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Socio-economic variations in the mental health treatment gap for people with anxiety, mood, and substance use disorders: results from the WHO World Mental Health (WMH) surveys

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Abstract

Background. The treatment gap between the number of people with mental disorders and the number treated represents a major public health challenge. We examine this gap by socio-economic status (SES; indicated by family income and respondent education) and service sector in a cross-national analysis of community epidemiological survey data.

Methods. Data come from 16 753 respondents with 12-month DSM-IV disorders from community surveys in 25 countries in the WHO World Mental Health Survey Initiative. DSM-IV anxiety, mood, or substance disorders and treatment of these disorders were assessed with the WHO Composite International Diagnostic Interview (CIDI).

Results. Only 13.7% of 12-month DSM-IV/CIDI cases in lower-middle-income countries, 22.0% in upper-middle-income countries, and 36.8% in high-income countries received treatment. Highest-SES respondents were somewhat more likely to receive treatment, but this was true mostly for specialty mental health treatment, where the association was positive with education (highest treatment among respondents with the highest education and a weak association

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of education with treatment among other respondents) but non-monotonic with income (somewhat lower treatment rates among middle-income respondents and equivalent among those with high and low incomes).

Conclusions. The modest, but nonetheless stronger, an association of education than income with treatment raises questions about a financial barriers interpretation of the inverse association of SES with treatment, although future within-country analyses that consider contextual factors might document other important specifications. While beyond the scope of this report, such an expanded analysis could have important implications for designing interventions aimed at increasing mental disorder treatment among socio-economically disadvantaged people.

Background

The discrepancy between the number of people needing treatment for mental disorders and the number receiving treatment, known as the mental health treatment gap, represents a major public health challenge. Although mental disorders are a leading cause of disability (World Health Organization, 2012; Whiteford *et al.* 2015; Vigo *et al.* 2016), only a minority of people with these disorders receives treatment (Wang *et al.* 2007). This gap is even greater for people with low socio-economic status (SES) and those living in low-income countries (Steele *et al.* 2007; Ormel *et al.* 2008) even adjusting for disorder severity (Mojtabai, 2010; Andrade *et al.* 2014).

It is less clear, though, whether these disparities are equally large across all service sectors and all levels of disorder severity. We know that cross-national differences in treatment rates are strongly influenced by healthcare spending (Lewer *et al.* 2015) and that probability of receiving treatment is influenced by illness severity (Wang *et al.* 2007). We also know that specialist mental health (SMH) treatment resources are scarcer than general medical (GM) and nonmedical resources and that access to SMH treatment is often restricted through gatekeepers to the most severe-complex cases (Thornicroft & Tansella, 2013). It is less clear, though, how much the association of SES with treatment varies with these other factors. SES might be more weakly associated with treatment among severe cases or in the SMH sector due to access being driven more by need than the ability to pay. Alternatively, it might be that the association of SES with treatment is stronger in these cases due to more stringent barriers associated with low-SES. Research on more general patterns of healthcare utilization suggests that the latter is the case: that is, under-representation of low-SES individuals is more pronounced in the specialty sector than GM sector (Devaux & De Looper, 2012), but this pattern might not hold for mental disorders. Nor do we know how stable such a pattern is across countries, although there is some evidence of cross-national differences in the association of SES with mental disorder treatment (Kessler *et al.* 1997; Van Doorslaer & Masseria, 2004; Devaux & De Looper, 2012).

The World Mental Health (WMH) Surveys (Kessler *et al.* 2009), a series of cross-sectional population surveys of common mental disorders, provide an unprecedented opportunity to investigate the SES gradient in treatment of mental disorders at the level of the individual survey respondent as a joint function of disorder severity, service sector, and country income level. We do this here focusing on mental disorders in the 12 months before interview. It is noteworthy that the cross-national interactions we consider are at the level of the country income group rather than the individual country in order to maintain precision in estimating individual-level coefficients. It might be that future analyses could gain more insight by investigating contextual factors other than country income level, but we considered this the most interesting broad factor discriminating WMH countries the current analysis.

Methods

Sample

Data come from the 16 753 respondents across 28 WMH surveys with 12-month DSM-IV disorders. The surveys were administered to representative samples of adult household residents in 25 countries. These include seven surveys from countries classified by the World bank as lower-middle-income (Colombia, Iraq, Nigeria, Peoples Republic of China, Peru, Ukraine), seven upper-middle-income [Brazil, Bulgaria, Medellin Colombia (carried out at a later date than the national Colombian survey, at which time the income level of the country had increased), Lebanon, Mexico, Romania, South Africa], and 14 high-income [Belgium, France, Germany, Israel, Italy, Japan, Netherlands, New Zealand, Northern Ireland, Poland, Portugal, Spain (both a national survey and regional survey in Murcia), USA] (World Bank, 2009). There were no low-income countries in the sample.

The samples were based on a multi-stage clustered area probability household design. Samples were nationally representative in 19 surveys, representative of all urbanized areas in three others (Colombia, Mexico, Peru), and representative of selected regions (Nigeria) or Metropolitan areas (Sao Paulo in Brazil, Medellin in Colombia, a series of cities in Japan, Beijing/Shanghai and Shenzhen in the Peoples Republic of China) in the others. More details on sample designs are presented in online Supplementary Table A1. Interviews were carried out face-to-face in respondents' homes by trained lay interviewers. The respondents considered here were aged 18 and over other than in Medellin (age 19), Japan (age 20), and Israel (age 21). Response rates were 45.9–97.2% across surveys with a weighted (by sample size) average of 70.1% using the American Association for Public Opinion research RR1w definition (AAPOR, 2016).

To reduce respondent burden, interviews were divided into two parts. Part I assessed core mental disorders and was administered to all respondents. Part II assessed additional disorders and correlates and was administered to all Part I 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. Treatment was assessed in Part II. 71 239 Part II respondents were interviewed across all surveys, 16 753 of whom met criteria for any 12-month disorders. These 12-month cases are the focus of analysis here. Further details about WMH weighting are available elsewhere (Heeringa *et al.* 2008).

Measures

Mental disorders

Mental disorders were assessed with the WHO Composite International Diagnostic Interview (CIDI) Version 3.0 (Kessler & Ustun, 2004), a fully-structured interview generating lifetime and 12-month prevalence estimates of common DSM-IV disorders. The 12 disorders considered here include seven anxiety disorders (adult separation anxiety disorder, agoraphobia, generalized anxiety disorder, panic disorder, post-traumatic stress disorder, social phobia, specific phobia), three mood disorders [bipolar disorder including bipolar I, II and sub-threshold; dysthymic disorder; major depressive episode (MDE)], and two substance use disorders (abuse or dependence on alcohol or illicit drugs). As detailed elsewhere (Merikangas *et al.* 2011), our definition of the sub-threshold bipolar disorder includes both hypomania without a history of major depressive episode and sub-threshold hypomania with a history of major depressive episode. Our definition of substance dependence is limited to cases with a history of abuse. The CIDI interview translation, back-translation, adaptation, and harmonization protocol required culturally competent bilingual clinicians to review, modify, and approve key phrases describing symptoms (Harkness *et al.* 2008). Blinded clinical reappraisal interviews with the Structured Clinical Interview for DSM-IV (First *et al.* 2002) in a number of WMH surveys found generally good concordance with diagnoses based on the CIDI (Haro *et al.* 2006).

We focus here on disorders present in the 12 months before interview. Respondents were classified as having a severe 12-month disorder if at least one of their DSM-IV/CIDI disorders included either bipolar I disorder, substance dependence with a physiological dependence syndrome, any disorder associated with making a 12-month suicide attempt, or any disorder associated with severe impairment in any domain of the expanded-revised Sheehan Disability scales (SDS) (Leon *et al.* 1997). Respondents not classified severe were classified moderate if at least one of their 12-month disorders included substance dependence without a physiological dependence syndrome or at least one disorder with moderate interference in any SDS domain. All other respondents with 12-month disorders were classified as mild (Ten Have *et al.* 2013).

Mental health treatment

Part II respondents were asked if they ever obtained professional treatment for 'problems with emotions, nerves, mental health, or use of alcohol or drugs' and, if so, whether they received such treatment at any time during the 12 months before interview. Importantly, this question was not disorder-specific, which means that we have no way of knowing which disorders respondents sought treatment for. Respondents who reported 12-month treatment were asked whether they received this treatment during the past 12 months from each of a wide range of treatment providers that were subsequently classified into four categories: (1) SMH (psychiatrist, psychologist, other mental health professional in any setting, social worker or counselor in a mental health specialist treatment setting, used a mental health hotline); (2) GM (primary care doctor, other medical doctor, any other healthcare professional seen in a GM setting); (3) *human services* (HS; religious or spiritual advisor, social worker, or counsellor in any setting other than SMH); and (4) *complementary alternative medicine* (CAM; any other type of healer such as chiropractors or participation in self-help groups). Further details on the treatment variables are presented elsewhere (Wang *et al.* 2007).

Socio-economic status

Two indicators of SES were considered: respondent education and family income in the 12 months before interview. As educational levels and systems varied across countries, education was defined in terms of four groups based on country-specific distributions of *high* (which, in high-income countries, corresponded to a college degree with or without further education), *high-average* (some post-secondary education without a college degree), *low-average* (secondary school graduation), and *low* (less than secondary education, including no education). More details on the education coding scheme are presented elsewhere (Scott *et al.* 2014). Family income was also divided into four categories using the within-country approach adopted in international studies of welfare economics (Levinson *et al.* 2010), which defines *high income* as greater than three times the within-country median per capita family income (i.e. income divided by number of family members), *high-average* income as between one and three times median per capita family income, *low-average* income as 50–100% of median per capita family income, and *low* income as less than or equal to 50% of median per capita family income.

Control variables

Our models controlled for respondent age, sex, and marital status. Age was considered in four groups of 18–34, 35–49, 50–64, and 65+. Marital status was divided into three groups of never married, previously married (separated, divorced, widowed), and currently married or cohabiting.

Statistical analysis

Weights adjusted for under-sampling Part I respondents without disorders, differences in within-household probabilities of selection (due to the selection of only one respondent per household no matter the number of eligible residents), and residual discrepancies between sample and population distributions on census demographic-geographic variables. All multivariable regression models in these weighted data were estimated in pooled cross-national analyses with dummy control variables included for surveys, yielding coefficients representing pooled within-survey associations. Controls were also included for respondent age, sex, and marital status.

The multivariate associations of type, number, and severity of mental disorders with treatment were specified in a relatively complex model, both because these disorder characteristics are known to predict treatment (Andrade *et al.* 2014) and because SES is known to be inversely related to these disorder characteristics (Scott *et al.* 2014), making it important to control adequately for these characteristics to obtain accurate estimates of effects of SES on treatment. Expanded models then examined both main effects of SES and interactions of SES with disorder severity and country income level. All models were estimated using a logistic link function.

The multivariable associations of mental disorders with treatment in these models were necessarily constrained because the number of logically possible disorder combinations ($2^{12} = 4096$) is far greater than the number of predictors we could include in the models. As a result, our models included 12 separate disorder-specific dummy variables along with dummy variables for exactly 3 and 4+ disorders. Given that all respondents had at least one disorder and that the model included dummy variables for people with 3+ disorders, the disorder-specific odds ratios (ORs) represent the adjusted (for the control variables) incremental

predicted odds of treatment (*v.* not-treatment) among respondents with exactly one disorder. The incremental predictive effects of individual disorders among people with two disorders were then assumed to be multiplicative; that is, if the OR associated with Disorder X was 1.5, we would expect respondents with exactly one other disorder would have a 1.5 increased odds of obtaining treatment in the presence *v.* absence of Disorder X. This specification imposed parsimony on the data by constraining the OR of Disorder X to be the same across all 11 combinations of Disorder X with exactly one other disorder (i.e. reducing the $12 \times 12 = 144$ logically possible main effects and 2-way interactions between pairs of disorders to 12 coefficients). The dummy variables for 3 and 4+ disorders imposed additional constraints by assuming that the 3-way and higher-order interactions among disorders predicting treatment were subject to a constant multiplier that could be 1.0 (i.e. the interactions were strictly multiplicative) or different from 1.0. Models of this form have been shown to be useful in a number of prior WMH analyses (e.g. McGrath *et al.* 2016; Stein *et al.* 2016).

Logistic regression coefficients and standard errors were exponentiated to generate ORs and 95% confidence intervals (95% CIs). CIs for prevalence estimates and ORs 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. We used design-based F tests to evaluate between country differences in means and design-based Wald χ^2 tests to evaluate the multivariable significance of predictor sets to decide when individually significant coefficients should be interpreted. Significance was consistently evaluated using 0.05-level two-sided tests. Even with these global tests, though, over-fitting was possible due to the large number of tests, making it important to consider results only exploratory.

Results

Twelve-month treatment of DSM-IV/CIDI disorders

A weighted 14.9% of Part II respondents across surveys met criteria for at least one 12-month DSM-IV/CIDI disorder. More details about between-survey differences and prevalence estimates of individual disorders are reported elsewhere (Scott *et al.* 2017). 29.0% of respondents with 12-month disorders received 12-month treatment. The treatment rate was highest in high-income countries (36.8%), lower in upper-middle-income countries (22.0%), and lowest in lower-middle-income countries (13.7%; $F_{2,5366} = 221.1$, $p < 0.001$). (Table 1) The highest treatment rate across surveys was in Murcia, Spain (49.6%) and the lowest in Shenzhen in the People's Republic of China (PRC; 6.7%).

The GM sector had the highest treatment rate (17.8%). The SMH sector had the second highest treatment rate (13.5%). The treatment rates were much lower in the HS sector (3.7%) and CAM sector (3.7%). The sum of sector-specific treatment rates (38.7/100 respondents) exceeded the 29.0% of individuals with any treatment due to some patients being treated in multiple sectors. Although there was a consistent trend for treatment rates to decrease with country income level within each sector ($F_{2,5366} = 132.7$, $p < 0.001$ for SMH; $F_{2,5366} = 231.4$, $p < 0.001$ for GM; $F_{2,5366} = 6.0$, $p = 0.003$ for HS; $F_{2,5366} = 33.2$, $p < 0.001$ for CAM) as well as overall ($F_{2,5366} = 221.1$, $p < 0.001$), treatment was consistently most common in the GM sector followed by the SMH sector and much lower in the HS and CAM sectors.

Clinical predictors of treatment

Disorder type was significant in predicting treatment in the base multivariate model predicting overall treatment ($\chi^2_{12} = 506.1$, $p < 0.001$) as well as treatment in each service sector ($\chi^2_{12} = 36.4$–315.1, $p < 0.001$). (Table 2) The significant disorder-specific ORs were overwhelmingly greater than 1.0, indicating that comorbidity was associated with increased odds of treatment. Generalized anxiety disorder and PTSD had significantly elevated ORs in all five equations (OR 1.4–2.0). Major depressive episodes had significantly elevated ORs in four equations (OR 1.5–2.4), the exception being HS treatment. Two disorders had significantly elevated ORs predicting any treatment and treatment in the SMH and GM sectors: panic disorders (OR 2.4–3.4) and agoraphobia (OR 1.6–1.9). Drug use disorder had significantly elevated ORs predicting any treatment and treatment in the SMH and CAM sectors (OR 1.6–1.8). And two disorders, social phobia, and bipolar spectrum disorder, had significant ORs predicting treatment in the SMH sector (OR 1.2–1.3). Alcohol use disorder was the only disorder associated with multiple significantly decreased ORs, which involved any treatment and treatment in the GM and HS sectors (OR 0.6–0.7) indicating that respondents with any other disorder profiles were significantly less likely to obtain treatment in these sectors in the presence than absence of comorbid alcohol use disorder.

Disorder number was significantly associated with each type of treatment ($\chi^2_2 = 9.4$–11.7, $p = 0.003$–0.009) due to significantly decreased ORs for 4+ disorders (OR 0.6–0.7). These decreased ORs indicate that the elevated odds of treatment due to comorbidity (i.e. the generally positive sign pattern of disorder-specific ORs) increase at a decreasing rate as comorbidity becomes more complex. Disorder severity, finally, had a significant monotonic relationship with each treatment outcome ($\chi^2_2 = 21.3$–186.0, $p < 0.001$), with severe disorders having highest relative-odds (OR 2.0–2.9) followed by moderate disorders (OR 1.3–1.5) compared with mild disorders.

SES differences in treatment

The 4-category measures of respondent education and income were significantly correlated with each other (polychoric correlation = 0.295, $p = <0.001$; see online Supplementary Table A2 for within-survey distributions and associations). Controlling income, respondent education was significantly and positively associated with treatment overall ($\chi^2_3 = 17.0$, $p < 0.001$) and in three service sectors ($\chi^2_3 = 8.9$–32.2, $p = 0.030$ to <0.001), the exception being the GM sector. These significant associations were due to reduced ORs of 0.4–0.8 for respondents in each of the three lower education categories relative to high-education respondents (Table 3).

Family income, in comparison, while not significant overall in predicting any treatment in a model that controlled for education ($\chi^2_3 = 4.3$, $p = 0.233$), was significantly and positively associated with SMH treatment ($\chi^2_3 = 8.0$, $p = 0.045$) due to an OR of 0.8 for respondents in each of the three lower income categories relative to the highest income category. In addition, income had a significant inverse association with HS treatment ($\chi^2_3 = 9.4$, $p = 0.024$) due to elevated ORs for respondents in each of the two lowest income categories (OR 1.5–1.7) relative to the highest income category.

Interactions of SES with disorder severity, respondent SES, and country income level

Significance of interactions

We estimated interactions of SES with disorder severity and country income level in predicting any treatment and

Table 1. Twelve-month treatment of mental disorders overall and within separate service sectors among WMH respondents with 12-month DSM-IV/CIDI disorders by survey

	Any treatment		Specialty mental health		General medical		Human services		CAM		Number of respondents with any disorder
	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	%	(S.E.)	(n)
(I) Lower-middle-income countries											
Colombia	13.5	(1.6)	7.4	(1.2)	5.8	(1.0)	1.1	(0.6)	0.5	(0.3)	(789)
Iraq	11.7	(2.3)	3.6	(1.6)	4.1	(1.4)	4.6	(1.5)	0.5	(0.4)	(469)
Nigeria	11.7	(2.5)	1.5	(0.8)	10.3	(2.5)	1.3	(0.7)	0.0	(0.0)	(204)
PRC-Beijing/ Shanghai	12.1	(4.5)	3.7	(1.5)	8.5	(4.4)	0.3	(0.3)	4.8	(4.0)	(206)
PRC-Shenzhen	6.7	(1.6)	2.4	(1.0)	2.6	(0.9)	1.1	(0.7)	2.4	(0.8)	(404)
Peru	19.1	(2.6)	10.3	(1.4)	5.4	(1.4)	2.7	(0.8)	2.9	(0.9)	(360)
Ukraine	18.1	(2.3)	4.0	(1.0)	11.1	(1.9)	3.8	(1.0)	1.5	(0.5)	(643)
Overall	13.7	(0.9)	5.1	(0.6)	6.4	(0.6)	2.6	(0.5)	1.3	(0.3)	(3075)
(II) Upper-middle-income countries											
Brazil-Sao Paulo	24.1	(1.0)	15.5	(1.1)	8.8	(0.8)	3.5	(0.7)	3.4	(0.6)	(1177)
Bulgaria	20.7	(2.7)	6.4	(1.2)	16.8	(2.5)	0.9	(0.8)	0.05	(0.05)	(400)
Colombia-Medellin	18.7	(2.1)	11.7	(1.5)	6.9	(1.4)	1.4	(0.6)	1.6	(0.6)	(514)
Lebanon	11.0	(1.8)	3.4	(1.1)	7.2	(1.4)	1.2	(0.6)	0.0	(0.0)	(309)
Mexico	18.0	(1.8)	10.3	(1.5)	6.1	(1.0)	0.6	(0.3)	3.1	(1.0)	(655)
Romania	23.4	(3.0)	11.2	(2.3)	13.5	(2.7)	0.8	(0.5)	0.0	(0.0)	(175)
South Africa	25.7	(2.5)	5.8	(1.3)	16.9	(1.9)	6.4	(1.4)	5.8	(1.0)	(700)
Overall	22.0	(0.9)	10.0	(0.6)	11.3	(0.7)	3.2	(0.5)	3.1	(0.3)	(3930)
(III) High-income countries											
Belgium	38.3	(4.2)	20.2	(2.8)	30.7	(4.9)	0.9	(0.7)	1.2	(0.6)	(227)
France	30.5	(2.9)	11.9	(1.6)	23.1	(2.6)	1.5	(0.7)	1.1	(0.6)	(394)
Germany	25.8	(3.3)	13.5	(2.4)	17.5	(2.7)	1.9	(0.8)	1.2	(0.5)	(268)
Israel	34.9	(2.3)	17.5	(1.8)	17.3	(1.9)	5.7	(1.1)	3.1	(0.8)	(483)
Italy	26.7	(2.7)	8.5	(2.2)	22.7	(2.5)	1.2	(0.5)	0.6	(0.4)	(280)
Japan	22.9	(3.3)	15.3	(2.5)	11.2	(2.1)	1.3	(0.7)	5.5	(2.2)	(237)
Netherlands	30.5	(4.4)	16.2	(2.9)	24.3	(4.2)	1.7	(0.7)	2.3	(0.8)	(273)
New Zealand	38.4	(1.2)	16.1	(1.0)	28.4	(1.0)	4.9	(0.5)	6.5	(0.7)	(2734)
Northern Ireland	42.5	(3.0)	14.8	(1.8)	38.1	(2.8)	2.7	(0.7)	6.2	(1.4)	(533)
Poland	21.5	(2.0)	13.5	(1.4)	10.1	(1.2)	2.6	(0.8)	3.7	(0.9)	(622)
Portugal	36.2	(2.0)	17.6	(1.7)	24.0	(1.7)	2.1	(0.6)	1.7	(0.4)	(726)
Spain	34.4	(3.1)	20.5	(2.3)	23.1	(2.4)	1.0	(0.5)	1.6	(0.6)	(407)
Spain-Murcia	49.6	(3.4)	28.0	(4.2)	26.9	(2.6)	0.0	(0.0)	1.0	(0.6)	(361)
USA	41.6	(0.9)	22.0	(0.9)	23.1	(0.8)	8.1	(0.8)	6.9	(0.6)	(2203)
Overall	36.8	(0.6)	17.7	(0.5)	24.2	(0.5)	4.3	(0.3)	4.6	(0.3)	(9748)
(IV) Total	29.0	(0.5)	13.5	(0.3)	17.8	(0.4)	3.7	(0.2)	3.7	(0.2)	(16 753)
$F_{2,5366}$	221.1*		132.7*		231.4*		6.0*		33.2*		

*Significant difference across the three country income groups at the 0.05 level, two-sided test.

treatment in the SMH and GM sectors. We lacked the statistical power to carry out parallel analyses of interactions predicting HS and CAM treatment. The 3-way interactions were significant for both education and income predicting any treatment ($\chi^2_{12} = 22.9–29.8$, $p = 0.029–0.003$) and for income predicting GM treatment ($\chi^2_{12} = 26.8$, $p = 0.008$). The 2-way interactions of income with severity and with country income level were significant in a model that excluded the 3-way

Table 2. Multivariable associations of clinical characteristics (disorder type, number, and severity) with 12-month treatment of mental disorders overall and within separate service sectors among WMH respondents with 12-month DSM-IV/CIDI disorders ($n = 16\,753$)[a]

	Any treatment OR (95% CI)	Specialty mental health OR (95% CI)	General medical OR (95% CI)	Human services OR (95% CI)	CAM OR (95% CI)
(I) Type of disorder					
(a) Anxiety					
Adult separation anxiety disorder	1.1 (0.8–1.4)	1.2 (0.9–1.6)	0.9 (0.7–1.2)	1.2 (0.7–2.0)	1.1 (0.7–1.7)
Agoraphobia (w/o panic disorder)	1.8* (1.4–2.2)	1.6* (1.2–2.1)	1.9* (1.5–2.5)	0.8 (0.5–1.4)	1.0 (0.7–1.5)
Generalized anxiety disorder	1.8* (1.5–2.0)	1.6* (1.3–1.9)	1.7* (1.4–2.0)	1.5* (1.1–2.0)	1.4* (1.1–1.9)
Panic disorder	3.4* (2.8–4.0)	2.4* (1.9–2.9)	3.2* (2.6–3.8)	1.4 (1.0–2.0)	1.4 (0.9–2.0)
Posttraumatic stress disorder	2.0* (1.7–2.4)	1.7* (1.4–2.1)	1.7* (1.5–2.1)	1.4* (1.0–2.0)	1.7* (1.2–2.3)
Social phobia	1.1 (1.0–1.3)	1.2* (1.0–1.5)	1.1 (1.0–1.3)	1.1 (0.8–1.6)	1.1 (0.9–1.5)
Specific phobia	0.9* (0.7–1.0)	0.8 (0.7–1.0)	0.9 (0.8–1.1)	0.8 (0.6–1.1)	1.0 (0.8–1.3)
(b) Mood					
Bipolar spectrum disorder	1.2 (0.9–1.4)	1.3* (1.1–1.7)	1.2 (0.9–1.5)	1.2 (0.9–1.7)	0.9 (0.6–1.3)
Dysthymic disorder	1.3* (1.1–1.6)	1.1 (0.9–1.4)	1.2 (1.0–1.5)	1.1 (0.8–1.6)	0.7 (0.5–1.1)
Major depressive episode	2.2* (1.9–2.5)	2.4* (2.0–2.8)	1.9* (1.7–2.3)	1.2 (0.9–1.7)	1.5* (1.1–2.1)
(c) Substance					
Alcohol abuse or dependence	0.7* (0.6–0.9)	1.0 (0.8–1.3)	0.6* (0.5–0.8)	0.7* (0.4–1.0)	0.9 (0.6–1.4)
Drug abuse or dependence	1.6* (1.2–2.2)	1.6* (1.2–2.1)	1.4 (0.9–2.0)	1.0 (0.6–1.8)	1.8* (1.1–3.0)
χ^2_{12}	506.1*	275.1*	315.1*	39.4*	36.4*
(II) Number of disorders					
4+	0.7* (0.5–1.0)	0.6* (0.4–0.9)	0.6* (0.4–0.9)	1.1 (0.5–2.1)	1.1 (0.6–2.1)
3	1.1 (0.9–1.3)	1.0 (0.8–1.3)	1.0 (0.8–1.2)	1.1 (0.7–1.7)	1.3 (0.9–1.9)
2	1.0 (–)	1.0 (–)	1.0 (–)	1.0 (–)	1.0 (–)
χ^2_2	11.0*	11.7*	9.4*	0.1	1.9
(III) Severity of disorders					
Severe	2.4* (2.1–2.8)	2.9* (2.4–3.4)	2.1* (1.8–2.5)	2.0* (1.5–2.7)	2.4* (1.8–3.3)
Moderate	1.3* (1.2–1.5)	1.3* (1.1–1.6)	1.4* (1.2–1.6)	1.3 (1.0–1.8)	1.5* (1.1–2.0)
Mild	1.0 (–)	1.0 (–)	1.0 (–)	1.0 (–)	1.0 (–)
χ^2_2	179.6*	186.0*	90.6*	21.3*	36.6*

[a]Results are based on multivariable logistic regression models with dummy variables for the survey. See the section on Analysis Methods in the text for a discussion of the logic of the models and interpretation of coefficients.
*Significant at the 0.05 level, two-sided test.

interactions in predicting SMH treatment ($\chi^2_6 = 12.9–13.6$, $p = 0.045–0.035$).

Education

Subgroup analysis showed that the significant association of education with any treatment in the total sample was limited to severe and moderate cases in high-income countries ($\chi^2_3 = 9.9–17.2$, $p = 0.019–0.001$). Significant ORs among respondents with lower levels of education were in the range 0.5–0.8. (Table 4) The significant association of education with SMH treatment in the total sample varied by disorder severity and country income, with significant ORs among respondents of lower education were in the range 0.6–0.7. The non-significant association of education with GM treatment found in the total sample was found not to vary significantly by disorder severity or country income.

Income

Subgroup analysis showed that the non-significant association of income with any treatment in the total sample masked a significantly positive association among severe cases in lower-middle income countries (significant ORs of 0.2–0.4 among respondents in lower income subgroups; $\chi^2_3 = 20.1$, $p < 0.001$) and a significantly negative association among mild cases in upper-middle-income countries (a significant OR 1.8 for low-income respondents; $\chi^2_3 = 14.9$, $p = 0.002$). (Table 5) The significant association of income with SMH treatment in the total sample was consistent across country income groups due to especially low odds of treatment in intermediate income groups within each severity subsample (OR 0.3–0.5) rather than in the lowest income group (OR 0.7–0.9). The non-significant association of income with GM treatment in the total sample, finally, was found to mask a significantly positive association among

Table 3. Multivariable associations of socio-demographic characteristics with 12-month treatment of mental disorders overall and within separate service sectors controlling for clinical characteristics among WMH respondents with 12-month DSM-IV/CIDI disorders ($n = 16\,753$)[a]

Level of education					Level of family income				
Low	Low average	High average	High		Low	Low average	High average	High	
OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	χ^2_3	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	χ^2_3
(I) Any treatment									
0.8* (0.7–0.9)	0.8* (0.7–0.9)	0.8* (0.7–1.0)	1.0 (–)	17.0*	0.9 (0.8–1.1)	0.9 (0.8–1.0)	0.9 (0.8–1.0)	1.0 (–)	4.3
(II) Specialty mental health care									
0.6* (0.5–0.8)	0.6* (0.5–0.7)	0.7* (0.6–0.9)	1.0 (–)	32.2*	0.8* (0.7–1.0)	0.8* (0.7–0.9)	0.8* (0.7–1.0)	1.0 (–)	8.0*
(III) General medical									
1.0 (0.8–1.2)	0.9 (0.8–1.1)	1.0 (0.8–1.2)	1.0 (–)	0.6	1.0 (0.8–1.1)	0.9 (0.8–1.1)	0.9 (0.8–1.1)	1.0 (–)	1.3
(IV) Human services									
0.6* (0.4–0.8)	0.8 (0.6–1.1)	0.8 (0.6–1.1)	1.0 (–)	8.9*	1.5* (1.0–2.1)	1.7* (1.2–2.4)	1.3 (0.9–1.9)	1.0 (–)	9.4*
(V) CAM									
0.4* (0.3–0.7)	0.7* (0.5–0.9)	0.7* (0.5–0.9)	1.0 (–)	19.7*	1.2 (0.9–1.7)	1.1 (0.8–1.5)	1.1 (0.8–1.6)	1.0 (–)	1.8

[a]Results are based on multivariable logistic regression models with dummy variables for survey and controls for the clinical variables in Table 2 as well as for respondent age, sex, and marital status. All respondents in the French survey were coded at the mean of education because education was not assessed in the French survey.
*Significant at the 0.05 level, two-sided test.

moderately severe cases in lower-middle income countries and mild cases in both lower-middle and high income countries (significant ORs of 0.2–0.7; $\chi^2_3 = 8.8$–18.3, $p = 0.032$ to <0.001) and significantly negative associations among mild cases in upper-middle-income countries and severe cases in high income countries (significant ORs of 1.5–2.0; $\chi^2_3 = 15.1$–44.3, $p = 0.002$ to <0.001).

Discussion

These results represent the most comprehensive examination ever undertaken of the associations of SES with mental disorder treatment. Consistent with previous research (Kohn *et al.* 2004; Wang *et al.* 2007; Ormel *et al.* 2008), only a minority of people with the 12-month disorders considered here received any treatment, the highest proportion of people receiving treatment was in the GM sector followed by the specialty mental health sector, and treatment was much less common in lower than higher-income countries. However, the two SES indicators considered here, respondent education and family income, were much less consistently associated with 12-month treatment than we had anticipated.

As noted in the introduction, we had expected to find the association of SES with special treatment to increase with disorder severity to the extent that the restrictions on access to specialty care were related to income but to decrease with disorder severity to the extent that the restrictions were related to need for treatment. We found neither pattern, as the lowest odds of SMH treatment were among respondents having intermediate income levels across all levels of disorder severity and country income groups. This could be due to lowest-income people, but not people with intermediate income levels, having free access to specialty care, resulting in highest financial barriers existing among people with intermediate incomes.

The association of education with SMH treatment was stable across all levels of disorder severity and country income groups, with the significant association due to a comparatively high odds of treatment among people at the highest education level (ORs of 0.6–0.7 for lower education levels equivalent to 1.4–1.7 higher odds at highest *v.* lower levels). These associations are presumably not due to financial barriers given that they were obtained after controlling income. Other possible explanatory variables (e.g. recognition of need, perceived stigma, perceived efficacy of treatment) need to be explored in future studies to interpret these associations.

Subgroup analysis found no significant association of income with overall treatment in the total sample and only inconsistent opposite-sign associations in subsamples. However, the significant positive association with specialty mental health treatment and the significant inverse association with HS treatment in the total sample showed that even though people of different financial means were equally likely to receive some type of treatment, a significant discrepancy existed in the sector in which treatment was received. This discrepancy was small, though, as cases in the highest income category (roughly one-fourth of the population) had only about 25% higher odds of specialty mental health treatment than those in lower income categories and, as noted in the prior paragraph, there were no differences in odds of receiving specialty treatment across the lower three income categories.

Although the association of income with GM treatment was non-significant in the total sample, a significant 3-way interaction was found due to a series of opposite-sign subgroup associations

Table 4. Subgroup associations of respondent education with 12-month treatment of mental disorders overall and in the specialty mental health and general medical sectors based on multivariable models that allowed for interactions of education with disorder severity and country income level controlling for clinical characteristics among WMH respondents with 12-month DSM-IV/CIDI disorders ($n = 16\,753$)[a]

	Level of education				
	Low	Low-average	High-average	High	
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	χ^2_3
(I) Any treatment					
(A) Lower-middle-income countries					
Severe	2.0 (1.0–4.1)	1.2 (0.6–2.3)	1.4 (0.7–2.9)	1.0 (–)	4.1
Moderate	0.9 (0.5–1.9)	1.4 (0.8–2.8)	0.8 (0.4–1.5)	1.0 (–)	4.0
Mild	0.5 (0.2–1.1)	0.7 (0.3–1.6)	0.6 (0.3–1.3)	1.0 (–)	3.1
(B) Upper-middle-income countries					
Severe	0.7 (0.4–1.4)	0.7 (0.4–1.2)	0.9 (0.6–1.6)	1.0 (–)	2.2
Moderate	0.8 (0.4–1.5)	0.7 (0.4–1.2)	0.7 (0.4–1.3)	1.0 (–)	2.3
Mild	0.7 (0.4–1.4)	0.8 (0.4–1.4)	0.9 (0.6–1.5)	1.0 (–)	1.5
(C) High-income countries					
Severe	0.5* (0.4–0.7)	0.7* (0.5–1.0)	0.9 (0.7–1.2)	1.0 (–)	17.2*
Moderate	0.7* (0.5–0.9)	0.8* (0.6–1.0)	0.8* (0.6–1.0)	1.0 (–)	9.9*
Mild	1.4 (1.0–1.9)	0.8 (0.6–1.1)	0.9 (0.7–1.2)	1.0 (–)	9.2*
(II) Specialty mental health treatment					
Total	0.6* (0.5–0.8)	0.6* (0.5–0.8)	0.7* (0.6–0.9)	1.0 (–)	31.7*
(III) General medical treatment					
Total	1.0 (0.8–1.2)	1.0 (0.8–1.1)	1.0 (0.9–1.2)	1.0 (–)	0.4

[a]Results are based on three multivariable logistic regression models, one for each type of treatment. In each model, subgroup coding was used to estimate associations of education with the outcome in subgroups where the education-treatment outcome was found to be statistically different from in other subgroups. All models included dummy variables for the survey, controls for the clinical variables in Table 2, and controls for respondent age, sex, marital status, and family income along with any significant interactions of income with disorder severity and country income level. All respondents in the French survey were coded at the mean of education because education was not assessed in the French survey.
*Significant at the 0.05 level, two-sided test.

that had no apparent patterning. Perhaps the clearest observation about this specification is that it showed that lowest income was for the most part not associated with lowest odds of GM treatment. Education, in comparison, was most consistently associated with SMH treatment, as the associations of education with treatment in other service sectors were relatively weak (significant ORs in the range 0.6–0.8).

Why did we find weaker and less consistent associations of income and education with treatment than previous studies (Rossi *et al.* 2005; Tello *et al.* 2005; Steele *et al.* 2007)? One possibility is that we included two indicators of SES in the models, income and education. Given that these two indicators are significantly correlated with each other, the strength of each as a predictor of treatment was reduced by including both in the equations. We considered it appropriate to include both, though, as the mechanisms involved in the two are presumably different. As we saw, both indicators were statistically significant, albeit not large in substantive terms

Limitations

The study had a number of limitations. First, the sample was limited in that the sample of countries was non-representative and the response rate varied widely across countries. Although we attempted to control for differential response through post-stratification adjustments, survey response might have been related to social status, presence, and severity of mental disorders or treatment in ways that were uncorrected.

Second, the disorder measures were limited in that some severe disorders, such as schizophrenia, were not assessed, duration was not measured for the disorders that were assessed, and validity, although good in the WMH surveys where it was assessed (Haro *et al.* 2006), was not assessed in all surveys and might have varied with SES.

Third, the treatment measures were limited to self-reports, which have been found to over-estimate treatment compared with administrative records (Rhodes & Fung, 2004). In addition, these self-reports only assessed number of visits rather than treatment quality. The small amount of research that exists on mental disorder treatment quality finds that low-SES patients are significantly more likely than other patients to receive lower-quality treatment (Amaddeo & Jones, 2007; Young & Rabiner, 2015).

Fourth, the only contextual variable considered was a simple 3-category measure of country income level. Many other potentially important contextual variable exist at both the country level (e.g. access to universal healthcare) and within countries (e.g. number of treatment providers per capita within the access area of the respondent). However, as the number of countries was small ($n = 25$) and no information was available about within-country geographic characteristics in most surveys, we had too few geographic units of analysis to carry out quantitative analyses of other contextual factors. It might be that future

Table 5. Subgroup associations of respondent family income with 12-month treatment of mental disorders overall and in the specialty mental health and general medical sectors based on multivariable models that allowed for interactions of education with disorder severity and country income level controlling for clinical characteristics among WMH respondents with 12-month DSM-IV/CIDI disorders ($n = 16\,753$)[a]

	Level of family income				
	Low	Low-average	High-average	High	
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	χ^2_3
(I) Any treatment					
(A) Lower-middle-income countries					
Severe	0.4* (0.2–0.8)	0.2* (0.1–0.4)	0.4* (0.2–0.7)	1.0 (–)	20.1*
Moderate	0.5* (0.2–0.9)	0.8 (0.4–1.6)	1.0 (0.5–1.9)	1.0 (–)	7.4
Mild	1.6 (0.7–3.6)	1.0 (0.4–2.1)	0.8 (0.4–1.9)	1.0 (–)	2.5
(B) Upper-middle-income countries					
Severe	0.7 (0.4–1.1)	1.0 (0.6–1.6)	1.0 (0.6–1.6)	1.0 (–)	4.0
Moderate	0.9 (0.5–1.5)	1.0 (0.6–1.7)	0.8 (0.5–1.3)	1.0 (–)	1.9
Mild	1.8* (1.1–3.0)	0.7 (0.4–1.2)	1.3 (0.8–2.3)	1.0 (–)	14.9*
(C) High-income countries					
Severe	1.0 (0.7–1.4)	1.2 (0.8–1.6)	0.8 (0.6–1.1)	1.0 (–)	6.4
Moderate	0.9 (0.7–1.2)	0.9 (0.7–1.2)	1.0 (0.8–1.3)	1.0 (–)	1.7
Mild	1.0 (0.7–1.4)	0.8 (0.6–1.1)	0.8 (0.6–1.1)	1.0 (–)	4.5
(II) Specialty mental health (by severity regardless of country income level)					
Severe	0.7 (0.3–1.4)	0.5* (0.3–0.8)	0.4* (0.2–0.7)	1.0 (–)	10.9*
Moderate	0.7 (0.4–1.4)	0.4* (0.3–0.8)	0.5* (0.3–0.8)	1.0 (–)	11.2*
Mild	0.9 (0.4–1.9)	0.3* (0.2–0.5)	0.4* (0.2–0.7)	1.0 (–)	20.2*
(III) General medical treatment					
(A) Lower-middle-income countries					
Severe	0.6 (0.3–1.3)	0.5 (0.2–1.0)	0.9 (0.3–2.6)	1.0 (–)	4.5
Moderate	0.4* (0.2–0.8)	0.5 (0.3–1.0)	0.8 (0.4–1.7)	1.0 (–)	8.8*
Mild	0.4* (0.2–0.9)	0.2* (0.1–0.8)	0.3* (0.1–0.9)	1.0 (–)	11.0*
(B) Upper-middle-income countries					
Severe	0.6 (0.4–1.1)	1.4 (0.8–2.6)	0.8 (0.5–1.5)	1.0 (–)	4.8
Moderate	0.8 (0.5–1.3)	1.4 (0.8–2.2)	0.6 (0.4–1.1)	1.0 (–)	6.7
Mild	1.7* (1.1–2.5)	0.5 (0.3–1.0)	0.9 (0.5–1.5)	1.0 (–)	15.1*
(C) High-income countries					
Severe	1.8* (1.4–2.3)	2.0* (1.6–2.6)	1.5* (1.2–2.0)	1.0 (–)	44.3*
Moderate	1.0 (0.8–1.3)	1.0 (0.8–1.2)	1.1 (0.9–1.3)	1.0 (–)	1.0
Mild	0.8 (0.6–1.1)	0.6* (0.5–0.8)	0.7* (0.5–0.9)	1.0 (–)	18.3*

[a]Results are based on three multivariable logistic regression models, one for each type of treatment. In each model, subgroup coding was used to estimate associations of family income with the outcome in subgroups where the income-treatment outcome was found to be statistically different from in other subgroups. All models included dummy variables for the survey, controls for the clinical variables in Table 2, and controls for respondent age, sex, marital status, and respondent education along with any significant interactions of education with disorder severity and country income level. All respondents in the French survey were coded at the mean of education because education was not assessed in the French survey.
*Significant at the 0.05 level, two-sided test.

analyses could gain more insight by estimating within-country models that treated each country as a case study and considering contextual factors qualitatively.

Conclusions

Within the context of these limitations, our findings are consistent with previous research in showing that only a minority of people with common mental disorders receive treatment, even in high-income countries, and that treatment rates are lower in lower income countries. We also broadly confirmed previous evidence that people with low SES have an especially low rate of treatment, although in the total sample this was true only for SMH treatment and income was inversely related to HS treatment, resulting in income being related more to the sector of treatment than to whether or not treatment was received. The

significant associations of SES with treatment were most consistent in predicting SMH treatment, but they were less strong than anticipated. Direct investigation of reports about barriers to treatment would be needed to delve more deeply into these patterns.

Supplementary material

The supplementary material for this article can be found at https://doi.org/10.1017/S0033291717003336.

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Dr Evans-Lacko received consulting fees from Lundbeck, not connected to this research. In the past 3 years, Dr Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research. The remaining authors declare no conflicts of interest.

Ethical standards

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.

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