needed help but did not want to see a professional because they didn't think it would be useful were coded as having perceived need. Respondents who did not receive 12-month treatment were asked: Was there ever a time during the past 12 months when you felt that you might need to see a professional because

of problems with your emotions or nerves or your use of alcohol or drugs? Those who responded yes were coded as having perceived need, as were respondents who responded no but reported in response to the same probe as above for reasons reported that they recognized they had a problem but did not think professional treatment would help. All other respondents were coded no on perceived need. It is important to recognize, based on this description, that our measure of perceived need assesses problem recognition regardless of respondent beliefs about the effectiveness of available treatments.

Twelve-month treatment: Twelve-month treatment, the focus of the current report, was defined as any contact in the past 12 months for each of the focal disorders with any of the treatment providers assessed. It is noteworthy that both lifetime and 12-month treatment were assessed separately by disorder, allowing us to detect cases where respondents received treatment for one disorder but not another. However, we classified a respondent who reported 12-month treatment for any disorder in each of three highly correlated disorder sets (MDD with any anxiety disorder; MDE with mania or hypomania among respondents with BD; any substance use disorder) as having received treatment for all disorders in the set. A list of providers was presented in a respondent booklet to assist with recall; examples of some types of providers were modified to fit the local context, but the broad provider types across surveys always consisted of general medical (including a general practitioner/primary care doctor, any other medical doctor other than a psychiatrist, and any other health care provider, such as a nurse or physician's assistant other than a mental health provider); psychiatrist; other mental health professionals (psychologist; counselor in a mental health specialized setting; social worker in a mental health specialized setting; any other mental health professional, such as a psychotherapist or mental health nurse); human services professionals (social worker in a human services setting, counselor in a human services setting, spiritual advisor); and complementary/alternative medicine providers (CAM; internet help or self-help groups; any other type of healer). Information was also obtained about the number of 12-month visits with each type of treatment provider and 12-month psychopharmacology. A medication list was presented to respondents as a visual aid in reporting medication use. The list included antidepressants, anxiolytics, hypnotics, antipsychotics, mood stabilizers, and other psychotropic agents that were modified to the local circumstances of each country and included both generic and brand names. Respondents were instructed to report "medications even if you took them only once."

History of prior treatment: All Part II respondents were asked if they had *ever in their life* seen the list of 11

different types of treatment providers described above for problems with emotions, nerves, mental health, or use of alcohol or drugs and, if so, age at first receiving treatment of each type. Separate questions were also asked about ever obtaining and, if so, age at first obtaining pharmacotherapy and psychotherapy. Finally, respondents with treatment histories were asked whether they ever received treatment for each of the focal disorders that they considered *helpful or effective* and, if so, their age at first receiving this type of helpful treatment. All these reports of past treatment were used as predictors of having a perception of needing treatment in the past 12 months. We required that treatment was first received at least two years before the age at interview to be considered "prior" treatment.

Individual-level predictors: The individual-level predictors considered here other than information about 12-month disorders and perceived need included measures of socio-demographics and health insurance and information about treatment history. The socio-demographics included self-reported sex, age (18-29, 30-44, 45-59, 60+), education (a four-category variable coded low, low-average, high-average, and high specific to the educational system of the country; see ref. [22]). Insurance was coded as two dichotomous dummy-coded variables for having private insurance (including both occupational insurance/social security insurance) and public insurance (universal health care), where it was possible for individual respondents to have either, both, or neither type of insurance. Respondents in countries with universal insurance were all coded as having public insurance. Predictors involving treatment history included information about the types of treatment providers ever seen prior to the last 12 months, types of treatment received (medication, psychotherapy, or both), and if past treatment of the disorders considered here was ever helpful.

Country-level predictors: We also considered associations involving four sets of widely-studied country-level predictors: (i) nine human development indicators: the World Bank designations of each country as a HIC or LMIC; per capita GDP defined in terms of purchase power parity with the US; percent of the population living in urban areas; mean years of education of adults in the population; child mortality rate; births per woman; life expectancy at birth; gender inequality index; and a composite score created by averaging across items; (ii) four healthcare spending indicators: total spending as a fraction of GDP; government spending as a fraction of total spending; out of pocket spending as a fraction of total spending; and mental healthcare spending as a fraction of total spending; (iii) four indicators of direct availability of resources per 100,000 in the survey year:

non-psychiatrist MDs; psychiatrists; psychologists; and hospital beds; and (iv) two indicators of stigmatization of care: mean country-level response to a WMH guestion asked of all respondents about how embarrassed they would be if someone knew they were seeing a professional for emotional problems; and the mean countrylevel response to a WMH question asked of respondents with a 12-month mental disorder about how much they experienced discrimination or unfair treatment because of these problems in the past 30 days. As detailed elsewhere [4], country-level variables were obtained from the United Nations, World Bank, World Health Organization, government agencies in the participating countries, and aggregation of individual-level reports in the WMH surveys. We standardized all these country-level variables at the level of the person-disorder, which, as described below, is the unit of analysis considered here, to have a mean of 0 and variance of 1 to facilitate comparison (See Supplementary Table 2).

Analysis methods

As noted above in the description of the sample, weights were applied to the data to adjust for differences in within-household probabilities of selection and to calibrate the samples to match Census population distributions on socio-demographic and geographic variables. Part II data were also weighted to adjust for differential probabilities of selection into Part II. The Taylor series linearization method implemented in SAS 9.4 [23], was used to adjust standard errors for the effects of these weights as well as for the effects of geographic clustering of the WMH data.

Analysis began by coding the small number of missing values (fewer than 1% for most variables) conservatively when they involved symptoms (i.e., coding missing symptom scores as absent) and to either medians (in the case of ordered variables) or modes (in the case of categorical variables) in other cases. We then used cross-tabulations to estimate 12-month prevalence of each disorder along with disorder-specific probabilities of 12-month perceived need for treatment and treatment as a function of disorder and perceived need. Regression analyses were then carried out at the level of the person-disorder to examine the associations of 12-month disorder types, number, severity, and perceived need with receiving 12-month treatment. Given the central importance of perceived need, we also determined whether the associations of the other disorder-related predictors with 12-month treatment differed depending on presence versus absence of perceived need. Parallel models were then estimated for the predictive associations of socio-demographics (including information on health insurance) and treatment history with receiving 12-month treatment.

Finally, a series of models was estimated looking at the joint associations of all three sets of predictors with 12-month treatment.

All regression models were estimated using a Poisson link function with robust standard errors [24]. The regression coefficients from these models were exponentiated to create risk ratios (RRs), while the coefficients ± 2 design-based standard errors were used to create designbased 95% confidence intervals (CIs) of the RRs. Significance of RR sets defining a single categorical variable (e.g., the two dummy variables distinguishing married, never married, and previously married respondents to define marital status) was evaluated with Wald χ^2 tests based on design-corrected coefficient variance-covariance matrices. Statistical significance was evaluated consistently using two-sided design-based 0.05-level tests. We addressed the problem of false positives among the many tests carried out here by consistently focusing on multivariable significance tests for sets of related predictors and only interpreting individually significant coefficients if the set in which these coefficients were embedded was significant. We chose this approach over multiple comparison correction methods for individual coefficients, like the Bonferroni test, because the latter is overly conservative. Models that focused only on individual-level predictors were estimated as pooled withincountry models including dummy variables for country. Country-level and multi-level models were estimated using SAS 9.4 proc glimmix [25]. As detailed in an earlier report [4], a composite variable constructed using a random forest machine learning algorithm to summarize the associations of multivariable disorder profiles with effective treatment was also used as a control in evaluating associations of other individual-level predictors with the outcomes. Details are provided in the eMethods section of our earlier report [4].

Results

The socio-demographic distribution of the sample

The total unweighted Part II WMH sample (n = 56,927) included 57.7% who were women. Median age was 43 years (inter-quartile range 31–57). However, the weighted distributions differed somewhat from these observed distributions due to sex and age differences in survey response rates, as well as differences in probabilities of selection into the Part II sample. As shown in a supplementary table, differences of a comparable sort between weighted and unweighted distributions were found for other socio-demographic characteristics of the sample (Supplementary Table 3). Shown in that table are also somewhat different distributions for the subsample of respondents with one or more 12-month disorders (n = 12,508) and the

person-disorders among these individuals (n = 18,702) given the existence of significant associations between socio-demographic variables and these disorders.

Associations of 12-month disorders with perceived need and 12-month treatment

The pooled weighted 12-month prevalence of any of the disorders considered here was 13.8% across all WMH surveys (Table 1). Anxiety disorders were the most common class of disorders (9.3%) followed by mood (5.4%) and substance use (2.3%) disorders. The single most

Table 1 Twelve-month treatment contact by disorder and perceived need for treatment^a

					Treatmen	t contact				
	Prevalence ^b		Perceived need (PN)/ dx ^c		PN=Yes ^c		PN=No ^c		Total ^c	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)
I. Anxiety disorders										
GAD	1.8	(0.1)	58.7	(1.5)	44.4	(1.9)	6.3	(1.0)	28.7	(1.3)
Panic/Ago	1.5	(0.1)	60.5	(1.5)	45.4	(1.9)	8.1	(1.3)	30.7	(1.4)
PTSD	1.3	(0.1)	55.7	(2.0)	42.6	(2.6)	5	(0.9)	26	(1.7)
SP	5.9	(0.1)	31.6	(0.8)	25.6	(1.1)	1.5	(0.3)	9.1	(0.4)
SoP	2.3	(0.1)	49.8	(1.4)	35.5	(1.8)	3.7	(0.7)	19.6	(1.0)
Any	9.3	(0.2)	45	(0.7)	36.7	(1.2)	3.3	(0.4)	18.3	(0.6)
II. Mood disorders										
MDD	4.3	(0.1)	54.8	(1.0)	38.3	(1.3)	5.2	(0.6)	23.4	(0.8)
BD	1.1	(0.0)	55.4	(1.9)	23.3	(2.0)	4	(1.1)	14.7	(1.2)
Any	5.4	(0.1)	55	(0.9)	35.2	(1.1)	5	(0.5)	21.6	(0.7)
III. Substance use d	isorder									
AUD	1.9	(0.1)	32.7	(1.5)	13.5	(1.8)	1.9	(0.5)	5.7	(0.7)
DUD	0.6	(0.0)	45.5	(3.4)	16.2	(3.3)	2.7	(1.1)	8.8	(1.7)
Any	2.3	(0.1)	35.6	(1.5)	14.3	(1.8)	2	(0.5)	6.4	(0.8)
IV. Number of disor	ders									
1	9.7	(0.1)	32.2	(0.6)	22.3	(0.9)	1.2	(0.2)	8	(0.4)
2	2.7	(0.1)	51	(1.2)	33.7	(1.6)	4.8	(0.6)	19.5	(0.9)
3+	1.4	(0.0)	70.5	(1.5)	45.3	(1.9)	11.8	(1.9)	35.4	(1.5)
V. Disorder severity										
Severe	3.7	(0.1)	64.3	(1.1)	41.4	(1.5)	9.9	(1.1)	30.1	(1.1)
Moderate	5.2	(0.1)	44.9	(1.1)	30.1	(1.4)	2.4	(0.4)	14.8	(0.7)
Mild	4.8	(0.1)	25.4	(0.9)	19.5	(1.8)	0.6	(0.2)	5.4	(0.5)
VI. 12 M Disorder										
Any Disorder	13.8	(0.2)	46.5	(0.6)	34.1	(1.0)	3.5	(0.3)	17.7	(0.5)
No Disorder ^d	86.2	(0.2)	8.1	(0.2)	48.5	(1.0)	1.2	(0.1)	5.0	(0.1)
(n)	(56,927)		(18,702)		(9,309)		(9,393)		(18,702)	

PN: Perceived Need for treatment; %: proportion of observation in column total with outcome indicated in column heading; SE: design-based standard error of % adjusting for weighting and geographic clustering of observations; GAD: generalized anxiety disorder; Panic/Ago: Panic disorder or agoraphobia; PTSD: post-traumatic stress disorder; SP: specific phobia; SOP: social phobia; MDD: major depressive disorder; BD: bipolar spectrum disorder; AUD: alcohol use disorder (either abuse or dependence); DUD: drug use disorder (either abuse or dependence); Severe: respondents with either 12-month BD: AUD with a physiological dependence syndrome: suicide attempt: of self-reported severe role impairment due to 12-month mental and/or substance disorders; Mild: respondents who do not qualify for either severe or moderate disorder; Any: the weighted averages of entries in above rows within the same subset; (n): unweighted number of survey observations in the denominator

^a Pooled across all WMH surveys, with surveys weighted by sample size rather than by country population size

^b Prevalence estimates based on unweighted numbers of survey respondents

^c Prevalence estimates are based on unweighted numbers of survey respondents with the row disorders. For the "Any" categories, estimates are based on the number of survey respondents with one or more of the disorders in the category

^d Prevalence estimates in this row are based on unweighted numbers of survey respondents with none of the disorders considered here

common disorders were specific phobia (5.9%) and major depressive disorder (4.3%). Among the n = 12,508 respondents with any of these 12-month disorders, 70.7% had exactly one, 19.4% exactly two, and 9.9% 3+disorders, for a total of n = 18,702 person-disorders. As noted above, these person-disorders are the unit of analysis considered in the current report.

Prevalence of perceived need for 12-month treatment was 46.5% at the person-disorder level, varying from a high of 60.5% for panic/agoraphobia to a low of 31.6% for specific phobia. Of the 5,362 respondents defined as having perceived need, 433 (8.4%) said they thought they needed help but didn't believe treatment would work. Perceived need was positively related to both number and severity of disorders. Prevalence of receiving treatment at the person-disorder level was 17.7%, from a high of 30.7% for GAD to a low of 5.7% for AUD. Treatment, like perceived need, was positively related to number and severity of disorders both in the total sample and in subsamples defined by perceived need. However, perceived need was by far the strongest predictor of receiving treatment, as treatment was tenfold as likely in the presence (34.1%) as absence (3.5%) of perceived need among respondents with one of the disorders considered here. About 90% of the participants who received treatment had perceived need, with the remaining 10% reporting that they obtained treatment only because someone else put pressure on them.

Although they are not considered here, it is also noteworthy that 8.1% of the respondents who did not meet criteria for any of the 12-month disorders considered here (although they may have met criteria for other disorders that were either not assessed in any of the WMH surveys or were assessed in only some of these surveys) reported perceived need for treatment compared to 46.5% of the respondents who met criteria for any of these 12-month disorders (Table 1). A prior report showed that WMH respondents who received 12-month treatment without meeting criteria for any of the disorders assessed in the surveys consisted largely of those who either received maintenance treatment for lifetime disorders that were not active in the 12-months before interview (e.g., maintenance medications for attention-deficit/hyperactivity disorder, bipolar disorder, or nonaffective psychosis) or who received low-intensity treatment associated with life problems (e.g., spiritual counseling for marital problems, short-term grief counseling associated with death of a loved one, or treatment in the human services sector for emotional problems associated with job loss) [26].

RR of receiving treatment varied significantly by disorder type (RR=1.3-0.4; χ^2_8 =288.5, p<0.001), number (RR=1.7-2.3; χ^2_2 =177.1, p<0.001), and severity (RR=1.8-2.7; χ^2_2 =155.0, p<0.001) as well as by

perceived need (RR=9.1, χ^2_2 =501.9, p<0.001) in univariable models (Table 2), where RRs for type in the multivariable models were scaled so that the product of the RRs was 1.0 across disorders. This means that the high RR of 1.4 for Panic/AGO indicates that probability of receiving treatment was 40% higher for Panic/AGO than the average across all disorders, whereas the low RR of 0.6 for AUD and DUD indicates that probability of treatment contact was only 60% as high for these disorders as for the average across disorders. The multivariate disorder profile was also a significant predictor $(RR = 1.3, \chi^2_1 = 245.0, p < 0.001)$. We also considered the number of years between time of interview and first onset of the focal disorder based on the thought that disorders with more recent onsets might be more salient, but the univariable association of this variable (which had a mean of 20.2 years and a standard deviation of 2.0, but was standardized to a mean of 0 and standard deviation of 1.0 for the analysis) and the outcome was nonsignificant (RR = 1.0, χ^2_1 = 0.5. p = 0.46).

Although these significant univariable RRs all attenuated, most remained statistically significant in a multivariable model that considered the joint associations of type, number, and severity of disorders and number of continuous years between onset of the focal disorder and age at interview, and the multivariate disorder profile, while controlling for perceived need. The RR with number of disorders did not remain significant (RR=1.1; χ^2_1 =0.6, p=0.43) for 3+disorders. In a consolidated model that controlled for the sociodemographic predictors and predictors involving prior treatment history, significant associations included perceived need (RR=5.0; χ^2_1 =253.9, p<0.001), disorder type (RR=1.4-0.6; χ^2_8 =123.5, p<0.001), disorder severity (RR=1.4-1.9; χ^2_2 =67.1, p<0.001), and the multivariate disorder profile (RR=1.1, χ^2_1 =32.7, p < 0.001) with only modest changes in magnitude of coefficients.

Given the central importance of perceived need, we also evaluated interactions of perceived need with disorder type, number, severity, and years since onset predicting treatment contact in the multivariate model. These interactions were significant as a set (χ^2_{12} =86.4, p<0.001), but the only individually significant interaction involved disorder severity (χ^2_2 =31.0, p<0.001), which was less strongly associated with treatment contact among people with (RR=1.3–1.6 for moderate-severe disorders relative to mild disorders; χ^2_2 =28.2, p<0.001) than without (RR=2.6–7.7; χ^2_2 =49.8, p<0.001) perceived need for treatment. The interactions of perceived need with type (χ^2_8 =6.0, p=0.64) and number (χ^2_1 =1.0, p=0.33) and number of years since onset of the focal disorder (χ^2_1 =3.0, p=0.08), and the multivariate

	Univariable		Multivariabl	e	Multivariable consolidated		
	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	
I. Multivariate disorder profile	1.3*	(1.3–1.3)	1.2*	(1.1–1.2)	1.1*	(1.1–1.1)	
X ² 1	245.0*		48.8*		32.7*		
II. Anxiety disorders							
GAD	1.3*	(1.2–1.4)	1.3*	(1.2–1.4)	1.2*	(1.1–1.3)	
Panic/Ago	1.4*	(1.3–1.6)	1.4*	(1.2–1.5)	1.3*	(1.2–1.5)	
PTSD	1.2*	(1.1–1.3)	1.2*	(1.1–1.3)	1.2*	(1.0–1.3)	
SP	0.7*	(0.6–0.7)	1.0	(0.9–1.1)	1.0	(0.9–1.1)	
SoP	1.0	(0.9-1.1)	1.1*	(1.0-1.2)	1.1*	(1.0-1.2)	
III. Mood disorders							
MDD	1.2*	(1.1–1.3)	1.3*	(1.2–1.5)	1.4*	(1.3–1.5)	
BD	0.7*	(0.6–0.8)	0.9	(0.8-1.0)	0.9*	(0.7-1.0)	
IV. Substance use disorder	rs						
AUD	0.4*	(0.3–0.5)	0.6*	(0.5-0.7)	0.6*	(0.5–0.8)	
DUD	0.5*	(0.4–0.7)	0.6*	(0.5-0.8)	0.6*	(0.5–0.8)	
X ² 8	288.5*		89.6*		123.5*		
V. Number of disorders							
1	1.0	-	-	-	-	-	
2	1.7*	(1.5-1.9)	1.0	-	-	-	
3+	2.3*	(2.0-2.6)	1.1	(0.9-1.2)	-	-	
X ² 1/2	177.1*		0.6				
VI. Disorder severity							
Severe	2.7*	(2.3-3.3)	2.0*	(1.6–2.4)	1.9*	(1.6–2.3)	
Moderate	1.8*	(1.5-2.2)	1.5*	(1.2-1.8)	1.4*	(1.2–1.8)	
Mild	1.0	-	1.0	_	1.0	-	
X ² 2	155.0*		68.1*		67.1*		
VII. Perceived need							
Yes	9.1*	(7.5–11.0)	6.2*	(5.1–7.6)	5.0*	(4.1–6.1)	
No	1.0	-	1.0	_	1.0	-	
χ^2_1	501.9*		318.5*		253.9* ^b		
VIII. Number of years since	e dx onset						
Continuous ^c	1.0	(1.0-1.0)	1.0	(1.0-1.0)			
χ^2_1	0.5		0.0				

Table 2 Disorder-related predictors of 12-month treatment evaluated at the person-disorder level^a

Univariable: univariable pooled within-country associations of row predictors with treatment; Multivariable: pooled within-country associations of all disorder-related predictors with treatment; Multivariable consolidated: pooled within-country associations of disorder-related predictors with treatment in a model including all other predictors; RR: relative risk of treatment; 95% CI: design-based 95% confidence interval of RR; GAD: generalized anxiety disorder; Panic/Ago: Panic disorder or agoraphobia; PTSD: post-traumatic stress disorder; SP: Specific phobia; SoP: Social phobia; MDD: major depressive disorder; BD: bipolar spectrum disorder; AUD: alcohol use disorder (either abuse or dependence); DUD: drug use disorder (either abuse or dependence); Severe: respondents with either 12-month BD: AUD with a physiological dependence syndrome: DUD with a physiological dependence syndrome: suicide attempt: or self-reported severe role impairment due to 12-month mental and/or substance use disorder; Mild: all others neither severe nor moderate; dx: diagnosis

^a Pooled within-survey associations across all WMH surveys at the person-disorder level (n = 18,702), with surveys weighted by sample size rather than by country population size

^b Perceived need interacted significantly with disorder severity (χ^2_2 =31.0, p < 0.001) in the consolidated model, as the association of disorder severity with treatment contact coverage was significantly less pronounced, although still statistically significant, in the presence (RR=1.3–1.6 for moderate-severe disorders relative to mild disorders; χ^2_2 =28.2, p < 0.001) than absence (RR=2.6–7.7; χ^2_2 =49.8, p < 0.001) of perceived need for treatment. The interactions of perceived need with type (χ^2_8 =6.0, p = 0.64) and number (χ^2_1 =1.0, p = 0.33) of disorders, in comparison, were nonsignificant

^c The mean and standard deviation number of years since onset of the disorder were 20.2 and 2.0, respectively. The variable was standardized to a mean of 0 and standard deviation of 1 for purposes of analysis

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

disorder profile (χ^2_1 =3.5, p=0.06) in comparison, were nonsignificant.

Socio-demographic predictors of 12-month treatment

When considered separately in univariable models that controlled only for perceived need, statistically significant but substantively modest associations were found between both of the socio-demographic variables and treatment contact, including sex (RR = 1.1 for females relative to males), age (RR = 0.8 for respondents ages 18–29, RR=1.2–1.3 for respondents ages 30–44 and 45–59 relative to those 60+), education (RR=0.8–0.8 for respondents with lower educational levels relative to those with high education), employment status (RR=1.2–1.4 for the retired, students, and disabled/ unemployed relative to the employed), and having health insurance (RR=1.4–1.6) (Table 3). These associations changed only modestly in a multivariable model that considered all these socio-demographic variables at once, but for the most part, became nonsignificant in

Table 3 Socio-demographic predictors of 12-month treatment at the person-disorder level^a

	Distribution		Univarial	Univariable		able	Multivariable consolidated	
	%	(SE)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)
I. Sex								
Female	62.6	(0.7)	1.1*	(1.0-1.3)	1.1*	(1.0-1.3)	1.0	(0.9–1.1)
Male	37.4	(0.7)	1.0	-	1.0	-	1.0	-
X ² 1	-		4.5*		4.9*		0.0	
II. Age								
18–29	30.0	(0.6)	0.8	(0.7-1.0)	0.9	(0.7-1.1)	1.1	(0.9–1.4)
30–44	33.1	(0.6)	1.2	(1.0-1.4)	1.2	(1.0–1.6)	1.2*	(1.0–1.5)
45–59	25.4	(0.5)	1.3*	(1.1–1.5)	1.3*	(1.1–1.7)	1.2*	(1.0-1.4)
60+	11.5	(0.4)	1.0	-	1.0	-	1.0	-
X ² ₃	-		35.4*		34.0*		6.2	
III. Education ^b								
Low	18.6	(0.5)	0.8*	(0.7–0.9)	0.7*	(0.6–0.8)	0.9	(0.8–1.0)
Low-Average	25.9	(0.6)	0.8*	(0.7–0.9)	0.8*	(0.7–0.9)	0.9	(0.8–1.0)
High-Average	33.8	(0.6)	0.8*	(0.7-1.0)	0.8*	(0.7-1.0)	1.0	(0.9–1.1)
High	18.4	(0.5)	1.0	-	1.0	-	1.0	-
X ² ₃	-		17.4*		29.5*		5.5	
IV. Employment status								
Homemaker	12.6	(0.4)	1.2	(1.0-1.4)	1.2	(1.0–1.3)	1.0	(0.9–1.2)
Retired	9.6	(0.4)	1.2	(1.0-1.4)	1.3*	(1.0–1.6)	1.1	(0.9–1.2)
Student	4.4	(0.3)	1.2	(0.9–1.6)	1.5*	(1.1–2.0)	1.5*	(1.1–2.1)
Unemployed/Disabled/Other	17.8	(0.5)	1.4*	(1.2–1.5)	1.5*	(1.3–1.6)	1.1	(1.0-1.2)
Employed	55.6	(0.7)	1.0	-	1.0	-	1.0	-
X ² ₄	-		31.2*		42.4*		9.1	
V. Health insurance								
Private or from occupation	57.0	(0.7)	1.4*	(1.2–1.6)	1.3*	(1.1–1.6)	1.3*	(1.2–1.5)
Public	31.4	(0.7)	1.4*	(1.2–1.6)	1.3*	(1.1–1.5)	1.2*	(1.0–1.3)
Any	83.1	(0.5)	1.6*	(1.3–2.0)	-	-	-	-
X ² ₂	-		24.6*		15.8*		18.9*	
VI. Perceived need								
Yes	46.5	(0.6)	9.1*	(7.5–11.0)	8.6*	(7.1–10.4)	5.0*	(4.1–6.1)
No	53.5	(0.6)	1.0	-	1.0	-	1.0	-
X ² 1	-		501.9*		461.0*		253.9*	

^a Pooled within-survey associations across all WMH surveys at the person-disorder level (n = 18,702), with surveys weighted by sample size rather than by country population size

^b In quartiles defined by country-specific distributions (see ref. [22] for details)

* Significant at the 0.05 level, two-sided design-based test

the consolidated model that controlled disorder-related predictors and predictors involving prior treatment history. The exception was health insurance (χ^2_4 =18.9, p < 0.001) with respondents with both public (RR = 1.2) and private (RR = 1.3) health insurance.

As in the above analysis of disorder-related predictors, we evaluated the possibility of significant interactions of socio-demographics with perceived need predicting treatment contact in the multivariate model. These interactions were significant as a set (χ^2_{13} =38.4, p < 0.001), but the only individually significant interactions involved student status and disability/unemployment; student status was a significant predictor of treatment contact coverage among respondents with perceived need for treatment (RR=1.5; χ^2_1 =6.2, p=0.01) but not for respondents without perceived need for treatment (RR=1.3; χ^2_1 =0.2, p=0.66). Disability/unemployment was significant for both respondents with perceived need for treatment (RR=1.3; χ^2_1 =0.2, p=0.4

 χ^{2}_{1} = 20.0, p < 0.001) and without perceived need for treatment (RR = 3.5; χ^{2}_{1} = 30.5, p < 0.001).

Aspects of prior treatment predicting 12-month treatment

Prior treatment was 50.5% across all person-disorders but much higher in the presence (67.3%) than absence (35.9%) of perceived need (Table 4). In the subsample with perceived need, the proportions treated by a psychiatrist (37.0%), other mental health treatment provider (38.3%), or general medical provider (38.6%) were much higher than the proportions treated by human services (10.4%) or CAM (13.1%) providers. The majority of those with perceived need had seen only one provider in the past (27.5%) rather than with two (18.7%), three (13.6%), or more (7.4%) types of treatment provider and treatment was more likely to be a combination of medication and psychotherapy (34.6%) than either alone (15.8–16.9%). Finally, past treatment was typically provided for focal disorders and was perceived to have been helpful (37.1%)

	Distribu	tion of predict	ors	Conditional probability of treatment contact				
	PN = Yes		PN = No		PN=Yes		PN = No	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
I. Any prior treatment								
Yes	67.3	(0.9)	35.9	(0.8)	41.0	(1.2)	7.8	(0.8)
No	32.7	(0.9)	64.1	(0.8)	19.9	(1.2)	1.1	(0.2)
II. Type of provider								
Psychiatrist	37.0	(0.9)	13.3	(0.6)	51.8	(1.5)	13.8	(1.6)
Other mental health	38.3	(1.0)	16.3	(0.6)	46.7	(1.6)	10.4	(1.4)
General medical	38.6	(1.0)	20.5	(0.7)	46.4	(1.6)	8.0	(1.1)
Human services	10.4	(0.6)	3.0	(0.3)	50.1	(3.1)	12.3	(3.5)
CAM	13.1	(0.7)	3.9	(0.3)	47.9	(2.5)	17.4	(3.2)
III. Number of provider types								
1	27.5	(0.9)	21.9	(0.7)	26.5	(1.6)	4.5	(0.8)
2	18.7	(0.8)	8.7	(0.5)	41.2	(2.1)	7.9	(1.5)
3	13.6	(0.8)	4.0	(0.3)	58.9	(2.4)	18.5	(3.3)
4	5.6	(0.5)	1.0	(0.1)	56.3	(3.7)	24.0	(7.5)
5	1.8	(0.3)	0.3	(0.1)	77.4	(5.0)	40.6	(15.4)
IV. Types of treatment								
Medication-only	15.8	(0.8)	13.0	(0.6)	24.7	(2.2)	3.6	(0.8)
Psychotherapy-only	16.9	(0.7)	10.2	(0.5)	30.8	(2.0)	5.8	(1.3)
Both	34.6	(1.0)	12.7	(0.5)	53.4	(1.6)	13.5	(1.7)
V. Helpfulness of prior treatment								
Helpful/current disorder	37.1	(1.1)	14.7	(0.6)	58.0	(1.4)	14.1	(1.6)
Not helpful/current disorder	14.6	(0.7)	8.0	(0.5)	30.0	(1.9)	6.5	(1.6)
Only for other problems	15.6	(0.7)	13.3	(0.6)	10.8	(1.2)	1.4	(0.5)
No past treatment	32.7	(0.9)	64.1	(0.8)	19.9	(1.2)	1.1	(0.2)

Table 4 Conditional probability of 12-month treatment at the person-disorder level by treatment history and perceived need^a

PN: perceived need for treatment; SE: the design-based standard error of % taking into consideration the weighting and geographic clustering of observations

^a Pooled across all WMH surveys at the person-disorder level separately in subsamples with (n = 9309) and without (n = 9393) perceived need, with surveys weighted by sample size rather than by country population size

compared to either unhelpful (14.6%) or provided only for some other unspecified emotional problem (15.6%). These patterns were somewhat different in the subsample without perceived need in several ways. When there was prior treatment: (i) Proportional treatment was higher in the general medical sector relative to the mental health specialty sectors in the subsample without than the subsample with perceived need. (ii) Treatment was much more likely to be with only one type of provider (61.0%) than in the subsample with perceived need (40.9%). (iii) A smaller proportion of treatment involved combined medication-psychotherapy (35.4%) than in the subsample with perceived need (51.4%). (iv) And, a smaller proportion of treatment was helpful treatment of focal disorders (40.8%) than in the subsample with perceived need (55.1%).

The association of prior treatment with receiving 12-month treatment also differed significantly depending on perceived need. In the subsample with perceived need, treatment contact was 41.0% when there was prior treatment and 19.9% without prior treatment, resulting in a pooled within-country RR of 1.8 ($\chi^2_1 = 77.7$, p < 0.001). In the subsample without perceived need, in comparison, treatment contact was much lower overall but still higher when there was prior treatment (7.8%)than without (1.1%). However, despite these low levels of treatment contact in the absence of perceived need, the pooled within-country RR of treatment contact based on prior treatment, RR=7.4 (χ^2_1 =60.7, p<0.001), was higher than in the subsample with perceived need due to the extremely low base rate of treatment contact in the absence of both perceived need and prior treatment. In the subsample with perceived need, conditional probability of treatment contact did not differ meaningfully depending on type of providers seen (46.4–51.8%) but increased with number of prior provider types seen (from 26.5% with one to 77.4% with five), was lower when treatment involved either medication only (24.7%) or psychotherapy-only (30.8%) than combined treatment (53.4%), and was higher when prior treatment for a focal disorder was seen as helpful (58.0%) or unhelpful (30.0%) than in the absence of prior treatment (19.9%). Strikingly, treatment contact was lowest for cases where prior treatment was only for other unspecified emotional problems (10.8%). These patterns were broadly similar, with two exceptions, in the subsample without perceived need in that conditional probability of treatment contact (i) increased with number of prior provider types seen (from 4.5% with one to 40.6% with five), (ii) was lower when treatment involved either medication only (3.6%)or psychotherapy-only (5.8%) than combined treatment (13.5%), (iii) and was highest when prior treatment was for a focal disorder and was seen as helpful (14.1%) or unhelpful (6.5%) than in the absence of prior treatment (1.1%). The two exceptions were, first, that conditional probability of treatment contact varied across types of prior providers seen in the absence of perceived need (highest for CAM, 17.4%; lowest for general medical, 8.0%) but not in the presence of perceived need and, second, that treatment contact was comparably low in the absence of prior treatment (1.1%) and when prior treatment was exclusively for other unspecified emotional problems (1.4%), whereas it was much lower for the latter than the former in the subsample with perceived need.

The above differences in conditional probabilities of receiving treatment resulted in three significant differences in pooled within-country RRs between the subsamples with and without perceived need (Table 5). First, univariable RRs involving provider types were much lower in the presence (RR = 1.3 - 2.0) than absence (RR = 3.5 - 6.8) of perceived need due to the very low conditional probability of receiving treatment in the absence of perceived need and no prior treatment. These differences became much less pronounced, though, in the multivariable model that controlled for other aspects of prior treatment (RR=0.8–1.1, χ^2_5 = 18.2, p=0.003, in the subsample with perceived need; RR=0.6-1.1, $\chi_{5}^{2} = 6.1$, p=0.30, in the subsample without perceived need). Similar differences across subsamples occurred in the monotonically increasing univariate RRs with number of provider types (RR = 1.2-3.3, $\chi^2_5 = 255.3$, p < 0.001, in the subsample with perceived need; RR=4.4-52.4, $\chi_{5}^{2} = 189.7$, p < 0.001, in the subsample without perceived need), again due to the very low conditional probability of receiving treatment in the absence of perceived need and no prior treatment. As in the RRs for provider type, these differences in RR for number of provider types became much less pronounced, although still notable, in the multivariable model that controlled for other aspects of prior treatment and focused on the gradient among participants with at least some prior treatment (RR = 1.2-2.2, $\chi^2_{~4}$ = 8.7, p =0.07, in the subsample with perceived need; RR=1.3–9.1, $\chi^2_{~4}$ = 3.9, p=0.41, in the subsample without perceived need).In the multivariable model that also controlled for 12-month disorders and socio-demographics, number of provider types remained nonsignificant in the subsample with perceived need, while it became significant in the subsample without perceived need (RR = 0.7-1.9, $\chi^2_5 = 23.4$, p < 0.001).

Second, the proportional benefits of prior psychotherapy and combined medication-psychotherapy over medication-only in predicting 12-month treatment were less pronounced in the univariable model for the subsample with perceived need (RR=1.1 versus 1.4–2.3 compared to no prior treatment, χ^2_3 =213.6, p<0.001) than without perceived need (RR=3.4 versus 5.8–12.5 compared

	Subsample with perceived need							Subsample without perceived need					
	Univariable		Multivariable		Multivariable with consolidated		Univariable		Multivariable		Multivariable with consolidated		
	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	
I. Any prior treatment													
Yes	1.8*	(1.6–2.0)	-	-	-	-	7.4*	(4.5–12.2)	-	-	-	-	
No	1.0	-	-	-	-	-	1.0	-	-	-	-	-	
χ^2_1	77.7*		-		-		-		_		_		
II. Types of providers													
Psychiatrist	2.0*	(1.8–2.2)	1.1	(0.8–1.3)	1.0	(0.8–1.3)	6.8*	(4.7–10.0)	1.1	(0.4-2.9)	-	-	
Other mental health	1.6*	(1.5–1.8)	1.0	(0.8–1.2)	0.9	(0.7-1.1)	5.1*	(3.4–7.7)	1.0	(0.4–2.5)	-	-	
General medical	1.5*	(1.4–1.7)	1.0	(0.8–1.2)	0.9	(0.7-1.2)	3.5*	(2.4–4.9)	0.6	(0.3–1.5)	-	-	
Human services	1.4*	(1.3–1.6)	1.0	(0.7-1.2)	1.0	(0.8–1.2)	3.9*	(2.3–6.8)	0.8	(0.3–2.3)	-	-	
CAM	1.3*	(1.2–1.5)	0.8*	(0.6–1.0)	0.8	(0.6–1.0)	5.7*	(3.7–8.7)	0.9	(0.3–2.6)	-	-	
X ² 5	-		18.2*		10.6		-		6.1		-		
$\chi^{2}_{4}^{b}$	-		13.3*		6.6		-		4.6		-		
III. Number of provider types													
1	1.2*	(1.0–1.5)	1.0	-	1.0	-	4.4*	(2.5–7.6)	-	-	0.8	(0.3–1.7)	
2	1.9*	(1.6–2.2)	1.2	(0.9–1.6)	1.2	(0.9–1.7)	8.2*	(4.4–15.4)	1.3	(0.5–3.6)	0.7	(0.3–1.8)	
3	2.5*	(2.2–2.9)	1.5	(0.9–2.4)	1.4	(0.9–2.4)	19.0*	(10.8–33.4)	2.9	(0.5–15.9)	1.7	(0.6–5.1)	
4	2.4*	(2.0-2.8)	1.5	(0.7–3.2)	1.5	(0.7–3.0)	28.5*	(12.7–64.3)	4.5	(0.3–64.8)	1.4	(0.4–4.6)	
5	3.3*	(2.7–3.9)	2.2	(0.8–5.6)	2.0	(0.8–4.9)	52.4*	(25.4–108.4)	9.1	(0.3–321.3)	1.9	(0.5–7.0)	
X ² _{5/4}	255.3*		8.7		8.5		189.7*		3.9		23.4*		
IV. Type of treatment													
Medication-only	1.1	(1.0-1.4)	1.0	-	1.0	-	3.4*	(1.9–6.3)	1.0	-	1.0	-	
Psychotherapy-only	1.4*	(1.1–1.6)	1.1	(0.9–1.4)	1.2	(1.0-1.4)	5.8*	(3.1–11.0)	1.9*	(1.0-3.5)	1.7	(0.9–3.1)	
Both	2.3*	(2.0–2.6)	1.3*	(1.1–1.6)	1.3*	(1.1–1.5)	12.5*	(7.3–21.3)	1.7*	(1.0-3.0)	1.5	(1.0-2.5)	
X ² _{3/2}	213.6*		12.3*		8.8*		93.6*		5.1		4.2		
V. Helpfulness of prior treatmen	t												
Helpful/current disorder	2.5*	(2.2–2.8)	1.7*	(1.5–1.9)	1.6*	(1.4–1.9)	14.0*	(8.4–23.2)	7.2*	(3.3–15.8)	6.3*	(2.8–14.2)	
Not helpful/current disorder	1.3*	(1.1–1.6)	1.0	-	1.0	-	6.5*	(3.4–12.3)	4.3*	(1.9–9.9)	4.0*	(1.7–9.1)	
Only for other problems	0.5*	(0.4–0.7)	0.4*	(0.3–0.6)	0.5*	(0.4–0.6)	1.4	(0.6–3.3)	1.0	-	1.0	-	
No past treatment	-	-	-	-	-	-	-	-	-	-	-	-	
X ² _{3/2}	476.3*		185.2*		147.1*		126.9*		24.4*		19.9*		

Table 5 Treatment history predictors of 12-month treatment at the person-disorder level separately by perceived need^a

Univariable: associations of each row predictor with treatment contact in a separate model controlling only for survey; Multivariable separate: associations of all predictors involving treatment history with treatment contact in in a single model controlling for survey; Multivariable consolidated: associations of all disorderrelated predictors with treatment contact in a single model controlling for survey, disorder-related predictors, and socio-demographics; %: the distribution of the predictors involving treatment history; SE: the design-based standard error of % taking into consideration the weighting and geographic clustering of observations; RR: relative risk of treatment contact as a function of the row predictor; 95% CI: the design-based 95% confidence interval of RR; taking into consideration the weighting and geographic clustering of observations;

^a Pooled across all WMH surveys at the person-level separately in subsamples with (n = 9309) and without (n = 9393) perceived need, with surveys weighted by sample size rather than by country population size

 $^{\rm b}$ The $\chi^2_{\,4}$ values evaluate the global significance of differences in RR across the 5 provider types

* Significant at the 0.05 level, two-sided design-based test

to no prior treatment, $\chi^2_3 = 93.6$, p < 0.001). This difference persisted in the multivariable model that controlled for other aspects of prior treatment, where the proportional increase in probability of receiving treatment given prior psychotherapy-only and combined medication-psychotherapy over prior medication-only remained

lower in the subsample with (RR=1.1–1.3, χ^2_2 =12.3, p=0.002) than without (RR=1.9–1.7, χ^2_2 =5.1, p=0.08) perceived need, although the association was nonsignificant in the subsample without perceived need due to the small number of cases that received treatment contact. There were no further meaningful changes in the

multivariable model that also controlled 12-month disorders and socio-demographics.

It is also noteworthy that the univariable model benefits of prior treatment of focal disorders, whether perceived to be helpful or unhelpful, were less pronounced proportionally in the subsample with (RR=2.5-1.3, $\chi^2_2 = 275.8$, p < 0.001) than without (RR = 14.0-6.5, $\chi^2_2 = 104.1$, p<0.001) perceived need and that a history of receiving prior treatment exclusively for unspecified other emotional problems was associated with significantly lower probability of -receiving 12-month treatment contact than if no prior treatment was received in the subsample with perceived need (RR=0.5, χ^2_1 =24.2, p < 0.001) but with an equivalent probability of 12-month treatment than if no prior treatment was received in the subsample without perceived need (RR=1.4, $\chi^2_{\ 1}{=}0.6$, p = 0.45). Together, these differences created a complex pattern in the multivariable model that controlled for other aspects of prior treatment, where the RRs for treatment helpfulness focused only on comparisons across the three helpfulness categories among those who received prior treatment.

There were also important consistencies across subsamples in that: (i) the RRs were significant as a set both in subsamples with (χ^2_3 =185.2, p<0.001) and without $(\chi^2_3 = 24.4, p < 0.001)$ perceived need; (ii) and the RRs were consistently highest for prior helpful treatment of focal disorders (RR=1.7, χ^2_1 =60.9, p<0.001, with perceived need; RR=7.2, χ^2_1 =24.1, p<0.001, without perceived need), lower for prior unhelpful treatment of focal disorders (RR=1.0, the contrast category, among participants with perceived need; RR=4.3, χ^2_1 =24.1, p<0.001, without perceived need), and lowest for prior treatment only for unspecified other emotional problems (RR = 0.4, $\chi^2_1 = 43.9$, p<0.001, with perceived need; RR=1.0, the contrast category, among participants without perceived need). However, the RRs were less pronounced in the subsample with than without perceived need. These level differences occurred because the contrast category was set differently in the two subsamples due to the treatment rate, which was lowest in the subsample with perceived need among cases that received prior treatment exclusively for other unspecified emotional problems, whereas the treatment rate was lowest in the subsample without perceived need among cases that received no prior treatment. There were no further meaningful changes in the multivariable model that also controlled 12-month disorders and socio-demographics.

Country-level predictors of 12-month treatment

We showed in an earlier report that only two of the country-level variables considered here were significant predictors of effective treatment, which we defined as treatment meeting generally established treatment guidelines for the disorders under study [4]: the number of non-psychiatrist MDs in the population per capita; and healthcare spending as a proportion of GDP. Both these country-level variables were significantly associated with increased rates of contact in the subsample of respondents with perceived need but with substantively modest standardized RRs (1.1–1.2; Supplementary Table 4). The strength of these associations decreased further when they were adjusted for compositional differences across countries in the individual-level variables in the consolidated model (RRs = 1.1 - 1.1, with only the RR for nonpsychiatrist MDs/population still statistically significant). RRs were of comparable magnitude in the subsample without perceived need after adjusting for compositional differences. It is noteworthy, though, that one of the country-level variables that was not significant, the one about mean levels of embarrassment if someone knew the respondent had emotional problems, asked only about emotional problems and not about problems with substance misuse, possibly leading to an underestimation of the importance of embarrassment.

Discussion

The current report builds on previous work in the WMH surveys emphasizing the importance of perceived need in the coverage cascade, noting that our definition of perceived need focuses on problem recognition regardless of respondent beliefs about the effectiveness of available treatments. Perceived need was by far the strongest predictor of treatment, with probability of receiving treatment tenfold as likely in the presence (34.1%) as absence (3.5%) of perceived need and 17.7% overall [4]. We showed that adjusting for perceived need, treatment was associated significantly with disorder type (highest for panic/agoraphobia, lowest for alcohol use disorder), number of disorders and severity, health insurance, student status, and being disabled/unemployed as well as with several aspects of prior treatment, particularly perceived helpfulness. Associations of these other predictors with treatment were for the most part quite similar in the subsamples of respondents with and without perceived need, suggesting that there are overlapping policy implications for these groupings.

WMH survey findings have previously shed light on predictors of bottlenecks in the coverage cascade, including predictors of perceived need. Effective treatment is predicted by country characteristics, disorder profiles, and socio-demographic characteristics such as having private insurance [4]. These prior studies also showed that perceived need is predicted by disorder characteristics (type, number, severity), socio-demographic characteristics (age, sex), and treatment history (provider type,

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treatment type, helpfulness of treatment) [27]. The current findings extend this prior work by showing that the strong association of perceived need with treatment is apparent within each disorder, for each number of disorders, and at each level of severity.

We further explored in the current report the associations of disorder characteristics with receiving treatment controlling perceived need. Treatment rates were highest among survey respondents with panic/agoraphobia and lowest for those with alcohol use disorder compared with other disorders at the same level of severity and perceived need. Treatment was also predicted by disorder number and severity. Taken together, these findings suggest that probability of treatment increases as the complexity and severity of disorders increases and is least likely for disorders that are often accompanied by denial or lack of insight [28].

The associations of socio-demographics with receiving treatment were weak (RR ranging from 0.8 to 1.6), although probability of treatment in our final multivariable model that controlled for perceived need was significantly elevated among respondents with insurance, those who were students, and those in the middle age ranges (30-59). The finding regarding insurance is consistent with much previous research documenting the importance of insurance in increasing probability of receiving treatment [4, 29, 30]. The association of being a student with treatment may reflect a willingness to seek help at a life stage that is often accompanied by challenges and where seeking assistance may be encouraged [31]. It is less clear why treatment rates should be highest in the middle-age range. Country-level predictors, in comparison, were for the most part nonsignificant and, in the one case where a country-level predictor was significant the association was very modest in substantive terms.

Our findings extend previous examinations of the role of past treatment in the coverage cascade. First, associations of past treatment with 12-month treatment differed depending on perceived need. Notably, past treatment was associated with increased perceived need; twothirds of respondents with perceived need had past treatment and only one-third without perceived need had past treatment. Further, among people with perceived need, roughly one in three of those with past treatment received 12-month treatment versus about one in five of those without prior treatment. This suggests that once a need is recognized, familiarity with prior treatment leads to increased probability of seeking 12-month treatment. We may gain further insights when we explore participant-reported reasons for not seeking treatment in a future report.

Second, in the subsample with perceived need, treatment is associated with type of past treatment providers (highest for psychiatrists and other mental health professionals, lowest for human services and CAM providers), with number of types of providers seen (more is better), the type of treatment received (combined is best), and perceived helpfulness of this past treatment. However, in the final multivariable model, these associations mostly disappear. Probability of treatment was highest for those who received combined treatment, furthermore, it was highest for those who had helpful treatment for a focal disorder, followed by those who had unhelpful treatment, followed by individuals who had treatment for other problems. Taken together, this suggests that the best outcomes occur when treatment is comprehensive, matched to the problem, and perceived to have worked.

Third, in the subsample without perceived need, treatment is associated with number of types of providers seen (more is better), the type of treatment received (combined is best), and perceived helpfulness of this past treatment. However, very small proportions of respondents without perceived need received treatment, whether (7.8%) or not (1.1%) they had prior treatment, and in the final multivariable model both past treatment helpfulness and unhelpfulness predict treatment contact. Taken together, these findings indicate that persistent lack of perceived need is associated with almost uniformly persistent lack of help-seeking; it is primarily in one-third of cases where prior treatment was obtained that others may pressure individuals without perceived need to seek treatment.

Identification of the largest bottlenecks in treatment contact has important policy implications. Bottlenecks such as perception of need (fewer than half of the 12-month person-disorders perceived their own need), disorder characteristics (type and severity), health insurance, and perceived helpfulness of past treatment can each be addressed by specific policy interventions. Perception of need may be addressed by health literacy and destigmatization programs [32], despite challenges in implementing such programs in flexible, feasible, and sustainable ways [33]. Alcohol use disorder deserves particular attention in terms of health promotion and harm reduction [34]. Health insurance may be tackled by including mental health conditions as an essential component of universal health insurance [35]. Perceived helpfulness can be addressed by better quality of services [36]; treatment should meet the minimal standards of clinical practice guidelines and be targeted optimally to those in greatest need [37].

Such interventions are consistent with the UN's Sustainable Development Goals (SDG), such as increasing universal health coverage for essential health services, including mental health (indicator 3.8.1), and increasing coverage for substance disorder treatment interventions (indicator 3.5.1). Bottlenecks in the coverage cascade are worse for people with substance use disorders, consistent with previous WMH Survey findings on effective treatment coverage, and again emphasize the importance of the SDG of obtaining good health and well-being by strengthening the prevention and treatment of substance abuse. Indeed, strengthening mental health services and policies is crucial for sustainable development [35].

Several limitations of this work deserve emphasis. First, data on service use, including perceived helpfulness, are based on self-report, and so are subject to bias, including memory bias [38]. We cannot be certain, for example, that the need for treatment was perceived before treatment contact or whether receiving treatment reinforced the perception of need. Claims data may suggest higher treatment contact than found here, but such data are not based on standardized diagnoses and may entail over-coding of subclinical cases [39]. Second, the focus here was on a limited number of mental disorders; the findings may not generalize to other conditions including externalizing disorders other than substance use disorders. Third, some comparisons lacked statistical power because they were based on small subsamples. This was especially true for the analyses that examined differences in predictors depending on the presence or absence of perceived need. An addition issue with the latter analysis was that the differences involving CAM in these two subsamples might have been associated with some respondents not thinking of CAM as "treatment," whereas the questions used to define perceived need all referred to need for "treatment." Fourth, different surveys were conducted over a two-decade period and the potential influence of this differential timing was not explored. A notable strength of the study, though, was that it was based on an international sample representative of 21 countries, employing a validated structured diagnostic interview of key mental disorders and allowing rigorous investigation of a range of transition points in the coverage cascade [10].

In conclusion, to the best of our knowledge, this is the first rigorous investigation of patterns and predictors of treatment contact that adjusts for perceived need. The analyses reported here build on previous work from the WMH surveys which show that perceived need is crucially important for 12-month treatment, with treatment occurring only uncommonly in the absence of perceived need. The findings here show how, adjusting for perceived need, probability of obtaining treatment varies significantly as a joint function of disorder type-severity, sociodemographic characteristics, including health insurance, and history of prior treatment. Policy recommendations emerging from this work include establishing health literacy and destigmatization programs, enhancing access through health insurance, and improving quality of care. Additional practical considerations include optimizing identification of individuals with mental health problems [40], integrating substance use or mental health care into routine care [41], and promoting peer support initiatives in those hardly reached by intervention initiatives [42]. Future exploration of respondent-reported barriers to obtaining treatment may be useful in further understanding the associations reported here.

Abbreviations

Agoraphobia
Alcohol use disorder
Bipolar spectrum disorder
Complementary and alternative medicine
Confidence intervals
Composite International Diagnostic Interview
Diagnostic and Statistical Manual of Mental Disorders, 4th edition
Drug use disorder
Generalized anxiety disorder
Gross domestic product
High-income
Low- or middle-income
Major depressive disorder
Panic disorder
Post-traumatic stress disorder
Risk ratios
Sustainable Development Goals
Social phobia
Specific phobia
World Mental Health

Supplementary Information

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Supplementary Material 1.

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Author contributions

DJS, MGH, AEK, DVV, and RCK conceived the study, provided overall guidance and prepared the first draft. NAS supervised data analyses, reviewed results and reviewed and contributed to the report. DJS and MCV reviewed results and reviewed and contributed to the report. IH and SMM conducted data analyses. All other authors provided data, reviewed results and/or reviewed and contributed to the report.

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Availability of data and materials

Access to the cross-national World Mental Health (WMH) data is governed by the organizations funding and responsible for survey data collection in each country. These organizations made data available to the WMH consortium through restricted data sharing agreements that do not allow us to release the data to third parties. The exception is that the U.S. data are available for secondary analysis via the Inter-University Consortium for Political and Social Research (ICPSR), http://www.icpsr.umich.edu/icpsrweb/ICPSR/series/00527.

Declarations

Ethics approval and consent to participate

This study has been performed in accordance with the Declaration of Helsinki. At all survey sites, the local ethics or institutional review committee reviewed and approved the protocol to ensure protection of human subjects, in line with appropriate international and local guidelines. Details of the ethics committees for the WMH surveys can be viewed at this link: http://www.hcp.med. harvard.edu/wmh/ftpdir/WMH_Ethics_approval.pdf

Consent for publication

Not applicable.

Competing interests

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