

## ORIGINAL PAPER

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## The burden of mental disorders in Victoria, 1996

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■ **Abstract** *Background:* Between 1998 and 1999, a burden of disease assessment was carried out in Victoria, Australia applying and improving on the methods of the Global Burden of Disease Study. This paper describes the methods and results of the calculations of the burden due to 22 mental disorders, adding 14 conditions not included in previous burden of disease estimates. *Methods:* The National Survey of Mental Health and Wellbeing provided recent data on the occurrence of the major adult mental disorders in Australia. Data from international studies and expert advice further contributed to the construction of disease models, describing each condition in terms of incidence, average duration and level of severity, with adjustments for comorbidity with other mental disorders. Disability weights for the time spent in different states of mental ill health were borrowed mainly from a study in the Netherlands, supplemented by weights derived in a local extrapolation exercise. *Results:* Mental disorders were the third largest group of conditions contributing to the burden of disease in Victoria, ranking behind cancers and cardiovascular diseases. Depression was the greatest cause of disability in both men and women. Eight other mental disorders in men and seven in women ranked among the top twenty causes of disability. *Conclusions:* Insufficient information on the natural history of many of the mental disorders, the limited information on the validity of mental disorder diagnoses in community surveys and considerable

differences between ICD-10 and DSM-IV defined diagnoses were the main concerns about the accuracy of the estimates. Similar and often greater concerns have been raised in relation to the estimation of the burden from common non-fatal physical conditions such as asthma, diabetes and osteoarthritis. In comparison, psychiatric epidemiology can boast greater scientific rigour in setting standards for population surveys.

### Introduction

Over the last two decades, Australian Health Ministers have identified mental health as a priority area with the potential for significant health gain at the population level. Initially the focus was on the development of a set of goals and targets for improving health and reducing inequalities [1, 2]. In 1994, the focus shifted to four major areas for action, one of which was mental health [3]. In a report on progress in all priority areas in 1996, the only indicator identified in the area of mental health was mortality from suicide [4]. While mortality and health facility data to a large extent describe the disease burden in other priority areas such as injuries, cardiovascular disease and cancer, this is not the case in mental health. The disease burden of mental disorders is largely due to non-fatal conditions, and a large proportion of people with a mental disorder never presents to a health facility. Thus, routine data collection systems do not contribute much to analysis of the disease burden due to mental disorders. The National Survey of Mental Health and Wellbeing (SMHWB) of 1997, on the other hand, provides a wealth of information on the occurrence of mental disorders in Australia [5]. The Australian Burden of Disease Studies relied heavily on this source of

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information for the majority of mental disorders [6–9]. This paper describes the methods and results of these analyses.

## Subjects and methods

Two burden of disease studies were carried out in Australia between 1998 and 1999: a national study conducted at the Australian Institute of Health and Welfare (AIHW) and a separate study for the state of Victoria by the Department of Human Services (DHS). The two studies used identical methods and shared a considerable proportion of the workload. The Victorian team was responsible for the calculation of the mental health burden and was guided by a panel of local mental health experts. The results presented in this paper are for the State of Victoria. Australian estimates of the burden of disease can be found at the AIHW website [6].

The burden of disease was calculated in disability-adjusted life years (DALY), a summary measure of population health developed by Murray and Lopez for the Global Burden of Disease (GBD) study [10]. The DALY combines information on mortality and non-fatal health outcomes to describe population health in a single number. The burden of disease in a population in a given year is the sum of the years of life lost due to premature deaths (YLL) and an estimate of the future years lived with disability (YLD) for new cases of disease or injury, weighted for severity. The DALY is a health gap measure that extends the concept of potential years of life lost (PYLL) so as to also include years of ‘healthy’ life lost, because a proportion of the population lives in a state of less than full health [11]. The DALY was designed to allow estimates of health impact to be mapped to causes, whether in terms of disease and injury, or risk factors and broader social determinants, and to use common values and health standards for all regions of the world. The Australian burden of disease studies depart from the general GBD methodology in a number of key areas:

1. The inclusion of a wider range of disease and injury categories than the GBD and a more detailed age breakdown of the burden of disease.
2. The use of the 1996 Australian cohort life expectancy (a method that takes declining mortality trends into account) rather than the standard life table used by the GBD to calculate the years of life lost for a death at each age. This results in a life expectancy at birth of 85.7 years in women and 81.5 years in men compared to the GBD’s standard life table with a life expectancy at birth of 82.5 years in women and 80 years in men.
3. The application of uniform age weighting rather than the greater weight given in the GBD to loss of health in young and mid-adult life to reflect a greater social responsibility at those ages to care for the young and old in society. We decided not to use age weighting, because of its controversial nature (see, for instance [12–14]) and because GBD results were reported not to be sensitive to the age weighting assumptions [10].
4. The use of disability weights developed in the Netherlands [15] in addition to those generated for the GBD. The Dutch weights were preferred because of their detail and their focus on health states that are common in Australia.
5. Adjustments for the effects of comorbidity between highly prevalent physical conditions, between mental disorders and between injuries.

The methods used to estimate the burden of mental disorders in Australia have been described in considerable detail in a previous paper comparing the Australian and GBD methods [16]. A summary is presented here with additional details on the mental disorders examined in the Victorian and Australian studies, but not the GBD study.

### ■ Mortality

The Australian Bureau of Statistics provided data on deaths occurring within Australia in people whose usual place of residence was Victoria. We chose 1996 as the baseline year, as this was the most recent year of mortality data at the start of the study. The number of deaths in Australia attributed to mental disorders was small, with the exception of drug overdose deaths and to a lesser extent deaths due to alcohol dependence. We included 85 heroin deaths coded under the injury chapter of the International Classification of Diseases version nine (ICD-9) as accidental poisoning due to opioids, because they had a similar age and sex profile to the 81 heroin deaths directly coded under the Mental Disorders chapter.

### ■ Disability

The estimation of the disability associated with mental disorders required information on the incidence, average duration and severity for each disease and its associated health states. The SMHWP was the main source of information to determine the burden in adults for six anxiety disorders, depression, most substance use disorders and borderline personality disorder. The survey was conducted on a representative sample of 10,641 Australian adults, with a response rate of 78% [5]. Interviewers used a computerised version of the Composite International Diagnostic Interview (CIDI) [17]. The unit record data of the survey provided information on the prevalence of mental disorders by ICD-10 and the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, of the American Psychiatric Association (DSM-IV) categories [18, 19]. We chose the ICD-10 diagnoses for consistency with our other disease categories, which were largely based on ICD-9 categories. The ICD-10 criteria for post-traumatic stress disorder (PTSD) are less strict than DSM-IV stipulates [20]. To avoid overestimation, we used the DSM-IV diagnosis of PTSD, which resulted in a 60% lower prevalence of PTSD. Our initial estimates of psychotic disorders were based on prevalence data from a US study [21]. These were subsequently confirmed by the recently released prevalence figures (4.7 per 1000 adults) of the Low Prevalence Disorders substudy of the SMHWP [22]. We estimated a prevalence of heroin dependence of 5 per 1000 persons aged 15–44 years from the number of heroin users enrolled in methadone programmes adjusted by estimates of the proportion of regular heroin users reached by these programmes. This estimate was consistent with the finding of a national drug household survey after accounting for the likelihood of both underreporting of heroin use and users not being included in a household sample [23]. The prevalence of eating disorders, depression in childhood and childhood disorders such as autism and Attention Deficit and Hyperactivity Disorder (ADHD) were derived from international epidemiological studies, for lack of relevant Australian data [24–30]. We classified dementia under the category of neurological and sense disorders and not under mental disorders, as is the convention in ICD.

### ■ Disease models

For each of the 22 mental disorders included in our analyses, we aimed to model the course of the disease in the average incident case. The incidence of mental disorders is rarely measured, and cross-sectional surveys tend to report 1-year period prevalence. To derive incidence, we made extensive use of the DisMod software package developed by Harvard University, which allows the modelling of internally consistent relationships between estimates of incidence, prevalence, duration, remission and mortality [31]. The disease models for anxiety disorders and bipolar disorder were based on evidence from the literature, which describes them as chronic diseases with periods of remission and relapse [32–35].

This differs from the approach adopted in the GBD 1990 study, in which short durations of between 0.75 and 2.5 years for all anxiety disorders, substance use disorders and bipolar disorder were assumed. We estimated the average duration for anxiety and bipolar disorders in the Australian studies basing our disease models on rates of disease remission reported in the literature [32, 34, 36, 37]. Lacking relevant published information, we estimated the duration of substance use disorders, borderline personality disorder and dysthymia from DisMod models, which gave the best fit between the observed age pattern of prevalence and assumptions of incidence and remission. Disease experts were consulted to check the estimates for plausibility. To account for asymptomatic periods during the course of the chronic conditions for which we derived prevalence estimates from the SMHWB, we adjusted the final YLD estimates by the ratio of 2-week prevalence and 1-year prevalence. There is evidence to suggest that dysthymia – a long-term condition with recurrent periods of low mood – and major depressive disorder are different expressions of the same chronic disease entity, with periods of greater, lesser or no symptoms [38–41]. However, the great diversity in the course of illness made it difficult to find a credible, ‘average’ chronic disease model for depression. Some people have only one episode in a lifetime; some have chronic unremitting disease and the majority experiences multiple episodes over a lifetime with no or low-grade symptoms in between. We therefore decided to model major depression as episodes and dysthymia separately, but to present the results under a single category of depression.

We estimated a 4–6 year average duration for borderline personality disorder. This may seem short for a personality disorder, but there was no alternative DisMod model with credible estimates of incidence and remission to match the prevalence observed in the SMHWB. Psychoses were modelled as a life-long condition that generally starts in young adulthood and is associated with an elevated risk of dying, based on standardised mortality ratios of 154 in males and 162 in females in the UK [42]. The estimated average duration for anorexia and bulimia was 8 and 5 years, respectively, based on overseas follow-up studies reporting 24% persistence of anorexia after 10–15 years and 20% persistence of bulimia after 5–10 years [43, 44]. We assumed an annual mortality risk of 0.58% in anorexia and no elevated mortality in bulimia [45]. An estimate of 50% remission after 5 years of follow-up led to an estimate of the average duration for ADHD of almost 7 years [46]. The duration for autism was extrapolated from the average life expectancy reported for moderate intellectual disability in California [47].

### ■ Severity

For the main mental disorders we used the Dutch disability weights (DWs). The DWs for drug dependence disorders, manic episodes in bipolar disorder and borderline personality disorder were extrapolated by panels of local experts in a manner similar to the way in which the GBD expert panel derived weights for most conditions after having determined weights for 22 indicator conditions by person trade-off methods. Our weight for psychoses is a compound of 30% of the untreated weight and 70% of the treated weight from the GBD study based on an average time spent in psychosis reported from a number of industrialised countries that took part in the International Pilot Study of Schizophrenia [48] (Table 1).

The Dutch DWs typically describe the mental disorders to which they refer by two or three levels of severity. However, it was not easy to find the epidemiological data by level of severity. When that level of detail was available, as for instance was the case with three levels of severity of ICD-10 diagnoses of depression and panic disorder in the SMHWB, local mental health experts doubted its validity. Instead, for conditions derived from the SMHWB, we found it necessary to develop a new classification of severity from six questions on mental well being in the SF-12. This method has been described previously in detail [16]. In comparison to the ICD-

10 categories of mild, moderate and severe depression, our severity classification resulted in larger differentials for the average disability score (and in the expected direction) than measured by each of the other disability instruments used in the SMHWB, including the mental component score of SF-12, the General Health Questionnaire, the Brief Disability Questionnaire and the Kessler psychological distress scale. This suggested that it was better than ICD-10 at discerning different levels of severity in depression and lent support to its use in other conditions derived from the SMHWB. Because of the large overall size of the mental health burden and the broad spectrum of severity experienced in mental disorders, we chose to use this unvalidated classification scheme and apply the graded Dutch DWs rather than the single GBD weights, which imply an undefined and potentially inappropriate distribution of severity.

### ■ Comorbidity

Comorbidity between mental disorders identified in the SMHWB was very common. The prevalence of people in Australia with a mental disorder was 17.8%, 35% of whom qualified for two or more diagnoses. At the level of individual diagnoses, the proportion of persons with comorbid conditions was even higher. For instance, of all people with a current diagnosis of major depression, 61% had at least one other concurrent diagnosis. Comorbidity with anxiety disorders was common, occurring in one-third of people with depression. Comorbidity in people with borderline personality disorder was even more frequent (94%): depression, anxiety disorder and substance use disorder occurred in 62, 48 and 52%, respectively. There were people identified with up to eight different mental disorders. Calculating the disability for each comorbid disorders as if it belonged to a separate person could result in attributing an amount of non-fatal burden in one person in excess of a DW of 1, or the equivalent of being dead. As this is obviously not credible, we decided to split the number of prevalent cases of anxiety disorders, affective disorders, borderline personality disorder and substance dependence categories equally between concurrent diagnoses. By capturing the level of severity separately, as described above, we allowed for the fact that people with multiple diagnoses were likely to experience more severe disease than those with a single diagnosis only. An increase in the number of comorbid diagnoses was associated with a higher proportion of people reporting moderate and severe disability (Table 2).

### ■ Depression as a risk factor

The contribution of certain diseases to the total burden of disease is not well captured by the mutually exclusive disease categories used in this study. This is because, in addition to the direct sequelae from these conditions, there is also an increased risk for other diseases or injuries. This ‘excess’ attributable burden can be estimated using similar methods to those used for estimating the burden attributable to risk factors. We made a separate more inclusive calculation of the burden attributable to depression including all depression without adjustment for comorbidity and part of the burden of suicide, self-inflicted harm and ischaemic heart disease. Estimation of the fraction of the burden from these conditions that is attributable to depression is based on the 2-week prevalence of depression observed in the SMHWB and relative risks of 30 for suicide [49] and 2.3 for ischaemic heart disease [49].

## Results

Mental illness was responsible for about one-seventh of the total disease burden in Victoria in 1996, or

**Table 1** Disability weights (DW) for 22 mental disorders (*in italics*) used in Australian burden of disease studies

Disease category	Disability weight				Origin of DWs
	None	Mild	Moderate	Severe	
Substance use disorders					
<i>Alcohol harmful use</i>	0.11				Dutch weights
<i>Alcohol dependence</i>		0.11	0.33	0.55	
Drug use					
<i>Heroin dependence</i>	0.27				Locally derived weights
<i>Marihuana dependence</i>	0.11				
<i>Sedative dependence</i>	0.18				
<i>Stimulant dependence</i>	0.11				
Anxiety disorders					
<i>Panic disorder</i>		0.16	0.16	0.69	Dutch weights
<i>Obsessive-compulsive disorder</i>		0.17	0.17	0.60	
<i>Post-traumatic stress disorder</i>		0.13	0.13	0.51	
<i>Agoraphobia</i>		0.11	0.11	0.55	
<i>Social phobia</i>		0.17	0.17	0.59	
<i>Generalised anxiety disorder</i>		0.17	0.17	0.60	
<i>Separation anxiety disorder</i>		0.11	0.11	0.55	
Affective disorders					
<i>Major depressive episodes</i>		0.14	0.35	0.76	Dutch weights
<i>Dysthymia</i>		0.14	0.35	0.76	
<i>Bipolar disorder</i>	0.18	Combined DW, consisting of 0.50 for mania (locally derived weight), 0.34 for depressive episodes (Dutch weight for moderate depression) and 0.14 for time in between episodes (Dutch weight for mild depression)			
<i>Psychoses</i>	0.43	Composite of 30% untreated GBD DW (0.63) and 70% treated GBD DW (0.35)			
<i>Borderline personality disorder</i>	0.54				Locally derived weight
Eating disorders ( <i>anorexia and bulimia</i> )	0.28				Dutch weight
<i>Attention-deficit hyperactivity disorder</i>		0.02	0.15	0.15	Dutch weight
<i>Autism</i>	0.55				Dutch weight

**Table 2** Reported level of severity from SF-12 questions on mental well-being by number of concurrent mental diagnoses, National Survey of Mental Health and Wellbeing 1997

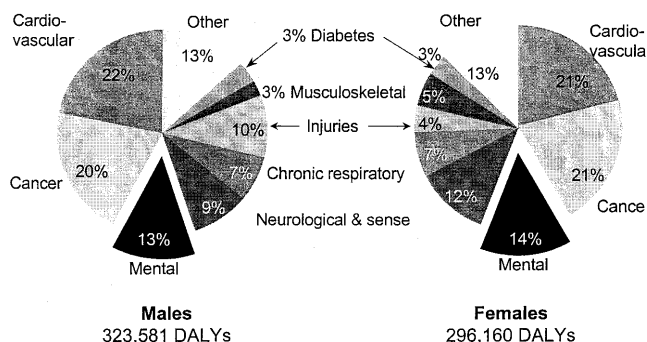
No. of diagnoses	Reported level of severity (%)				Total
	None	Mild	Moderate	Severe	
0	71	22	6	0	100
1	46	29	21	3	100
2	27	29	36	8	100
3 or more	14	24	46	16	100

40,776 DALYs in men and 41,451 in women (Fig. 1). Only 6% of this burden was due to mortality, most of which can be accounted for by fatal outcomes associated with substance use disorders. The picture is dominated by substance use and affective and anxiety disorders, which together constitute four-fifths of the overall burden attributable to mental illness (Fig. 2). There were marked sex differentials in the distribution of the mental illness burden due to particular causes. The contribution from affective disorders was 50% higher in women than in men, while the anxiety burden was three-fifths higher.

Conversely, the male burden from substance abuse was two and one-third times higher compared with women. Eating disorders occurred mainly in women, with men having only 5% of the female burden attributable to these disorders. Childhood conditions (such as autism and ADHD) were predominantly found in boys, who had a three times higher burden from these conditions than girls.

In men, depression was the eighth leading cause of overall burden, while alcohol and drug use disorders were the 13th and 15th respectively. In women, depression was the fifth leading cause of overall burden, while generalised anxiety disorder and alcohol use disorder were 12th and 17th respectively (Table 3). A more inclusive calculation of depression as a risk factor for suicide and ischaemic heart disease and without adjustment for comorbidity with other mental disorders increased the share of depression as a proportion of total disease burden, making it the third largest condition in males and the top condition in females.

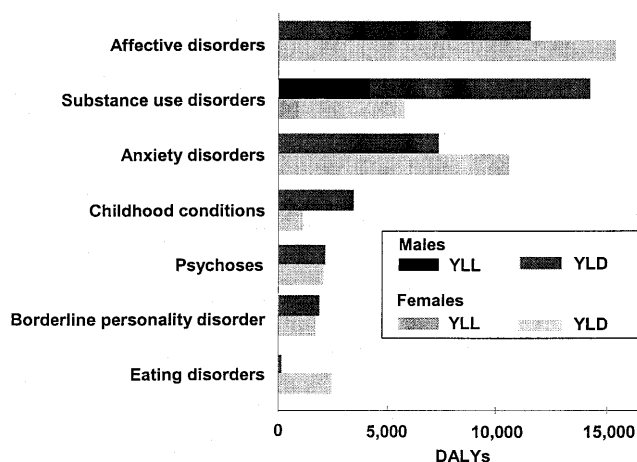
Mental disorders accounted for the largest proportion of non-fatal burden of any group of diseases or injuries, representing 25.5% of disability in males



**Fig. 1** The burden of disease, in disability-adjusted life years (DALYs) by disorder and sex, Victoria 1996

and 27.5% in females. Depression, alcohol dependence, generalised anxiety disorder, psychotic disorders, bipolar disorder and social phobia ranked among the top 20 causes of disability in males and females. Also ranked in the top 20 were borderline personality disorder and ADHD in males and eating disorders in females (Table 4).

The usual way of calculating DALYs for non-fatal outcomes is to multiply incident cases of disease with the average duration of disease and the severity weight. Thus calculated, the per capita incident non-fatal burden attributable to mental illness was far greater in early adulthood than at any other age (Fig. 3). This is largely due to the peak in new cases of chronic mental illnesses at this life stage, the disability of which is experienced for



**Fig. 2** The burden of mental illness in years of life lost (YLL), years lived with disability (YLD) and DALYs by disorder and sex, Victoria 1996

many years into the future. Using an incidence approach, this disability is attributed back to age at onset. Boys experienced incident non-fatal burden from childhood disorders at twice the rate of girls. Sex differences in the age distribution of incident burden rates, however, were the most pronounced for depression, which we modelled as an episodic condition. In men, this burden steadily rises to half the male mental illness burden at middle age, after which it diminishes quickly. In women, the burden from depression increases rapidly to the highest

**Table 3** Top 20 causes of burden of disease in disability-adjusted life years (DALYs) by sex, Victoria 1996

Males	% of total	Females	% of total
1. Ischaemic heart disease	13.1	1. Ischaemic heart disease	10.7
2. Stroke	4.8	2. Stroke	6.1
3. Lung cancer	4.7	3. Breast cancer	5.4
4. COPD <sup>a</sup>	4.4	4. Dementia	4.9
5. Diabetes mellitus	3.3	5. <i>Depression</i> <sup>b</sup>	4.7
6. Bowel cancer	2.9	6. Osteoarthritis	3.3
7. <i>Depression</i> <sup>b</sup>	2.9	7. COPD	3.3
8. Prostate cancer	2.7	8. Diabetes mellitus	3.2
9. Suicide	2.7	9. Asthma	2.9
10. Road traffic accidents	2.7	10. Bowel cancer	2.8
11. Dementia <sup>c</sup>	2.6	11. Lung cancer	2.7
12. Hearing loss	2.6	12. <i>Generalised anxiety disorder</i>	1.7
13. <i>Alcohol abuse/dependence</i>	2.3	13. <i>Other vision disorders</i> <sup>d</sup>	1.5
14. Asthma	2.3	14. Hearing loss	1.3
15. <i>Drug abuse/dependence</i>	2.1	15. Ovary cancer	1.2
16. Osteoarthritis	1.8	16. Parkinson's	1.2
17. Benign prostatic hypertrophy	1.1	17. <i>Alcohol abuse/dependence</i>	1.1
18. Inflammatory heart disease	1.0	18. Road traffic accidents	1.1
19. HIV/AIDS	1.0	19. Peripheral vascular disease	1.0
20. Lymphoma	0.9	20. Lymphoma	1.0

<sup>a</sup> Chronic obstructive pulmonary disease

<sup>b</sup> A more inclusive calculation of depression, ignoring the adjustment for comorbidity with other mental disorders and adding an attributable fraction for suicide and ischaemic heart disease, increases the share of the burden for depression in males to 5.0% (rank 3) and 11.2% in females (rank 1)

<sup>c</sup> Dementia is classified under neurological and sense disorders and not mental disorders

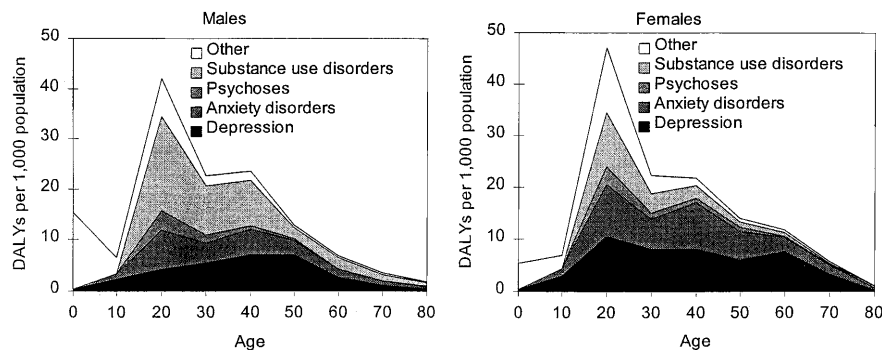
<sup>d</sup> Excludes cataract, glaucoma and diabetic retinopathy and mainly concerns macular degeneration

**Table 4** Top 20 causes of disability in years lived with disability (YLD) by sex<sup>a</sup>, Victoria 1996

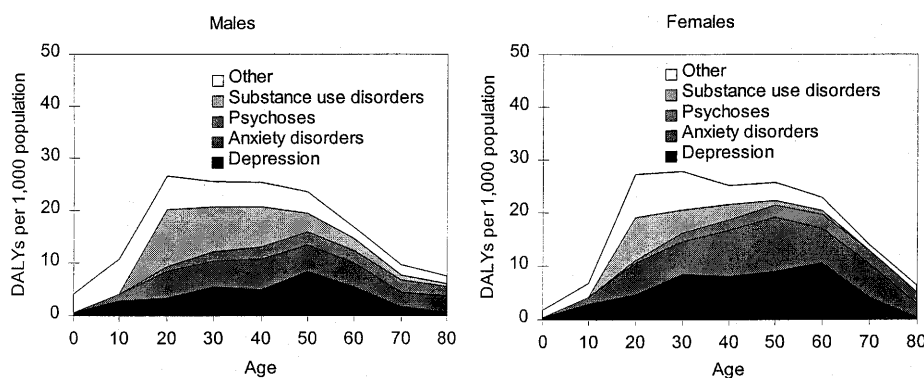
Males	% of total	Females	% of total
1. Depression	6.5	1. Depression	10.7
2. Hearing loss	5.8	2. Dementia	6.1
3. Alcohol abuse/dependence	4.9	3. Osteoarthritis	5.4
4. Dementia	4.5	4. Asthma	4.9
5. Asthma	4.5	5. Diabetes mellitus	4.7
6. COPD	4.3	6. Generalised anxiety disorder	3.3
7. Diabetes mellitus	4.0	7. Breast cancer	3.3
8. Osteoarthritis	3.9	8. Other vision disorders	3.2
9. Ischaemic heart disease	3.7	9. Stroke	2.9
10. Stroke	3.5	10. COPD	2.8
11. Benign prostatic hypertrophy	2.4	11. Hearing loss	2.7
12. Prostate cancer	2.2	12. Ischaemic heart disease	1.7
13. Generalised anxiety disorder	2.0	13. Alcohol abuse/dependence	1.5
14. Borderline personality disorder	1.6	14. Parkinson's	1.3
15. Attention-deficit disorder	1.3	15. Eating disorders	1.2
16. Bipolar disorder	1.5	16. Social phobia	1.2
17. Psychoses	1.5	17. Infertility	1.1
18. Parkinson's	1.5	18. Bipolar disorder	1.1
19. Social phobia	1.4	19. Psychoses	1.0
20. Bowel cancer	1.0	20. Rheumatoid arthritis	1.0

<sup>a</sup> The eight mental disorders listed in the top 20 list account for 20.8% of the 25.5% share of YLD for all mental disorders in males; the seven mental disorders listed account for 21.6% out of the 27.5% share of YLD for all mental disorders in females; note that dementia is classified under neurological and sense disorders and not mental disorders

**Fig. 3** Incident YLD rates per 1000 population by mental disorder, age and sex, Victoria 1996



**Fig. 4** Prevalent YLD rates per 1000 population by mental disorder, age and sex, Victoria 1996



rate for any mental illness at any age by early adulthood, after which it declines slightly to three-quarters the female mental illness burden at retirement age.

Another way of presenting the burden of disease is by calculating DALYs for prevalent cases of disease

during the 1-year duration of the year of study, again weighted for severity. This per capita prevalent non-fatal burden attributable to mental illness provides a substantially different picture to an incidence approach (Fig. 4). The large burden from high-incidence mental disorders of early adulthood illustrated in

Fig. 3 is reduced by more than one-third, and appears instead throughout older ages until death, this being the period during which chronic conditions (i.e. anxiety disorders and psychoses) remain prevalent. Only a proportion of substance use disorders in early adulthood leads to chronic mental illness, which explains the larger reduction in prevalent burden after this life stage for substance abuse than for anxiety disorders and psychoses. The difference in the picture for depression between an incidence and prevalence approach is not nearly as apparent, because we modelled this condition as an episodic disorder. A useful way of interpreting the prevalent burden is as a measure of the proportion of the population experiencing disability at a particular point in time. Viewed in these terms, four-fifths of the burden from mental illness was experienced at ages between 15 and 64 in both men and women.

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## Discussion

This paper presents results from the first attempt at a comprehensive assessment of the burden of mental disorders in Australia. The loss of health due to 22 mental disorders was quantified in DALYs. The DALY is a summary measure of population health that allows the quantification of mortality and morbidity in one measure and thus allows comparisons between diseases of a very different nature. Mental disorders rank third in size of burden behind cardiovascular disease and cancer. We have reported elsewhere that mental disorders would have ranked first, with an increase in its share of the total burden from 13.3% to 20.7%, if age weighting were applied [16]. In other low-mortality countries, with most of the burden of physical disorders occurring at old age and a high prevalence of mental disorders in young and mid-adult ages, burden of disease results will be similarly sensitive to the GBD age weighting function. This is an undesirable outcome for a social value in a summary measure of population health that does not enjoy universal support.

Because mental disorders largely run a non-fatal course and are often not presented or recognised as such during contacts with health services [5], routine data collection systems are unable to capture the information that is needed to quantify the burden of mental disorders. It was fortunate that data from the SMHWB became available during the course of the national and Victorian burden of disease studies. Mental health epidemiologists have made considerable progress in setting standards on how to obtain and classify mental disorders in population surveys [51]. The CIDI performs well in terms of inter-rater and test-retest reliability [52]. The validity of mental diagnoses derived from population surveys is less well

established. Most validity studies have examined a few selected aspects of validity and have been conducted on small selected clinical samples [53]. Validity studies are difficult because of the lack of a well-defined gold standard of psychiatric diagnoses and the existence of two major psychiatric classification systems. Discordance between ICD-10 and DSM-IV diagnostic categories in a study from New South Wales was 32% for all mental disorders examined [54]. Analysing the SMHWB in a similar fashion shows an even greater lack of agreement between ICD-10 and DSM-IV diagnoses (42%). However, when using survey data in a burden of disease analysis, it is more important to compare the prevalence estimates and the subsequent DALY estimates of mental disorders between the two classification systems. In the SMHWB, the prevalence of ICD-10 defined mental disorders was 14% higher than that of DSM-IV diagnoses. The biggest outliers were PTSD (59% more common in ICD-10), dysthymia (55% more common in ICD-10), obsessive-compulsive disorder (OCD) (51% less common in ICD-10), social phobia (49% more common in ICD-10) and agoraphobia (42% more common in ICD-10). The calculations in the Australian burden of disease studies were based on ICD-10 diagnoses, with the exception of PTSD for which we opted for the DSM-IV diagnosis, following expert advice. For this paper, we recalculated the DALYs for 14 mental disorders that were derived from the SMHWB using the DSM-IV diagnoses, but otherwise the same methods. In comparison, the sum of DALYs for the 14 DSM-IV defined mental disorders is 7% greater. Under DSM-IV, a greater burden of major depression is partially compensated by a much smaller estimate for dysthymia. Large differences in size between individual anxiety disorders cancel each other out when added together. DSM-IV also gives higher estimates for alcohol dependence, harmful use of alcohol and cannabis dependence and lower estimates of sedative dependence (Table 5). On balance, the differences between ICD-10 and DSM-IV diagnoses are not great, although the large differences in estimates for social phobia, agoraphobia and OCD challenge the accuracy of estimates for individual anxiety disorders. Concern about the validity of survey results is not restricted to mental health. In the course of collecting information for the burden of disease studies, we were concerned about the validity of self-reported health status measures from population surveys for common physical conditions such as diabetes, asthma and osteoarthritis. In comparison, psychiatric epidemiology can boast a much greater scientific rigour in setting standards for interview-based population surveys.

Our estimates for bipolar disorder, childhood mental disorders and eating disorders relied on overseas data and should be considered provisional

**Table 5** The prevalence and burden in YLD for 14 mental disorders estimated from the Survey of Mental Health and Wellbeing, calculated by ICD-10 and DSM-IV diagnostic categories

Mental disorder	Prevalence		YLD		Difference as % of ICD-10 YLD
	ICD-10 (%)	DSM-IV (%)	ICD-10	DSM-IV	
<b>Depression</b>			<b>23,330</b>	<b>26,145</b>	<b>-12</b>
Major depression	5.2	6.3	17,288	23,261	-35
Dysthymia	1.1	0.5	6,042	2,884	52
<b>Anxiety disorders</b>			<b>17,984</b>	<b>17,098</b>	<b>5</b>
Panic disorder	1.1	1.0	1,497	1,441	4
Agoraphobia	0.9	0.5	1,149	756	34
Social phobia	2.7	1.4	4,548	3,175	30
Generalised anxiety disorder	3.1	2.6	7,990	7,806	2
Obsessive-compulsive disorder	0.4	0.7	1,191	2,312	-94
Post-traumatic stress disorder	3.3	1.3	1,609	1,609	-26
<b>Substance use disorders</b>			<b>12,073</b>	<b>14,236</b>	<b>-18</b>
Harmful alcohol use	3.0	1.9	1,243	1,807	-45
Alcohol dependence	3.5	4.1	8,912	9,375	-5
Sedative dependence	0.4	0.4	744	419	44
Cannabis dependence	1.6	1.5	1,097	1,332	-21
Stimulant dependence	0.2	0.2	78	73	6
Borderline personality disorder	0.4		3,653	3,596	2
<b>Total for 14 mental disorders</b>			<b>57,040</b>	<b>61,075</b>	<b>-7</b>

until local data become available. This was also the case for psychotic disorders although an Australian estimate of prevalence obtained prior to finalising our results confirmed our initial estimate.

Comorbidity between mental disorders is very common. For an estimate of the burden of disease in a population, estimating each disorder independently would lead to considerable overestimation. We were able to adjust for comorbidity between the disorders derived from the SMHWB. This was the first time that adjustment for comorbidity has been attempted in a burden of disease study. As we included a greater number of mental disorders than previously had been included in the GBD, it became more difficult to ignore the issue. With the results in Table 2, we show that people with more than one mental disorder had more severe disease. Because their greater severity is translated into higher disability weights, people with comorbid mental disorders contribute more per individual to the burden of disease than people with a single mental disorders, even though we apportion them equally between conditions. We were unable to adjust for comorbidity arising from mental disorders that were not derived from the SMHWB, such as the comorbidity between psychoses and depression or between eating disorders and depression. This could have led to some degree of overestimation of the mental burden. We decided not to adjust for comorbidity between physical and mental disorders even though the SMHWB collected self-reported data on physical conditions, because of the concerns we had in general about the accuracy of self-reported health status and the difficulty of attributing self-reported disability categories (such as ‘heart trouble’, ‘kidney

disease’ and ‘liver trouble’) to specific causes. For the majority of mental disorders, the age at which they are most prevalent is between young and mid-adulthood, when physical disorders are less common. Therefore, ignoring comorbidity between mental and physical disorders may not lead to much overestimation of the burden of disease.

Declining prevalence of depressive and anxiety disorders with increasing age is a consistent finding of population surveys of mental health. Four types of error in case ascertainment of depression have been suggested as potential explanations:

1. Exclusion of the institutionalised and homeless,
2. Failure of the elderly to respond adequately to the complexity of the interview schedule,
3. Failure to detect depression in the presence of chronic physical illness, and
4. A lesser likelihood of elderly persons acknowledging symptoms of depression [54–56].

The balance of arguments, however, leans towards accepting the validity of lower prevalence of depression and anxiety in the elderly. ‘Psychological immunisation’, that is, increasing resistance to depression after prolonged exposure to adversity over a lifetime, has been suggested as an explanation for this phenomenon [58].

Depression in old age is commonly associated with chronic physical conditions such as Parkinson’s, dementia and stroke [59]. The Dutch disability weight study used descriptions that included some or considerable depression and/or anxiety at all severity levels for these three diseases [15]. Thus, our DALY calculations for these diseases include a component of



depression. Not all of these depressive symptoms would qualify as major depression or dysthymia, the two categories of depression estimated in this study. In fact, it is reported that survey instruments and diagnostic classification systems erroneously downplay the importance of depression associated with physical illness [59].

For the Australian burden of disease studies, we made a conscious choice to concentrate on the epidemiological inputs and not to derive separate DWs for Australia. Instead, we adopted DWs developed in the Netherlands that covered the main sources of disability in Australia. Dutch DWs were available for varying levels of severity for the major mental disorders. This had the advantage over the single DWs used in the GBD study, that it allowed the specification of a local distribution of severity. However, there were no readily available data on the distribution by severity of mental disorders in Australia to match the description of the health states valued in the Dutch study. For conditions derived from SMHWB, we devised a classification of severity based on answers to six questions on mental health status of the SF-12. Our assumption that the same classification system was valid when applied to the other conditions measured in the SMHWB, however, is an example of the need to improvise when undertaking a burden of disease study. More accurate information about the natural history of mental disorders including duration and patterns of severity would require longitudinal studies of people identified with a mental disorder in community samples. The fact that such a study was not planned to follow-up a sample of SMHWB respondents with a mental disorder represents a lost opportunity. Follow-up studies of clinical samples can only provide partial information, as they report on those patients who are in contact with health services and therefore probably have more severe disease.

## Conclusions

While there is room for improvement in our estimates of the burden due to mental disorders in Australia, the results published here represent a major step forward in our understanding of the importance of mental disorders as a population health problem. As a health gap measure, DALYs describe the unfinished health agenda, that is the amount of ill health in a population that currently is not addressed by health service efforts. As such, it suggests where opportunities for further health gain may exist. Complementary analyses of the cost-effectiveness of interventions are required to identify the mix of mental health interventions that gives greatest value for money. The Department of Human Services in Victoria is

planning to conduct cost-effectiveness analyses in mental health using the DALY as the measure of health outcome. The disease models developed for the burden of disease study will be a starting point to assess the scope for change and the resources required to reduce the size of the burden due to mental disorders.

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