Special Articles

The global burden of mental disorders: An update from the WHO World Mental Health (WMH) Surveys*

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SUMMARY. **Aims** – The paper reviews recent findings from the WHO World Mental Health (WMH) surveys on the global burden of mental disorders. **Methods** – The WMH surveys are representative community surveys in 28 countries throughout the world aimed at providing information to mental health policy makers about the prevalence, distribution, burden, and unmet need for treatment of common mental disorders. **Results** – The first 17 WMH surveys show that mental disorders are commonly occurring in all participating countries. The inter-quartile range (IQR: 25th-75th percentiles) of lifetime DSM-IV disorder prevalence estimates (combining anxiety, mood, externalizing, and substance use disorders) is 18.1-36.1%. The IQR of 12-month prevalence estimates is 9.8-19.1%. Prevalence estimates of 12-month Serious Mental Illness (SMI) are 4-6.8% in half the countries, 2.3-3.6% in one-fourth, and 0.8-1.9% in one-fourth. Many mental disorders begin in childhood-adolescence and have significant adverse effects on subsequent role transitions in the WMH data. Adult mental disorders are found to be associated with such high role impairment in the WMH data that available clinical interventions could have positive cost-effectiveness ratios. **Conclusions** – Mental disorders are commonly occurring and often seriously impairing in many countries throughout the world. Expansion of treatment could be cost-effective from both employer and societal perspectives.
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As health care spending continues to rise (World Health Organization, 2006), resource allocation decisions will need to be based increasingly on information about prevalence and severity of disorders and cost-effectiveness of interventions. This will require disorder-specific information to be obtained not only about prevalence, but also about disability (Katschnig *et al.*, 1997; Murray & Lopez, 1996). Despite the fact that many studies in developed countries have estimated the effects of specific disorders on disability (Berto *et al.*, 2000; Maetzel & Li, 2002; Reed *et al.*, 2004), comparative studies are rare (Druss *et al.*, 2008;

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Merikangas *et al.*, 2007). Recognizing the importance of this information, one of the main aims of the WHO World Mental Health (WMH) Surveys is to produce data on the prevalence and severity of mental disorders in each participating WMH country. Although this is still a work in progress, enough useful information has been produced on overall prevalence and severity of mental disorders in the WMH surveys to warrant a review of this evidence.

THE WHO WORLD MENTAL HEALTH (WMH) SURVEY INITIATIVE

The WMH Survey Initiative is an initiative of the World Health Organization (WHO) designed to help countries throughout the world carry out and analyze epidemiological surveys of the prevalence and correlates of mental disorders. A key aim of the WMH surveys is to help countries that would not otherwise have the expertise or infrastructure to implement high quality community epidemiological surveys by providing centralized instrument development, training, and data analysis (www.hcp.med.harvard.edu/wmh). Twenty-eight countries have so far completed WMH surveys. The vast majority of these surveys are nationally representative, although a few are representative of only a single region (e.g., the San Paolo metropolitan area in Brazil) or regions (e.g., six metropolitan areas in Japan).

All WMH surveys use the same diagnostic interview, the WHO *Composite International Diagnostic Interview* (CIDI) (Kessler & Üstün, 2004). The CIDI is a state-of-the-art fully-structured research diagnostic interview designed to be used by trained lay interviewers who do not have any clinical experience. Consistent training materials, training programs, and quality control monitoring procedures are used in all WMH surveys to guarantee comparability across surveys. Consistent WHO translation, back-translation, and harmonization procedures for the survey and the training materials are also used across countries.

The use of a fully-structured interview was critical to the success of the WMH, as many participating countries do not have the critical mass of trained mental health professions needed to implement a large-scale clinical survey. However, the WMH collaborators are encouraged to carry out blinded clinician re-interviews with a probability sub-sample of WMH respondents in order to confirm that the diagnoses generated by the CIDI are consisted with independent clinical diagnoses generated by culturally competent clinicians. Methodological studies of these clinical reappraisal interviews have documented good concordance with CIDI diagnoses (Haro *et al.*, 2006).

The CIDI was designed to go well beyond the mere assessment of mental disorders to include a wide range of measures about a number of correlates. For the purposes of this report, two of these extensions need to be noted. One is that the CIDI includes a disorder-specific measure of role impairment that is administered in exactly the same fashion for each mental disorder assessed in the surveys and for each of the physical disorders assessed for comparison purposes in the surveys. This measure is known as the *Sheehan Disability Scales* (SDS). The SDS is a widely used self-report measure of condition-specific role impairment that consists of four questions, each asking the respondent to rate on a 0-10 scale the extent to which a particular disorder "interfered with" activities in one of four role domains during the month in the past year when the disorder was most severe. The four domains include:

i) "your home management, like cleaning, shopping, and taking care of the (house/apartment)" (home);
ii) "your ability to work" (work);
iii) "your social life" (social); and
iv) "your ability to form and maintain close relationships with other people" (close relationships). The 0-10 response options were presented in a visual analogue format with labels for the response options None (0), Mild (1-3), Moderate (4-6), Severe (7-9), and Very Severe (10). A global SDS disability score was also created by assigning each respondent the highest SDS domain score reported across the four domains.

Previous methodological studies have documented good internal consistency reliability across the SDS domains (Hambrick *et al.*, 2004; Leon *et al.*, 1997), a result that we replicated in the WMH data by finding Cronbach's alpha (a measure of internal consistency reliability) in the range .82-.92 across countries. Importantly, reliability was high both in developed countries (median .86; inter-quartile range .84-.88) and developing countries (median .90; inter-quartile range .88-.90). Previous methodological studies have also documented good discrimination between role functioning of cases and controls based on SDS scores in studies of social phobia (Hambrick *et al.*, 2004), PTSD (Connor & Davidson, 2001), panic disorder (Leon *et al.*, 1997), and substance abuse (Pallanti *et al.*, 2006). Similar results were found in the WMH surveys in responses to a question asked after the SDS about "How many days out of 365 in the past year were you totally unable to work or carry out you normal activities because of (the illness)?" If the SDS measures genuine disability, we would expect correlations of

SDS scores to be significant and comparable for physical and mental disorders with this relatively objective measure of disability. That is, in fact, what we found. In developed countries, the multiple correlations of the four SDS domain scores predicting days out of role were .55 for mental disorders and .50 for physical disorders, while the comparable correlations in less developed countries were .39 for mental disorders and .36 for physical disorders.

Second, the CIDI assesses disorder severity. This is important in light of the finding in previous epidemiological surveys that quite a high proportion of the general population in many countries meets criteria for a DSM or ICD mental disorder (Somers *et al.*, 2006; Waraich *et al.*, 2004; Wittchen & Jacobi, 2005). Faced with this high prevalence, mental health policy planning efforts need to consider disorder severity for treatment planning purposes, as the simple presence of a diagnosis may not indicate the level of need for services. All 12-month cases were consequently classified as either serious, moderate, or mild. Serious disorders were defined as: non-affective psychosis, bipolar I disorder or substance dependence with a physiological dependence syndrome; making a suicide attempt in conjunction with any other disorder; reporting severe role impairment due to a mental disorder in at least two areas of functioning measured by the SDS or having overall functional impairment from any disorder consistent with a *Global Assessment of Functioning* (GAF) (Endicott *et al.*, 1976) score of 50 or less. Disorders not classified as serious were classified as moderate if the respondent had: substance dependence without a physiological dependence syndrome; or at least moderate interference in the disorder-specific scale of role impairment. All other disorders were classified as mild.

DISORDER PREVALENCE ESTIMATES IN THE WMH SURVEYS

The WMH surveys that have been completed so far show clearly that mental disorders are quite common in all the countries studied. The inter-quartile range (IQR; 25th-75th percentiles across countries) of lifetime prevalence estimates of any DSM-IV disorder assessed in the CIDI across these surveys is 18.1-36.1% in this set of surveys. (Table I) A lifetime DSM/CIDI diagnosis was found among more than one--third of respondents in five countries (Colombia, France, New Zealand, Ukraine, United States), more than one--fourth in six (Belgium, Germany, Lebanon, Mexico, Netherlands, South Africa), and more than one-sixth in four (Israel, Italy, Japan, Spain). The remaining two countries, China (13.2%) and Nigeria (12.0%), had considerably lower prevalence estimates that are likely to be downwardly biased (Gureje *et al.*, 2006; Shen *et al.*, 2006). Prevalence estimates for other developing countries were all above the lower bound of the IQR. When coupled with the fact that our clinical reappraisal studies showed prevalence estimates in developed countries to be accurate and with the possibility that prevalence estimates in less developed countries are under-estimated, these results argue persuasively that mental disorders have great public health importance throughout the world.

As noted above, a number of recent literature reviews have presented detailed comparative data on the prevalence estimates for individual mental disorders and classes of disorder across all recently published community epidemiological surveys (Somers *et al.*, 2006; Waraich *et al.*, 2004; Wittchen & Jacobi, 2005). Several consistent patterns are found in these reviews that are replicated in the WMH surveys. One is that anxiety disorders are consistently found to be the most prevalent class of mental disorders in the general population, with estimated lifetime prevalence of any anxiety disorder averaging approximately 16% and 12-month prevalence averaging approximately 11% across surveys. There is wide variation around these averages, though, with prevalence estimates generally higher in Western developed countries than in developing countries. This same pattern can be seen in the first set of WMH surveys to be completed, where the median lifetime prevalence estimate of any anxiety disorder is somewhat higher for anxiety disorders than in the larger literature – 14.3%, with an IQR of 9.9-16.7%. The 12-month prevalence estimates, in comparison, average 8.3% for any anxiety disorder with an IQR of 6.5-12.1. (Table II)

Mood disorders are generally found to be the next most prevalent class of mental disorders in community epidemiological surveys, with lifetime prevalence estimates of any mood disorder averaging approximately 12% and 12-month prevalence estimates averaging approximately 6%. Again, prevalence estimates are generally higher in Western developed countries than in developing countries. The median WMH lifetime prevalence estimate for any mood disorder is somewhat lower than the average in the literature: 10.6% with an IQR of 7.6-17.9%. The 12-month prevalence estimates for any mood disorder in the WMH surveys average 5.1%, with an IQR of 3.4-6.8.

The other two commonly occurring classes of disorders assessed in the WMH surveys are externalizing disorders (attention-deficit/hyperactivity disorder, oppositional-defiant disorder, conduct disorder, and intermittent

Table I – *Lifetime prevalence estimates of DSM-IV / CIDI disorders in the WMH surveys*[1, 2]

	Any anxiety disorder		Any mood disorder		Any externalizing disorder		Any substance disorder		Any disorder	
	%	(se)	%	(se)	%	(se)	%	(se)	%	(se)
I. WHO Region: Pan American Health Organization (PAHO)										
Colombia	25.3	(1.4)	14.6	(0.7)	9.6	(0.8)	9.6	(0.6)	39.1	(1.3)
Mexico	14.3	(0.9)	9.2	(0.5)	5.7	(0.6)[6]	7.8	(0.5)	26.1	(1.4)
United States	31.0	(1.0)	21.4	(0.6)	25.0	(1.1)	14.6	(0.6)	47.4	(1.1)
II. WHO Region: African Regional Office (AFRO)										
Nigeria	6.5	(0.9)	3.3	(0.3)	0.3	(0.1)[7, 9]	3.7	(0.4)	12.0	(1.0)
South Africa	15.8	(0.8)[3, 4]	9.8	(0.7)[5]	—	—[6, 7, 8, 9]	13.3	(0.9)	30.3	(1.1)
III. WHO Region: Eastern Mediterranean Regional Office (EMRO)										
Lebanon	16.7	(1.6)	12.6	(0.9)	4.4	(0.9)[9]	2.2	(0.8)	25.8	(1.9)
IV. WHO Region: European Regional Office (EURO)										
Belgium	13.1	(1.9)	14.1	(1.0)[5]	5.2	(1.4)[6]	8.3	(0.9)[10]	29.1	(2.3)
France	22.3	(1.4)	21.0	(1.1)[5]	7.6	(1.3)[6]	7.1	(0.5)[10]	37.9	(1.7)
Germany	14.6	(1.5)	9.9	(0.6)[5]	3.1	(0.8)[6]	6.5	(0.6)[10]	25.2	(1.9)
Israel	5.2	(0.3)[3, 4]	10.7	(0.5)	—	—[6, 7, 8, 9]	5.3	(0.3)	17.6	(0.6)
Italy	11.0	(0.9)	9.9	(0.5)[5]	1.7	(0.4)[6]	1.3	(0.2)[10]	18.1	(1.1)
The Netherlands	15.9	(1.1)	17.9	(1.0)[5]	4.7	(1.1)[6]	8.9	(0.9)[10]	31.7	(2.0)
Spain	9.9	(1.1)	10.6	(0.5)[5]	2.3	(0.8)[6]	3.6	(0.4)[10]	19.4	(1.4)
Ukraine	10.9	(0.8)[3, 4]	15.8	(0.8)[5]	8.7	(1.1)[7, 9]	15.0	(1.3)	36.1	(1.5)
V. WHO Region: Western Pacific Regional Office (WPRO)										
PRC[11]	4.8	(0.7)	3.6	(0.4)	4.3	(0.9)[7, 9]	4.9	(0.7)	13.2	(1.3)
Japan	6.9	(0.6)[3]	7.6	(0.5)	2.8	(1.0)[7, 8, 9]	4.8	(0.5)	18.0	(1.1)
New Zealand	24.6	(0.7)[3]	20.4	(0.5)	—	—[6, 7, 8, 9]	12.4	(0.4)	39.3	(0.9)

[1]Anxiety disorders include Agoraphobia, Adult Separation Anxiety Disorder, Generalized Anxiety Disorder, Panic Disorder, Post-Traumatic Stress Disorder, Social Phobia, and Specific Phobia. Mood disorders include Bipolar Disorders, Dysthymia, and Major Depressive Dsorder. Impulse-control disorders include Intermittent Explosive Disorder, and reported persistence in the past 12 months of symptoms of three child-adolescent disorders (Attention-Deficit Hyperactivity Disorder, Conduct Disorder, and Oppositional-Defiant Disorder). Substance disorders include Alcohol or Drug Abuse with or without Dependence. In the case of substance dependence, respondents who met full criteria at some time in their life and who continue to have any symptoms are considered to have 12-month dependence even if they currently do not meet full criteria for the disorder. Organic exclusions were made as specified in the Diagnostic and Statistical Manual of Mental Health Disorders, Fourth Edition.
[2]Impulse disorders restricted to age ≤ 39 (China, Ukraine, Nigeria) or to age ≤ 44 (all other countries).
[3]Adult Separation Anxiety Disorder was not assessed.
[4]Specific Phobia was not assessed.
[5]Bipolar Disorders were not assessed.
[6]Intermittent Explosive Disorder was not assessed.
[7]Attention-Deficit Hyperactivity Disorder was not assessed.
[8]Conduct Disorder was not assessed.
[9]Oppositional-Defiant Disorder was not assessed.
[10]Only alcohol abuse with or without dependence were assessed. No assessment was made of other Drug Abuse with or without dependence.
[11]People's Republic of China.

explosive disorder) and substance use disorders (alcohol and illicit drug abuse and dependence). Impulse-control disorders are the less prevalent of these two in terms of lifetime prevalence in most of the WMH countries that included a relatively full assessment of these disorders (0.3-25.0%, IQR: 3.1-5.7%). Substance use disorders are generally less prevalent elsewhere (1.3-15.0%, IQR: 4.8-9.6). The Western European countries did not assess illicit drug abuse or dependence, though, leading to artificially low lifetime prevalence estimates (1.3-8.9%) compared to other countries (2.2-15.0%). Substance dependence was also assessed only in the presence of abuse, possibly further reducing estimated prevalence (Hasin & Grant, 2004). The same general pattern holds for 12-month prevalence, where substance disorders (0.2-6.4%; IQR: 1.2-2.8%) and impulse-control disorders (0.1-10.5%; IQR: 0.6-2.6%) are consistently less prevalent than anxiety or mood disorders.

Focusing on individual disorders, specific phobia is generally found to be the most prevalent mental disorder in community epidemiological surveys, with lifetime prevalence estimates usually in the 6-12% range and 12-month prevalence estimates in the 4-8% range (Silverman & Moreno, 2005). Major depressive disorder (MDD) is generally found to be the next most prevalent disorder, with lifetime prevalence estimates usually in the 4-10% range and 12-month prevalence estimates in the 3-6% range (Judd & Akiskal, 2000). Social phobia is generally found to be the next most prevalent disorder, with prevalence estimates sometimes approaching those of MDD (Furmark, 2002). The WMH estimates are generally quite consistent with these more general patterns.

Table II – *12-month prevalence estimates of DSM-IV/CIDI disorders in the WMH surveys*[1, 2]

	Any anxiety disorder		Any mood disorder		Any externalizing disorder*		Any substance disorder		Any disorder	
	%	(se)	%	(se)	%	(se)	%	(se)	%	(se)
I. WHO Region: Pan American Health Organization (PAHO)										
Colombia	14.4	(1.0)	7.0	(0.5)	4.4	(0.4)	2.8	(0.4)	21.0	(1.0)
Mexico	8.4	(0.6)	4.7	(0.3)	1.6	(0.3)[6]	2.3	(0.3)	13.4	(0.9)
United States	19.0	(0.7)	9.7	(0.4)	10.5	(0.7)	3.8	(0.4)	27.0	(0.9)
II. WHO Region: African Regional Office (AFRO)										
Nigeria	4.2	(0.5)	1.1	(0.2)	0.1	(0.0)[7, 9]	0.9	(0.2)	6.0	(0.6)
South Africa	8.2	(0.6)[3, 4]	4.9	(0.4)[5]	1.9	(0.3)[7, 8, 9]	5.8	(0.5)	16.7	(1.0)
III. WHO Region: Eastern Mediterranean Regional Office (EMRO)										
Lebanon	12.2	(1.2)	6.8	(0.7)	2.6	(0.7)[9]	1.3	(0.8)	17.9	(1.7)
IV. WHO Region: European Regional Office (EURO)										
Belgium	8.4	(1.4)	5.4	(0.5)[5]	1.7	(1.0)[6]	1.8	(0.4)[10]	13.2	(1.5)
France	13.7	(1.1)	6.5	(0.6)[5]	2.4	(0.6)[6]	1.3	(0.3)[10]	18.9	(1.4)
Germany	8.3	(1.1)	3.3	(0.3)[5]	0.6	(0.3)[6]	1.2	(0.2)[10]	11.0	(1.3)
Israel	3.6	(0.3)[3, 4]	6.4	(0.4)	—	—[6, 7, 8, 9]	1.3	(0.2)	10.0	(0.5)
Italy	6.5	(0.6)	3.4	(0.3)[5]	0.4	(0.2)[6]	0.2	(0.1)[10]	8.8	(0.7)
The Netherlands	8.9	(1.0)	5.1	(0.5)[5]	1.9	(0.7)[6]	1.9	(0.3)[10]	13.6	(1.0)
Spain	6.6	(0.9)	4.4	(0.3)[5]	0.5	(0.2)[6]	0.7	(0.2)[10]	9.7	(0.8)
Ukraine	6.8	(0.7)[3, 4]	9.0	(0.6)[5]	5.7	(1.0)[7, 9]	6.4	(0.8)	21.4	(1.3)
V. WHO Region: Western Pacific Regional Office (WPRO)										
PRC[11]	3.0	(0.5)	1.9	(0.3)	3.1	(0.7)[7, 9]	1.6	(0.4)	7.1	(0.9)
Japan	4.2	(0.6)[3]	2.5	(0.4)	0.2	(0.1)[7, 8, 9]	1.2	(0.4)	7.4	(0.9)
New Zeland	15.0	(0.5)[3]	8.0	(0.4)	—	—[6, 7, 8, 9]	3.5	(0.2)	20.7	(0.6)

[1]See the notes Table 1 for a listing of the disorders included in each entry
[2]Impulse disorders restricted to age ≤ 39 (China, Ukraine, Nigeria) or to age ≤ 44 (all other countries).
[3]Adult Separation Anxiety Disorder was not assessed.
[4]Specific Phobia was not assessed.
[5]Bipolar Disorders were not assessed.
[6]Intermittent Explosive Disorder was not assessed.
[7]Attention-Deficit Hyperactivity Disorder was not assessed.
[8]Conduct Disorder was not assessed.
[9]Oppositional-Defiant Disorder was not assessed.
[10]Only alcohol abuse with or without dependence were assessed. No assessment was made of other Drug Abuse with or without dependence.
[11]People's Republic of China.

It is important to note that these relatively high prevalence estimates are, if anything, conservative, as controversy exists regarding the possibility that the current diagnostic criteria in the DSM and ICD systems are overly conservative. For example, in the case of both post-traumatic stress disorder (PTSD) (Mylle & Maes, 2004) and generalized anxiety disorder (GAD) (Ruscio *et al.*, 2007), good evidence exists from epidemiological surveys that one or more diagnostic criteria define a much more restrictive set of cases than the other criteria, calling into question the wisdom of including the restrictive criterion. A related issue is that considerable evidence exists for the existence of clinically significant sub-threshold manifestations of many mental disorders that are much more prevalent than the disorders themselves (Brown & Barlow, 2005). For example, even though OCD is almost always estimated to be fairly rare in general population surveys, sub-threshold manifestations of OCD, some of them appearing to be clinically significant, are fairly common (Matsunaga & Seedat, 2007). The same is true for bipolar spectrum disorder, where even though the lifetime prevalence of BP-I is estimated to be only about 0.8-1.5%, the combined prevalence of BP-I, BP-II, and clinically significant sub-threshold BPD is likely in the range 4-6% (Skeppar & Adolfsson, 2006). However, as community epidemiological surveys have for the most part not explored these sub-threshold manifestations systematically, we do not currently have good estimates of the proportion of the population that would meet criteria for one or more anxiety and mood spectrum disorders.

DISORDER SEVERITY

While many previous epidemiological surveys estimated disorder prevalence, the WMH surveys are the first ones to generate systematic estimates of disorder severi-

ty. The proportions of 12-month DSM disorders classified either serious (12.8-36.8%; IQR: 18.5-25.7%) or moderate (12.5-47.6%; IQR: 33.9-42.6%) in the first set of completed WMH surveys, using the definitions of those terms described above, are generally smaller than the proportions with a mild disorder. (Table III) The severity distribution among cases varies significantly across countries («232 = 153.5, p < .001), with severity not strongly related either to region or to development status. The unconditional 12-month prevalence estimate of serious mental illness (SMI) in the WMH surveys is in the range 4.0-6.8% for half the surveys, 2.3-3.6% for another quarter, and 0.8-1.9% for the final quarter. There are substantial positive associations, though, between overall prevalence of any disorder and both the proportion of cases classified serious (Pearson r = .46, p < .001) and the proportion of cases classified either serious or moderate (Pearson r = .77, p < .001).

Table III – *Prevalence of 12-month DSM-IV/CIDI disorders by severity in the WMH surveys*[1]

	Serious		Moderate		Mild	
	%	(se)	%	(se)	%	(se)
I. WHO Region: Pan American Health Organization (PAHO)						
Colombia	23.1	(2.1)	41.0	(2.6)	35.9	(2.1)
Mexico	25.7	(2.4)[6]	33.9	(2.2)	40.5	(2.6)
United States	25.2	(1.4)	39.2	(1.2)	35.7	(1.4)
II. WHO Region: African Regional Office (AFRO)						
Nigeria	12.8	(3.8)	12.5	(2.6)	74.7	(4.2)
South Africa	25.7	(1.8)	31.5	(2.2)	42.8	(2.2)
III. WHO Region: Eastern Mediterranean Regional Office (EMRO)						
Lebanon	22.4	(3.1)	42.6	(4.7)	35.0	(5.5)
IV. WHO Region: European Regional Office (EURO)						
Belgium	31.8	(4.2)	37.8	(3.3)	30.4	(4.8)
France	18.5	(2.5)	42.7	(3.0)	38.8	(3.6)
Germany	21.3	(2.5)	42.6	(4.6)	36.1	(4.3)
Israel	36.8	(2.4)	35.2	(2.3)	28.0	(2.1)
Italy	15.9	(2.7)	47.6	(3.8)	36.5	(3.9)
The Netherlands	30.7	(3.4)	31.0	(3.7)	38.3	(4.6)
Spain	19.3	(2.4)	42.3	(4.0)	38.4	(4.7)
Ukraine	22.9	(1.8)	39.4	(2.9)	37.7	(3.5)
V. WHO Region: Western Pacific Regional Office (WPRO)						
PRC[11]	13.8	(3.7)	32.2	(4.9)	54.0	(4.6)
Japan	13.2	(3.1)	45.5	(5.3)	41.3	(4.6)
New Zeland	25.3	(1.0)	40.8	(1.4)	33.9	(1.2)

[1]See the text for a description of the coding rules used to define the severity levels.

The finding of a positive association between estimated prevalence and severity across countries is potentially important because it speaks to an issue that has been raised in the methodological literature regarding the possibility of biased prevalence estimates. Two separate research groups found an opposite sort of effect. A report comparing results from the Korean *Epidemiologic Catchment Area* (KECA) Study (Chang *et al.*, 2008) with results from a parallel survey in the US argued that the lower estimated prevalence of major depression in the KECA than the US survey was due, at least in part, to a higher threshold for reporting depression among people in the Korean population than in the US. In support of this assertion, the investigators showed that Koreans diagnosed as depressed with an earlier version of the CIDI, which was the diagnostic instrument used in the KECA survey, had considerably higher levels of role impairment than respondents diagnosed as depressed using the same instrument in the US.

A similar finding was reported in a methodological study carried out as part of the WHO Collaborative Study on Psychological Problems in General Health Care (PPG) (Üstün & Sartorius, 1995). In that study, nearly 26,000 primary care patients in 14 countries were assessed using an earlier version of the CIDI that included an evaluation of current symptoms of depression. As in the WMH surveys, substantial cross-national variation was found in the prevalence of major depression. However, the investigators found that the average amount of impairment associated with depression across countries was inverse-

ly proportional to the estimated prevalence of depression in those countries (Chang *et al.*, 2008; Simon *et al.*, 2002). This result is consistent with the possibility that the substantial differences in estimated prevalence of depression in the PPG study might be due, at least in part, to cross-national differences in diagnostic thresholds. However, as shown in Table III, we do not replicate this result in the WMH surveys. The countries with the lowest prevalence estimates of the DSM-IV disorders assessed in the WMH surveys also have the lowest reported levels of impairment associated with those disorders.

Table IV – *Association between severity of 12-month DSM-IV/CIDI disorders and days out of role in the WMH surveys.*

	Serious		Moderate		Mild			
	Mean	(se)	Mean	(se)	Mean	(se)	Wald F1	(*p*-value)
I. WHO Region: Pan American Health Organization (PAHO)								
Colombia	53.0	(8.9)	33.7	(6.7)	15.6	(3.0)	10.8*	(<.001)
Mexico	42.8	(6.9)	26.3	(5.3)	11.7	(2.7)	11.7*	(<.001)
United States	135.9	(6.9)	65.3	(4.6)	35.7	(2.7)	126.1*	(<.001)
II. WHO Region: African Regional Office (AFRO)								
Nigeria	56.7	(22.3)	51.5	(18.8)	25.9	(7.4)	1.6	(.20)
South Africa	73.1	(9.7)	49.3	(6.5)	32.5	(4.8)	9.1*	(<.001)
III. WHO Region: Eastern Mediterranean Regional Office (EMRO)								
Lebanon	81.4	(10.6)	42.0	(9.5)	13.6	(5.4)	14.4*	(<.001)
IV. WHO Region: European Regional Office (EURO)								
Belgium	96.1	(26.0)	59.9	(11.6)	42.5	(9.6)	3.7*	(.025)
France	105.7	(14.3)	71.8	(16.5)	67.6	(17.3)	2.7	(.07)
Germany	77.8	(18.1)	33.2	(8.2)	45.7	(12.1)	2.2	(.12)
Israel	184.6	(12.5)	109.4	(10.1)	44.6	(9.1)	41.8*	(<.001)
Italy	178.5	(25.6)	55.6	(10.9)	41.7	(11.2)	11.7*	(<.001)
The Netherlands	140.7	(19.9)	87.1	(17.1)	68.9	(22.7)	4.0*	(.018)
Spain	131.5	(15.8)	56.6	(10.0)	57.4	(22.0)	8.1*	(<.001)
Ukraine	142.5	(14.5)	103.2	(9.2)	51.6	(9.9)	13.9*	(<.001)
V. WHO Region: Western Pacific Regional Office (WPRO)								
PRC[11]	48.7	(18.4)	21.1	(5.2)	21.3	(7.2)	1.5	(.23)
Japan	51.0	(17.3)	39.3	(10.6)	22.5	(6.4)	3.7*	(.024)
New Zeland	98.1	(5.9)	54.6	(3.4)	36.4	(3.6)	40.7*	(<.001)

[1]No demographic controls were used.
*Significant association between severity and days out of role at the .05 level.

It is important to mention here a point briefly touched on earlier: that the severity classification used in the WMH surveys was validated by documenting a consistently monotonic association between reported disorder severity and mean number of days out of role associated with the disorders. This association is statistically significant in all but four surveys (Table IV). Respondents with serious disorders in most surveys reported at least 40 days in the past year when they were totally unable to carry out usual activities because of these disorders (IQR: 56.7-135.9 days). The mean days out of role for mild disorders, in comparison, is in the range 11.7-68.9 days, while the mean for moderate disorders is intermediate between these extremes (21.1-109.4 days; IQR: 39.3-65.3 days). When we compare between-country differences in these means with between-country differences in prevalence, using the same logic as in the previous paragraph, we once again find a positive association between prevalence and this indicator of role impairment. For example, in the three countries with the highest estimated overall 12-month prevalence (US, Ukraine, New Zealand), the mean number of days out of role associated with disorders classified "severe" is in the range 98.1-142.5, compared to means in the range 48.7-56.7 in the three countries with the lowest 12-month prevalence estimates (Nigeria, China, Japan).

Another possibility is that we under-estimated prevalence in some countries because the DSM categories are less relevant to symptom expression in some countries than others. We did not investigate this possibility in the WMH surveys, but rather assumed that DSM categories apply equally well to all countries. A sophisticated analysis of the possibility that DSM categories might not apply equally to all countries was carried out as part of the WHO Collaborative Study on Psychological Problems in General Health Care (PPG) (Üstün & Sartorius, 1995). In that study, an analysis of cross-national variation in the

structure of depressive symptom was carried out using item response theory (IRT) methods (Simon *et al.*, 2002). The results showed clearly that both the latent structure of depressive symptoms, and the associations between specific depressive symptoms and this latent structure, were very similar across the countries studied. These results argue against the suggestion that the large cross-national variation in estimated prevalence of depression is due to cross-national differences in the nature of depression. Comparable psychometric analyses have not yet been completed for other disorders, though, so it remains possible that cross-national differences exist in latent structure that might play a part in explaining the substantial differences in 12-month prevalence documented in the WMH surveys. New methodological studies are being carried out by WMH collaborators to investigate this possibility.

At the same time, it is noteworthy that the countries with the lowest disorder prevalence estimates in the WMH series also have the highest proportions of treated cases classified as "subthreshold;" that is, as not meeting criteria for any of the DSM-IV/CIDI disorders assessed in the WMH interview. This finding at least indirectly raises the possibility that the assessments in the CIDI are less adequate in capturing the psychopathological syndromes that are common in all the WMH countries. In particular, the syndromes associated with treatment in low-prevalence countries are not well characterized by the CIDI. Additional WMH clinical reappraisal studies using flexible and culturally sensitive assessments of psychopathology are currently underway in both developed and developing countries aimed at exploring the implications of this finding empirically.

LONG-TERM ADVERSE EFFECTS OF MENTAL DISORDERS

Mental disorders are known to have much earlier ages-of-onset (AOO) than most chronic physical disorders (Kessler *et al.*, 2007). The WMH survey results are consistent with these previous findings. WMH respondents with a lifetime history of each disorder were asked to report retrospectively how old they were when the disorder first began. AOO distributions were generated from these reports. Distributions are very consistent across countries (Kessler *et al.*, in press). Some anxiety disorders, most notably the phobias and separation anxiety disorder (SAD), have very early AOO distributions, with median AOO in the range 7-14 and the vast majority of lifetime cases occurring with 5-10 years of these medians. Similarly early onsets are typical for the externalizing disorders considered in the WMH surveys. The other common anxiety disorders (panic disorder, generalized anxiety disorder, and post-traumatic stress disorder) and mood disorders, in comparison, have later AOO distributions, with median AOO in the age range 25-50 and a wide IQR (15-75). Substance use disorders, finally, have intermediate median AOO (20-35), with the vast majority of cases having onsets within ten years of these medians.

WMH analyses show that early-onset mental disorders are significant predictors of the subsequent onset and persistence of a wide range of physical disorders (He *et al.*, 2008; Ormel *et al.*, 2007). This is part of a larger pattern of associations between early-onset mental disorders and a wider array of adverse life course outcomes that might be conceptualized as societal costs of these disorders, including reduced educational attainment, early marriage, marital instability, and low occupational and financial status (Kessler *et al.*, 1997; 1995; 1998). It is unclear if these associations are causal; that is, if interventions to treat early-onset mental disorders would prevent the subsequent onset of the adverse outcomes with which they are associated. As a result, it is not possible to state unequivocally that these outcomes are consequences of mental disorders. It would be very valuable from a public health perspective to have long-term evidence to evaluate this issue from experimental treatment effectiveness studies. Even in the absence of this evidence, though, the available data from the WMH surveys show that mental disorders, and especially early-onset mental disorders, are associated with substantially reduce life changes in terms of physical health and achievements in a variety of role domains.

SHORT-TERM ADVERSE EFFECTS OF MENTAL DISORDERS

A considerable amount of research has been carried out to quantify the magnitude of the short-term societal costs of mental disorders in terms of healthcare expenditures, impaired functioning, and reduced longevity, but most of this work has been done in the US (Greenberg & Birnbaum, 2005; Greenberg *et al.*, 1999). The magnitude of the cost estimates in these studies is staggering. For example, Greenberg *et al.* (1999) estimated that the annual total societal costs of anxiety disorders in the US over the decade of the 1990s exceeded $42 billion. This estimate excludes the indirect costs of early-onset anxiety disorders through adverse life course outcomes described in the previous section (e.g., the effects of child-adolescent anxiety disorders in predicting low educational attainment and consequent long-term effects on lower income) and through increased risk of other disorders (e.g., anxiety dis-

orders predicting the subsequent onset of cardiovascular disorder) and focuses exclusively on such short-term effects as healthcare expenditures and days out of role.

Although comparable studies of the societal costs of mental disorders have been carried out in only a few other countries, a recent study of the comparative impairments in role functioning caused by mental disorders and commonly occurring chronic physical disorders in the WMH surveys documented that mental disorders have substantial adverse effects on functioning in many countries around the world (Ormel *et al.*, in press). This analysis made use of the fact that physical disorders were assessed in the WMH surveys with a standard chronic disorders checklist. Respondents with the ten most commonly reported such disorders were asked to report the extent to which each such disorder interfered with their ability to carry out their daily activities in both productive roles (i.e., job, school, housework) and social roles (i.e., social and personal life). The same questions about disorder-specific role impairments were also asked of respondents with each of the mental disorders assessed in the surveys, the ten most commonly occurring of which were compared to the ten physical disorders.

Table V – *Disorder-specific global Sheehan Disability Scale ratings for commonly occurring mental and chronicphysical disorders in developed and developing WMH countries.*

	Proportion rated severely disabling			
	Developed		Developing	
	Mean	(se)	Mean	(se)
I. Physical disorders				
Arthritis	23.3	(1.5)	22.8	(3.0)
Asthma	8.2*	(1.4)	26.9	(5.4)
Back/neck	34.6*	(1.5)	22.7	(1.8)
Cancer	16.6	(3.2)	23.9	(10.3)
Chronic pain	40.9*	(3.6)	24.8	(3.8)
Diabetes	13.6	(3.4)	23.7	(6.1)
Headaches	42.1*	(1.9)	28.1	(2.1)
Heart disease	26.5	(3.9)	27.8	(5.2)
High blood pressure	5.3*	(0.9)	23.8	(2.6)
Ulcer	15.3	(3.9)	18.3	(3.6)
II. Mental disorders				
ADHD	37.6	(3.6)	24.3	(7.4)
Bipolar	68.3*	(2.6)	52.1	(4.9)
Depression	65.8*	(1.6)	52.0	(1.8)
GAD	56.3*	(1.9)	42.0	(4.2)
IED	36.3	(2.8)	27.8	(3.6)
ODD	34.2	(6.0)	41.3	(10.3)
Panic disorder	48.4*	(2.6)	38.8	(4.7)
PTSD	54.8*	(2.8)	41.2	(7.3)
Social phobia	35.1	(1.4)	41.4	(3.6)
Specific phobia	18.6	(1.1)	16.2	(1.6)

Of the 100 logically possible pair-wise disorder-specific mental-physical comparisons, the proportion of impairment ratings in the severe range were higher for the mental than physical disorder in 76 comparisons in developed and 84 comparisons in developing countries. (Table V) Nearly all of these higher mental-than-physical impairment ratings were statistically significant at the .05 level and hold in within-person comparisons (i.e., comparing the reported impairments associated with a particular mental-physical disorder pair in the sub-sample of respondents who had both disorders). Furthermore, a similar pattern holds when treated physical disorders are compared with all (i.e., treated or not) mental disorders to address the concern that the more superficial assessment of physical than mental disorders might have led to the inclusion of subthreshold cases of physical disorders with low disability.

These results involve individual-level effects. It is also instructive to examine societal-level effects, by which we mean effects that take into consideration not only how seriously impairing disorders are but also how prevalent they are. We are only beginning to do this in the cross-national WMH data, but results of this sort have been generated for the US WMH survey (Merikangas *et al.*, 2007). That analysis estimated that fully one-third of all the days out of role associated with chronic-recurrent health problems in the US population are due to mental disorders. This amounts to literally billions of days of lost functioning per year in the US population. We do not yet know if comparable results will be obtained in parallel analyses of WMH surveys in other countries, but preliminary results suggest that this might be the case.

THE COST-EFFECTIVENESS OF TREATMENT INTERVENTONS

WMH analyses have been carried out to estimate the magnitude of the effects of specific disorders on role functioning in workplace settings (de Graaf *et al.*, in press; Kessler *et al.*, 2006). The results are striking. In the US WMH survey, for example, 6.4% of workers were found to have an episode of major depressive disorder (MDD) in the year of the survey, resulting in an average of over five weeks of lost work productivity (Kessler *et al.*, 2006). Given the salaries of these workers, the annualized human capital loss to employers in the US labor force associated with MDD was estimated to be in excess of $36 Billion. A similar result was found in a WMH analysis that estimated the workplace costs of adult ADHD in ten WMH surveys (de Graaf *et al.*, in press). ADHD was found to be associated with an average of 22 days excess lost productivity per worker with this disorder across the ten WMH countries that assessed this disorder. Workplace costs as large as these raise the question whether expansion of detection, treatment, and treatment quality improvement initiatives might be able to reduce the adverse workplace

effects of mental disorders to an extent that makes treatment cost-effective from an employer perspective. An effectiveness trial carried out in conjunction with the WMH survey in the US evaluated this question experimentally (Wang *et al.*, 2007b). A large sample of workers was screened for MDD and randomized to either a model outreach and best-practices treatment intervention or to usual care. The intervention group was found at six and twelve months to have significantly higher job retention than controls as well as significantly more hours worked than controls (equivalent to an annualized two weeks more work). The financial benefits of these intervention effects (in terms of hiring and training costs, disability payment, and salaries paid for sickness absence days) were substantially higher than the costs of treatment, documenting that an expansion of workplace screening, detection, and treatment of worker mental disorders can be a human capital investment opportunity for employers. Replications of this intervention experiment are currently underway in other WMH countries, including Australia and Japan. Extensions of the intervention to consider treatment of bipolar depression and adult ADHD are also underway. Ongoing analyses of the WMH data are also being used to search for other intervention targets that can be used to evaluate the effects of treatment in reducing the burdens associated with mental disorders.

CONCLUSIONS

The data reviewed in this paper document that mental disorders are commonly occurring in the general population, often have an early age-of-onset, and often are associated with significant adverse societal costs. We also reviewed evidence to suggest that the current diagnostic criteria might under-estimate the true prevalence of clinically significant mental disorders, in which case the societal burdens of these disorders would be even greater than estimated here. We also presented evidence to show that some of these burdens can be reversed with best-practices treatment. The latter finding argues much more persuasively than the naturalistic survey findings that mental disorders are actual *causes* rather than merely *correlates* of impaired role functioning. Based on these results, we can safely conclude that mental disorders are common and consequential from a societal perspective throughout the world. Yet, as reported elsewhere, the WMH data show that only a small minority of people with even seriously impairing mental disorders receive treatment in most countries and that even fewer receive high-quality treatment (Wang *et al.*, 2007a). This situation has to change. A good argument could be made based on the WMH results that an expansion of treatment would be a human capital investment opportunity from the employer perspective. The same argument could be made more generally to government policy-makers about human capital consequences of expanded treatment from a societal perspective. Ongoing WMH analyses will continue to refine the naturalistic analyses of the adverse effects of mental disorders in an effort to target experimental interventions that can demonstrate the value of expanded treatment to address the enormous global burden of mental disorders.

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