Annex 2A Global Burden of Mental, Neurological, and Substance Use Disorders: An Analysis from the Global Burden of Disease Study 2010

Case Definition

Table 2A.1 summarizes the mental, neurological, and substance use disorders in the GBD 2010 cause list. This included an extended list of disorders compared to previous GBD studies. To allow for comparability in measurement, the definitions of dementia, mental, and substance use disorders used for GBD 2010 were restricted to diagnostic classifications provided in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR) (APA 2000) and the International Classification of Diseases (ICD-10) (WHO 1992). The epilepsy definition was based on ICD-10 (WHO 1992).

Estimation of Years Lived with Disability

There were some key differences in how YLDs were estimated between GBD 2010 and previous GBD studies. Previously, YLDs were derived using incidence data, greater weighting was given to particular ages (age weighting) and future health loss (or gain) was valued differently from current health loss (or gain) (discounting) (Murray, Ezzati, and others 2012). In contrast, GBD 2010 estimated *prevalent-YLDs* (by multiplying the prevalence of a given condition by its disability weight) without age-weighting and discounting. As these, in combination with other factors such as newly derived disability weights changed the DALY metric, burden in GBD 2010 was recalculated for 1990, as well as for 2005 and 2010, to facilitate the investigation of changes in burden across time.

For each disorder, prevalence data were assembled by conducting systematic reviews of the published and gray literature to capture data on prevalence, incidence, remission, duration, and excess mortality (Baxter, Patton, and others 2013; Baxter, Vos and others, 2014; Baxter, Brugha, and others 2014; Degenhardt, Bucello, and others 2011; Degenhardt, Ferrari, and others 2013; Erskine and others 2013; Ferrari, Baxter, and Whiteford 2010; Ferrari, Charlson, and others 2013; Saha and others 2006). DisMod-MR, a Bayesian meta-regression tool (Vos and others 2012) developed specifically for GBD 2010, was then used to model the prevalence for each disorder by, age, gender, year, region and country. A generalized negative binomial model was estimated for all epidemiological data using super-region, region, and country random effects, as well as two sets of covariates: study level covariates that adjusted for systematic bias in the raw epidemiological data, and country level covariates that aided the predictive power of the model by adjusting for known ecological effects in the data, such as the effect of conflict or economic status on prevalence. DisMod-MR also made use of the data available to estimate prevalence for countries and regions for which no raw data were available. Given that the aim of GBD 2010 was to compare burden caused by diseases and injuries between countries, this approach was considered preferable to the alternative, which was to entirely exclude parts of the world where no local data was available from GBD estimations, thereby assuming the prevalence of mental, neurological, and substance use disorders in those countries was zero. The final results provided prevalence estimates for 187 countries, 21 regions, 7 super regions, 20 age groups, males and females, for 1990, 2005, and 2010. Uncertainty around the raw epidemiological data was propagated to the final DisMod-MR model to provide 95 percent uncertainty intervals around all prevalence estimates (Vos and others 2012). The DisMod-MR prevalence output has been summarized in table 2A.1, with more comprehensive analyses of the prevalence output presented elsewhere (Baxter, Vos and others, 2014; Baxter, Brugha, and others 2014; Degenhardt, Baxter, and others 2014; Degenhardt, Charlson, and others 2014; Degenhardt, Ferrari, and others 2013; Ferrari, Charlson, and others 2013; Erskine, Ferrari and others 2013).

Disability weights in GBD 2010 quantified the severity of any short- or long-term health loss. They ranged from zero to one, with zero equivalent to perfect health and one equivalent to death, and were estimated for 220 distinct health states that together represented the non-fatal consequences of diseases and injuries in the study. Community surveys in Bangladesh, Indonesia, Peru, Tanzania, a telephone survey in United States, and an open-internet survey (accessible in English, Mandarin, and Spanish), captured the views of 31,038 individuals. In each survey, participants were asked to compare two randomly selected health states and to identify which of the two they considered healthier. To calculate

disability weights, their responses were anchored on a scale of zero to one, using a series of "population health equivalence" questions designed to compare overall health benefits of lifesaving or disease prevention programs (Salomon and others 2012). For a number of mental, neurological, and substance use disorders, disability weights were generated for more than one health state to capture differences in disability within the symptomatic presentation of the disorder (see table 2A.1 for heath states investigated for each disorder). For major depressive disorder, for instance, disability weights were estimated for mild, moderate, and severe states. Survey data on the distribution of these health states in the population were then used to proportionally aggregate the three disability weights into an average disability weight for the disorder, which also took into consideration the proportion of those diagnosed with major depressive disorder who were asymptomatic at the time of survey (Ferrari and others 2013). For the headaches, data on the frequency and average duration of episodes were used to estimate a proportion of time symptomatic.

In GBD 2010, comorbidity refers to the experience of more than one disease or injury within the study's reference period. As the aim of the study was to estimate the burden attributable to (1) individual causes and (2) all causes combined, the effect of any comorbid disease or injury on burden estimates needed to be removed. This correction was completed through the use of microsimulation methods. For each age, gender, year, region and country category, a hypothetical population of 20,000 individuals was created who would have no, one, two, or more comorbid conditions, using prevalence data as probabilities. Using a multiplicative function, a combined disability weight was calculated for all comorbid health states and then reapportioned to each health state relative to the sum of comorbid disability weights. The average "corrected" disability for each health state was calculated in each age, gender, year, and country stratum and the decrement compared to the original disability weight taken as the comorbidity correction for YLDs (Vos and others 2012).

Estimation of Years of Life Lost to Premature Mortality

YLLs for each disorder were estimated by multiplying deaths occurring as a result of a given disorder, by the reference standard life expectancy at the age the death occurred. Standard life expectancy data came from GBD 2010 standard model life tables put together using the lowest observed death rate in each age group across countries with a population size of 5 million or more (Salomon and others 2012). The number of deaths occurring as a result of each mental, neurological, and substance use disorder was estimated from cause of death data (by age, gender, year, region and country) available for 235 of 291 diseases and injuries in GBD 2010 (Wang and others 2012). These estimates were based on comprehensive searches of data sources such as vital registrations, verbal autopsies, and mortality surveillance databases, dating back to 1980, for 187 countries. Codes from different revisions of the ICD cause of death directory were matched to GBD 2010's list of diseases and injuries. Deaths allocated to unclear or imprecise diagnoses (for example, deaths assigned to conditions that were not likely to be the underlying cause of death) were reassigned using standard algorithms (Lozano and others 2012). Deaths and YLLs were estimated for schizophrenia, alcohol use disorders, drug use disorders, anorexia nervosa, epilepsy, Alzheimer's disease, Parkinson's disease, multiple sclerosis, and the residual groups of other mental, substance use, and neurological disorders. There were insufficient data for the remaining mental, neurological, and substance use disorders to enable the allocation of deaths to specific disorders. More information on the GBD 2010 cause of death data for mental, neurological and substance use disorders has been presented in chapter three ("Excess Mortality from mental, neurological and substance use Disorders in the global burden of disease study 2010") in this volume.

Table 2A.1 GBD 2010 Mental, Neurological, and Substance Use Disorders, Estimated Disability Weights, and Prevalent Cases

Disorders	Disability weights	Prevalent cases (to the nearest 100,000)	Age standardized prevalence rate (per 100,000 with 95% uncertainty)
Mental disorders			
Major depressive disorder	mild: 0.159 (0.107-0.223); moderate:0.406 (0.276-0.551); severe:0.655 (0.469-0.816)	298,700,000	4372.6 (4090.4-4672.6)
Dysthymia	0.159 (0.107-0.223)	105,700,000	1552.6 (1501.9-1607.9)
Bipolar disorder	manic: 0.480 (0.323-0.642); depressive: 0.406 (0.276-0.551); residual: 0.035 (0.021-0.055)	58,900,000	861.1 (820.4-908.8)
Schizophrenia	acute: 0.756 (0.571-0.894); residual:0.576 (0.399-0.756)	21,500,000	319.9 (309.4-330.6)
Anxiety disorders	mild: 0.03 (0.017-0.048); moderate:0.149 (0.101-0.210); severe: 0.523 (0.365-0.684)	272,100,000	3978 (3753-4255.2)
Eating disorders	Anorexia nervosa: 0.223 (0.151-0.313); Bulimia nervosa:0.223 (0.150-0.310)	Anorexia nervosa: 9,400,000 Bulimia nervosa: 8,600,000	Anorexia nervosa: 13 (11.9-14.3) Bulimia nervosa: 123.9 (111.7-140.2)
Autism	0.259 (0.177-0.362)	14,900,000	240.9 (230.5-254.1)
Asperger's syndrome	0.11 (0.073-0.157)	35,500,000	509.5 (482.2-539.7)
Attention-deficit hyperactivity disorder	0.049 (0.031-0.074)	36,400,000	517.1 (491.4-544.7)
Conduct disorder	0.236 (0.031-0.074)	48,700,000	692 (644.6-737.5)
Idiopathic intellectual disability	mild: 0.031 (0.018-0.049); moderate:0.08 (0.053-0.114); severe:0.126 (0.085-0.176); profound: 0.157 (0.107-0.221)	30,800,000	440.2 (316.6-585.2)
Neurological disorders			
Alzheimer's disease	mild: 0.082 (0.055-0.117); moderate:0.346 (0.233-0.475); severe:0.438 (0.299-0.584)	43,000,000	644 (625.5-664.6)
Parkinson's disease	mild: 0.011 (0.005-0.021); moderate:0.263 (0.179-0.360); severe:0.549 (0.383-0.711)	5,100,000	77.6 (74.8-80.4)
Epilepsy	treated, seizure free:0.072 (0.047-0.106); treated, with recent seizures:0.319 (0.211-0.445); untreated:0.420 (0.279-0.572); severe:0.657 (0.464-0.827)	28,300,000	410 (368.9-455-5)
Multiple sclerosis	mild: 0.198 (0.137-0.278); moderate:0.445 (0.303-0.593); severe:0.707 (0.522-0.857)	1,800,000	26.5 (25.5-27.7)
Migraine	0.433 (0.287-0.593)	1,014,000,000	14764.2 (14080.3-15597.4)
Tension-type headache	0.04 (0.025-0.062)	1,432,500,000	21020.1 (20573.3-21478.2)

Substance use disorders

Disorder	Disability weight	Prevalent cases	YLDs
Alcohol dependence	mild: 0.25 (90.176-0.359); moderate:0.388 (0.262-0.529); severe:0.549 (0.384-0.708)	94,800,000	1382.7 (1260.8-1508.3)
Fetal alcohol syndrome	mild: 0.017 (0.008-0.032); moderate: 0.057 (0.036-0.087); severe: 0.177 (0.117-0.255)	1,600,000	23.3 (20.9-26.1)
Opioid dependence	0.641 (0.459-0.803)	15,500,000	222.3 (200.4-248.9)
Cocaine dependence	0.376 (0.235-0.553)	6,900,000	99.2 (89.4-111.2)
Amphetamine dependence	0.353 (0.215-0.525)	17,200,000	247.9 (220.4-283.3)
Cannabis dependence	0.329 (0.223-0.455)	13,100,000	185.3 (166.2-211.4)

Sources: Degenhardt, Whiteford, and others 2013; Salomon and others 2012; Vos and others 2012; Whiteford, Degenhardt, and others 2013.

Note: GBD 2010 comorbidity adjustment is applied to disability weights and YLDs as opposed to prevalent cases so the latter cannot be summed across disorders that co-occur to avoid any double counting of cases. Prevalent cases were derived from estimates of point prevalence for all conditions apart from bipolar disorder and headaches where one-year prevalence was used. Given the episodic nature of bipolar disorder, estimates of point prevalence surveying symptoms experienced in the past 30 days or less may fail to diagnose cases of bipolar disorder in a residual state thereby underestimating prevalence.

GBD 2010 also quantified burden for three residual categories of "other mental and substance use disorders," "other drug use disorders," and "other neurological disorders." These were made up of rare disorders for which there were insufficient data to estimate prevalence. For residual categories leading to deaths and YLLs (e.g., other neurological disorders) burden was estimated using a ratio of YLDs to YLLs for similar or related disorders. For residual categories with few deaths (e.g., mental disorders) burden was estimated using prevalence and severity data from MEPS, NESARC, or the 1997 Australian mental health survey. More information on the process has been provided elsewhere (Vos and others 2012).

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