## Global Mental Health 1

# No health without mental health

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**About 14% of the global burden of disease has been attributed to neuropsychiatric disorders, mostly due to the chronically disabling nature of depression and other common mental disorders, alcohol-use and substance-use disorders, and psychoses. Such estimates have drawn attention to the importance of mental disorders for public health. However, because they stress the separate contributions of mental and physical disorders to disability and mortality, they might have entrenched the alienation of mental health from mainstream efforts to improve health and reduce poverty. The burden of mental disorders is likely to have been underestimated because of inadequate appreciation of the connectedness between mental illness and other health conditions. Because these interactions are protean, there can be no health without mental health. Mental disorders increase risk for communicable and non-communicable diseases, and contribute to unintentional and intentional injury. Conversely, many health conditions increase the risk for mental disorder, and comorbidity complicates help-seeking, diagnosis, and treatment, and influences prognosis. Health services are not provided equitably to people with mental disorders, and the quality of care for both mental and physical health conditions for these people could be improved. We need to develop and evaluate psychosocial interventions that can be integrated into management of communicable and non-communicable diseases. Health-care systems should be strengthened to improve delivery of mental health care, by focusing on existing programmes and activities, such as those which address the prevention and treatment of HIV, tuberculosis, and malaria; gender-based violence; antenatal care; integrated management of childhood illnesses and child nutrition; and innovative management of chronic disease. An explicit mental health budget might need to be allocated for such activities. Mental health affects progress towards the achievement of several Millennium Development Goals, such as promotion of gender equality and empowerment of women, reduction of child mortality, improvement of maternal health, and reversal of the spread of HIV/AIDS. Mental health awareness needs to be integrated into all aspects of health and social policy, health-system planning, and delivery of primary and secondary general health care.**

*Lancet* 2007; 370: 859–77

Published Online
September 4, 2007
DOI:10.1016/S0140-6736(07)61238-0

This is the first in a **Series** of six papers about global mental health

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## Introduction

The WHO proposition that there can be "no health without mental health"[1] has also been endorsed by the Pan American Health Organisation, the EU Council of Ministers, the World Federation of Mental Health, and the UK Royal College of Psychiatrists. What is the substance of this slogan?

Mental disorders make a substantial independent contribution to the burden of disease worldwide (panel 1).[2] WHO's 2005 estimates of the global burden of disease provide evidence on the relative effect of health problems worldwide.[3,4] Non-communicable diseases are rapidly becoming the dominant causes of ill health in all developing regions except sub-Saharan Africa (table 1).[4] The Global Burden of Disease report has revealed the scale of the contribution of mental disorders, by use of an integrated measure of disease burden—the disability-adjusted life-year, which is the sum of years lived with disability and years of life lost.[4] The report showed that neuropsychiatric conditions account for up to a quarter of all disability-adjusted life-years, and up to a third of those attributed to non-communicable diseases, although the size of this contribution varies between countries according to income level (table 1).[4] The neuropsychiatric conditions that contribute the most disability-adjusted life-years are mental disorders, especially unipolar and bipolar affective disorders, substance-use and alcohol-use disorders, schizophrenia, and dementia. Neurological disorders (such as migraine, epilepsy, Parkinson's disease, and multiple sclerosis) make a smaller but still significant contribution. Of the non-communicable diseases, neuropsychiatric conditions contribute the most to overall burden (figure 1 and table 1),[4] more than either cardiovascular disease or cancer.

### Search strategy

We searched relevant databases (Medline, PubMed, Embase, and the Cochrane Library of systematic reviews and clinical trials) with the following Mesh terms: "mental disorders", "substance-related disorders", "cardiovascular diseases", "cerebrovascular disorders", "diabetes mellitus", "diabetes complications", "HIV infections", "malaria", "tuberculosis", "genital diseases", "female", "infant nutrition disorders", "and accidents", together with the PubMed clinical queries algorithms for aetiology, prognosis, treatment, and systematic reviews. For non-communicable disorders (coronary heart disease, stroke, and diabetes), and communicable disorders (HIV/AIDS, tuberculosis, and malaria) we focused on index conditions that are especially salient to public health. We concentrated on papers published since 2000, and have prioritised evidence from low-income and middle-income countries and from systematic reviews and meta-analyses. We have cited subsequent publications if they provided new information.

***Panel 1:* WHO classification of mental and behavioural disorders[2]**

1.1 (F00–F09) Organic, including symptomatic, mental disorders (dementia, delirium, and brain injury)
1.2 (F10–F19) Mental and behavioural disorders due to use of psychoactive substances (alcohol-use and substance-use syndromes, including harmful use, dependence, and withdrawal)
1.3 (F20–F29) Schizophrenia, and schizotypal and delusional disorders
1.4 (F30–F39) Mood (affective) disorders (mania, hypomania, bipolar affective disorder, and depressive episodes)
1.5 (F40–F48) Neurotic, stress-related, and somatoform disorders (phobic anxiety disorder, panic disorder, generalised anxiety disorder, obsessive-compulsive disorder, post-traumatic stress disorder, adjustment disorder, dissociative disorder, and somatisation disorder)
1.6 (F50–F59) Behavioural syndromes associated with physiological disturbances and physical factors (eating disorders, sleep disorders, sexual dysfunction)
1.7 (F60–F69) Disorders of adult personality and behaviour
1.8 (F70–F79) Mental retardation
1.9 (F80–F89) Disorders of psychological development
1.10 (F90–F98) Behavioural and emotional disorders with onset usually in childhood and adolescence (hyperkinetic disorders, emotional disorders, and conduct disorders)
1.11 (F99) Unspecified mental disorders

Note: The term 'common mental disorder' (CMD) refers to the most prevalent conditions classified under depressive episode, neurotic, stress-related, and somatoform disorders. The term also recognises that mental disorders in the community are frequently characterised by comorbidity between these groups and shifting patterns of symptoms that resist precise classification.

Despite these new insights, ten years after the first WHO report on the global burden of disease, mental health remains a low priority in most low-income and middle-income countries. Developing countries tend to prioritise the control and eradication of infectious diseases and reproductive, maternal, and child health, whereas developed countries prioritise non-communicable diseases that cause early death (such as cancer and heart disease) above those that cause years lived-with-disability (such as mental disorders, dementia, and stroke). If mental disorders are regarded as a distinct health domain, with separate services and budgets, then investment in mental health is perceived to have an unaffordable opportunity cost.

Our first aim is to critically appraise the way that the burden of disability and premature mortality is apportioned, in WHO's estimates of global burden of disease, between underlying conditions within groups of disorder, and, specifically, to assess whether these estimates account for the full contribution of mental disorder to mortality and disability. Our second aim is to review available evidence for interactions between mental disorders and other health conditions (such as medically unexplained somatic symptoms, communicable diseases, maternal and perinatal conditions, non-communicable diseases, and injuries). Our third aim is to discuss the implications of these links for the future orientation of health policies, health systems, and services.

## Contributions of mental disorders to disability and mortality

Mental disorders are an important cause of long-term disability and dependency. WHO's 2005 report attributed 31·7% of all years lived-with-disability to neuropsychiatric conditions: the five major contributors to this total were unipolar depression (11·8%), alcohol-use disorder (3·3%), schizophrenia (2·8%), bipolar depression (2·4%), and dementia (1·6%).[4] However, the interaction between mental disorder and disability is more complex and extensive than the WHO report suggests. Depression predicts the onset and progression of both physical and social disability.[5,6] Conversely, disability is an important prospective risk factor for depression in older adults,[7–12] and mediates most of the effects of specific physical health conditions in this group.[10,13–15] Social support is an effect modifier.[10,11,16] The population-attributable fraction (which is the proportion of cases of disability that would not have occurred in the absence of mental disorders) could be as high as 0·69,[10] which suggests that failing health and consequent disability could be the most important contributory cause for late-life depression. Two studies suggest that disability is an equally powerful, although less prevalent, prospective risk factor for depression in young people.[17,18]

Mental disorders also contribute to mortality. According to WHO's 2005 estimates, neuropsychiatric disorders account for 1·2 million deaths every year and 1·4% of all years-of-life lost; most of these are caused by dementia, Parkinson's disease, and epilepsy.[4] Only 40 000 deaths were attributed to mental disorders (mainly unipolar and bipolar depression, schizophrenia, and post-traumatic stress disorder) and 182 000 to use of drugs and alcohol.[4] These numbers are almost certainly underestimated, since the report attributes death by suicide to intentional injury.[4] Every year, about 800 000 people commit suicide, 86% of whom are in low-income and middle-income countries, and more than half of whom are aged between 15 and 44 years. Even these figures might be underestimated, since official statistics in low-income and middle-income countries are not reliable. For example, studies in south India that used surveillance with validated verbal autopsy showed that rates of suicide were ten times greater than the official national estimates;[19,20] that suicide was the leading cause of death in 10–19 year olds; and that suicides accounted for a quarter of all deaths in boys and up to three-quarters of all deaths in young women.[19] A systematic review of psychological autopsy case-control studies identified mental disorders (depression, schizophrenia and other psychoses, and alcohol-use and substance-use disorders) as important proximal risk factors for suicide, with a median prevalence of mental

| | 2005 | | | | Projected for 2030 | | | |
|---|---|---|---|---|---|---|---|---|
| | World | High-income countries | Middle-income countries | Low-income countries | World | High-income countries | Middle-income countries | Low-income countries |
| Total DALYs | 1 483 060 000 | 119 361 000 | 492 549 000 | 871 141 000 | 1650 629 000 | 118 309 000 | 528 066 000 | 1 004 236 000 |
| I Communicable, maternal, perinatal, and nutritional conditions | 572 292 000 (38·6%) | 6 647 000 (5·6%) | 99 696 000 (20·2%) | 465 948 000 (53·5%) | 494 384 000 (30·0%) | 4 060 000 (3·4%) | 79 623 000 (15·1%) | 410 698 000 (40·9%) |
| II Non-communicable diseases | 725 506 000 (48·9%) | 102 311 000 (85·7%) | 318 415 000 (64·7%) | 304 773 000 (35%) | 938 468 000 (56·9%) | 105 716 000 (89·4%) | 380 324 000 (72%) | 452 416 000 (45·1%) |
| Neuropsychiatric conditions | 199 606 000 (13·5%) (27·5%)* | 32 717 000 (27·4%) (32·0%)* | 87 398 000 (17·7%) (27·5%)* | 79 490 000 (9·1%) (26·1%)* | 237 962 000 (14·4%) (25·4%)* | 34 798 000 (29·4%) (32·9%)* | 92 590 000 (17·5%) (24·3%)* | 110 571 000 (11·0%) (24·4%)* |
| III Injuries | 185 262 000 (12·5%) | 10 403 000 (8·7%) | 74 439 000 (15·1%) | 100 420 000 (11·5%) | 217 777 000 (13·2%) | 8 533 000 (7·2%) | 68 120 000 (12·9%) | 141 122 000 (14·1%) |

DALYs=disability-adjusted life-years. Data are DALYs (proportion of total DALYs), unless otherwise specified. *Proportion of non-communicable disease DALYs caused by neuropsychiatric conditions.

***Table 1:*** **Contribution by different health conditions to disability-adjusted life-years, by income level of countries**

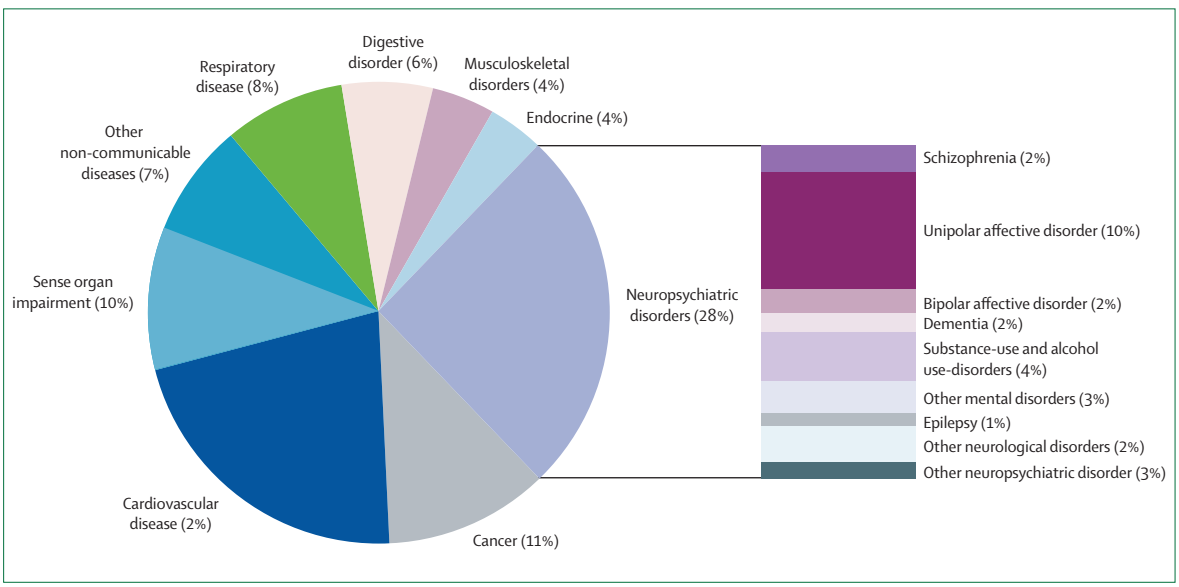


***Figure 1:*** **Contribution by different non-communicable diseases to disability-adjusted life-years worldwide in 2005**
Data adapted from WHO, with permission.[3]

disorder of 91% in suicide completers, and a population-attributable fraction of 47–74%.[21] Findings from psychological autopsy studies in India and China were similar.[22,23] Therefore, prevention, identification, and appropriate management of mental health problems is an important element of suicide prevention.

Mental disorder is independently associated with a substantial excess in all-cause mortality risk. Most studies have focused on associations with depression: a meta-analysis of 15 population-based studies reported that depression diagnosis was linked with subsequent all-cause mortality, and yielded a pooled odds ratio (OR) of 1·7 (95% CI 1·5–2·0).[24] Several studies report that this association is mediated partly through disability,[25] but not through cardiovascular disease, cardiovascular risk factors, or antidepressant use.[26] Increased all-cause mortality, excluding suicides, has also been reported for schizophrenia (relative risk [RR] 2·59, 95% CI 2·55–2·63),[27] bipolar disorder (standardised mortality ratio [SMR] 1·9 for men and 2·1 for women),[28] and dementia (RR 2·63, 95% CI 2·17–3·21).[29] In a record linkage study of mental health service users from western Australia,[30] mortality from ischaemic heart disease was linked with most mental disorders, especially dementia and schizophrenia and other psychoses, although rates of admission for ischaemic heart disease were similar. People with schizophrenia (RR for men 0·31 [95% CI 0·21–0·45] and for women 0·34 [0·18–0·64]) and people with dementia (RR for men 0·14 [0·07–0·26] and for women 0·53 [0·16–1·74]) were much less likely to undergo revascularisation procedures such as coronary artery bypass grafting. In the general population, between 1980 and 1998, ischaemic heart disease mortality fell by 34% in men and 13% in women, but in users of mental health services the rate was stable in men and had

increased by 40% in women. Although evidence from low income countries is scarce, a large population-based study in Ethiopia indicated very high mortality rates for major depression (SMR 3·55, 95% CI 1·97–6·39)[31] and for schizophrenia (nearly 5% per year).[32] The association between alcohol use and mortality is complex, with a U-shaped association, and different effects according to cause of death; nevertheless, in the UK 8·5% of years-of-life lost to age 65 in men and 4·0% in women have been attributed to drinking more than the recommended alcohol limits.[33] In Russia, alcohol-related mortality contributed to substantial fluctuations in the overall mortality rate in the 1990s.[34]

## Mental disorders interact with other health conditions

### Medically unexplained somatic symptoms

Typically, at least a third of all somatic symptoms remain medically unexplained, both in the general population[35] and in general medical-care settings.[36] Common medically unexplained symptoms include pain, fatigue, and dizziness. Syndromes that represent characteristic organ-specific groups of medically unexplained symptoms have also been defined: irritable bowel syndrome, fibromyalgia, chronic-fatigue syndrome, chronic pelvic pain, temporomandibular joint dysfunction, and sexual-discharge syndromes. Medically unexplained somatic symptoms[37] and syndromes[38] are strongly associated with common mental disorders; however, at least a third of those with somatisation have no comorbid mental disorder.[39,40] About 15% of patients seen in primary care have somatisation, which is defined as medically unexplained somatic symptoms coupled with psychological distress and help-seeking behaviour.[40,41] Somatisation is independently associated with poor health-related quality of life[40–42] and greatly increased use of health care,[39] after controlling for comorbid mental disorder. In the USA, somatisation is estimated to contribute US$256 billion to health-care costs every year.[39] Evidence from randomised controlled trials supports the effectiveness of specific intervention strategies such as structured treatment recommendations,[43,44] antidepressant medication,[45] and cognitive behaviour therapy[46,47] for reduction of somatic symptoms and health-care use. Health-care costs can be reduced by as much as a third.[43] A pilot trial of cognitive behavioural therapy for medically unexplained symptoms in Sri Lankan primary care (the only published trial from a developing country) also showed that treatment was associated with significant reductions in medically unexplained symptoms, visits, and distress.[48]

### Non-communicable diseases

Aside from neuropsychiatric disorders, the main contributors to disability and mortality from non-communicable disease are cardiovascular disease and cancer. Coronary heart disease and stroke account for 21% of disability-adjusted life-years in this group, and cancer for 12% (figure 1).[4] Endocrine disorders (primarily diabetes) account for 3·7% of the disability-adjusted life-years attributed to non-communicable disease, and this proportion is predicted to rise sharply to 5·4% by 2030, with much of the increase in low-income and middle-income countries.[4] Non-communicable diseases are a global challenge: they are the leading cause of death in all world regions other than sub-Saharan Africa, with 80% of deaths in low-income and middle-income countries.[49]

#### *Cardiovascular disease*

A systematic review of evidence from population-based research reported moderate to strong prospective associations between depression (15/22 studies), anxiety (four of eight studies), and coronary heart disease.[50,51] The outcomes studied included angina and non-fatal and fatal myocardial infarction.[50,51] Population-based cohort studies also show that depression is an independent risk factor for non-fatal[52–54] and fatal[55] stroke. Follow-up periods in many of these studies were longer than ten years, which renders depression induced by preclinical cardiovascular disease an unlikely explanation. The effects were largely independent of risk factors for cardiovascular disease, since most of the cited studies comprehensively controlled for such factors.

The scarcity of evidence for risk mediation is surprising since mental health is strongly associated with cardiovascular risk exposures. Obesity, in a nationally representative survey in the USA, was associated with significant increases in lifetime diagnoses of major depression, bipolar disorder, and panic disorder or agoraphobia.[56] Smoking, in population-based studies, is consistently shown to be associated with depressive and anxiety disorders (OR 1·5–2·0),[57–59] and with schizophrenia (OR 5·9).[60] These associations might be bidirectional; prospective studies of young people indicate both that affective disorders and alcohol-use disorders could predict adoption of a daily smoking habit,[61,62] and that tobacco use can be associated with the onset of common mental disorder.[63] Findings from prospective population-based studies conflict as to whether mental disorders predict failure to quit smoking in those with the habit.[59,64] In a study with a 7–16 year follow-up of participants,[65] incident hypertension was independently predicted by both high depression scores (OR 1·8, 95% CI 1·2–2·8) and anxiety scores (1·8, 1·3–2·5) at baseline, after controlling for age, sex, education, smoking, body-mass index, alcohol use, history of diabetes or cardiovascular disease, and baseline systolic blood pressure.

The incidence of depression increases after myocardial infarction, to 15–30% for major depression, mostly in the first month after the event.[66] Systematic reviews of prognostic studies report that comorbid depression is a consistent predictor of adverse outcomes (including recurrent coronary heart disease events, mortality from

coronary heart disease, and all-cause mortality) after non-fatal myocardial infarction, after controlling for disease severity and treatment-related factors.[50,51] Poor prognosis might be mediated partly by poor adherence by patients with depression to behaviour and lifestyle changes intended to reduce the risk of subsequent cardiac events.[67] The evidence for anxiety as a prognostic factor is less strong.[51,68,69] In a study based on the Maastricht stroke registry, the cumulative 1-year incidence of major depression was 23·3%.[70] Two population-based incidence studies[71,72] support a strong association between recent incident stroke and subsequent onset of depression, independent of disability. Depression after stroke is associated with poor functional outcomes[73,74] and with a 3·4 times higher mortality over 10 years, after adjusting for baseline severity and type of stroke.[75]

A Cochrane review of 36 trials of psychological interventions after myocardial infarction (18 of which focused on stress management) did not report an effect on total or cardiac mortality, but did show small reductions in anxiety and depression in patients with coronary heart disease.[76] Few interventions have specifically targeted affective disorder. Antidepressants (selective serotonin-reuptake-inhibitors [SSRI]) have been shown to be safe and moderately effective treatments for depression after myocardial infarction.[77,78] A large trial of stepped-care cognitive behavioural therapy and SSRIs for depression and perception of low social support after myocardial infarction reported that the intervention was associated with significant improvement in mood and social support but not with improvement in event-free or overall survival.[79] Therefore, more intensive and flexible patient-specific interventions have been advocated.[80]

The evidence base for the effectiveness of antidepressants after stroke is weak. A Cochrane review of antidepressants as a preventive intervention reported no effect either on incident depression, or on reduction of disability or mortality.[81] Another Cochrane review on pharmacological interventions for depression after stroke reported a reduction in symptoms, but not remission of diagnosable depression.[82] Stroke recovery was not improved by pharmacological interventions.[82] One trial subsequently published, with a 9-year follow-up, did show a sustained reduction in mortality after stroke, associated with antidepressant treatment.[83]

*Diabetes*

Two US population cohort studies suggested that depression increases the risk for onset of type 2 diabetes, controlling for demographic, metabolic, and lifestyle factors;[84,85] however, another large cohort study did not support this finding.[86] The prospective associations might yet be explained by undetected diabetes leading to depression, or by help-seeking for depression leading to detection of diabetes. The evidence for comorbidity between mental disorder and diabetes is much stronger. The prevalence of diabetes in people with schizophrenia has consistently been shown to be about 15%, compared with a typical community prevalence of 2–3%.[87] Much of this difference is probably explained by lifestyle factors, and some by the metabolic effects of typical and atypical antipsychotic medication.[87] Abnormalities of glucose regulation were noted in people with schizophrenia before the use of antipsychotic medication,[87] and independent of treatment in the modern era.[88,89] The increased frequency of a family history of diabetes in people with schizophrenia[87] also suggests an underlying mechanism specific to the disease. A meta-analysis of the association between depression and diabetes identified 20 controlled studies (of which 11 were population-based) with an OR for the association between the two conditions of 2·0 (95% CI 1·8–2·2); this ratio did not vary by type of diabetes, method for assessment of depression, or study design.[90] Data on comorbid anxiety and diabetes were sparser, with only five controlled studies, one of which was population-based; the mean rate of generalised anxiety disorder in the clinical samples was 13·5%, which is much higher than the 3–4% typically seen in community studies.[91] Comorbidity between diabetes and common mental disorder is important because of the implications for chronic disease management, and the effect on diabetic outcomes.

People with schizophrenia show poor adherence to oral hypoglycaemic therapy.[92] Adherence to recommendations for diet[93,94] and exercise,[94] and to oral hypoglycaemic medication[93,94] is low in diabetics with depression. In one study, however, attendance for screening by medical services to prevent complications was not affected by mood.[94] Similar effects on adherence were noted for alcohol consumption in diabetics from ethnic minorities in Los Angeles.[95] Poor mental health seems to have the greatest effects on patient-initiated behaviours that are difficult to maintain.[94] The quality of diabetic care received by those with and without mental disorders, including serious mental illness, seems to be similar for most indicators,[96,97] with the possible exception of those with substance-use disorders.[97] Even so, meta-analyses suggest that both depression[98] and anxiety[99] are associated with poor glycaemic control. These cross-sectional associations are equally consistent with depression and anxiety being causes or consequences of poor glycaemic control. However, structural equation modelling in a prospective study suggested that the effect of depression on symptoms of glucose dysregulation is mediated through lower adherence to self-care.[100] Depression in diabetes is consistently shown to be associated with diabetes complications, including retinopathy, nephropathy, macrovascular complications, and sexual dysfunction.[101] Major depression (hazard ratio [HR] 2·3) and minor depression (HR 1·7) are significantly associated with mortality in type 2 diabetes.[102] These associations were partly but not completely explained by extensive control for behavioural mediators and diabetes severity.

Evidence for the benefits of mental health interventions on these outcomes is mixed. Meta-analyses suggest that

psychological interventions in type 1 diabetes (in children only)[103] and type 2 diabetes[104] improve diabetic control. Participants in these trials were generally selected on the basis of risk factors for diabetes complications, such as poor glycaemic control, obesity, or inactivity, rather than depression. A large trial in nine US primary-care clinics reported that evidence-based collaborative depression treatment (consisting of pharmacotherapy, problem-solving treatment, or both in combination) for patients with diabetes and depression did not produce better effects than usual primary care on either glycaemic control[105] or diabetic self-care,[106] despite significant effects on depression outcomes.[105] Similar findings were reported from two small randomised controlled trials of antidepressant treatment in diabetes.[107,108]

***Panel 2:* Possible mechanisms for interactions between mental disorders and other health conditions**

**Mental disorders affect the rate of other health conditions**

- Mental disorders are associated with risk factors for chronic disease such as smoking, reduced activity, poor diet, obesity, and hypertension; however, these lifestyle factors have not yet been shown to mediate associations with morbidity and mortality
- Depression has various biological effects: on serotonin metabolism[117] (alteration of cardiac function, platelet aggregation, and vasoconstriction); on cortisol metabolism[118] (increased cortisol, leading to inflammation, excessive clotting, and the metabolic syndrome); on inflammatory processes[117,119] (raised inflammatory markers, which also predict the development of cardiovascular disease); and on cell-mediated immunity[119] (impairments in T-cell mediated functions, reduced natural-killer cell counts and cytotoxicity, with relevance to cancer, HIV progression, and other infectious diseases)
- Mental disorders and other health conditions could have common genetic or environmental risk factors

**Some health conditions affect the risk of mental disorders**

- Some disease processes directly affect the brain. Examples include infections (eg, cerebral malaria, HIV, tuberculosis); cerebrovascular diseases (cortical strokes and progressive subcortical damage); diabetes; alcohol and substance use; and neurodevelopmental disorders. The consequences of such effects depend on the site and extent of brain damage, and can include cognitive impairment, behaviour disturbance, mood disorders, delusions, and hallucinations
- Many chronic diseases create a psychological burden, which arises from factors such as the acute trauma of the diagnosis; the difficulty of living with the illness; the long-term threat of decline and shortened life expectancy; necessary lifestyle changes; complicated therapeutic regimens; aversive symptoms such as pain; and stigma, which can lead to guilt, loss of social support, or breakdown of key relationships
- Disability associated with chronic health conditions might mediate risk for depression and other common mental disorders

**Some comorbid mental disorders affect treatment and outcome for other health conditions**

- Mental disorders can delay help-seeking, reduce the likelihood of detection and diagnosis, or do both
- The extent and the quality of general medical health care received by people with mental disorders might be poor.[30,97,120,121] The evidence for this inequity is especially strong for those with psychoses, dementia, and substance-use disorders
- Mental disorders, cognitive impairment, and substance-use and alcohol-use disorders adversely affect adherence to medication, to recommendations for behavioural modification, and to activities to prevent disease or promote health.[122] Cognitive models of illness view patients as active problem-solvers, who process health advice and make decisions that in turn influence coping, adjustment, and illness behaviour across a range of chronic illnesses.[123] Cognitive behaviour therapy targets the intentions, beliefs, and attitudes of patients, and can help to modify their emotional responses and health behaviours

## Communicable diseases

Communicable diseases continue to cause substantial death and disability in low-income and middle-income countries. HIV/AIDS (which causes 8·2% of all years-of-life lost) and malaria (which causes 4·5% of years-of-life lost) collectively account for nearly 13% of premature mortality and 39% of that attributable to communicable diseases. In 2004, about 34 million people were living with AIDS and over 3 million died of the disease. *Plasmodium falciparum* infects 500 million people each year and causes 2·7 million deaths, more than 90% of which are in young African children. The HIV epidemic and the emergence of strains with multiple drug-resistance has led to a resurgence of tuberculosis as a major public-health menace worldwide. In 2003, an estimated 8·8 million new cases of tuberculosis resulted in 1·7 million deaths; 27% of these cases and 31% of these deaths arose in Africa.[109]

### *HIV/AIDS*

Some (mainly indirect) evidence shows that people with mental disorder are at heightened risk of contracting HIV/AIDS. Consistent evidence from the USA suggests that those with serious chronic mental illnesses have a high seroprevalence of HIV (5–7%), and that in those with schizophrenia, the mental illness generally precedes HIV infection.[110] Behavioural risk factors identified (with a frequency of 30–60% in these high-risk groups) included high rates of sexual contact with multiple partners, low adherence to condom use, injected drug-use or sexual contact with injecting drug users, and unprotected sex between men.[111] A large US cohort study of men who have sex with men provided more direct evidence: it identified use of alcohol and drugs before sex and depressive symptoms as independent predictors of seroconversion.[112] Up to 10% of HIV cases worldwide are attributable to use of injection drugs.[113] The evidence from low-income and middle-income countries is less clear; seroprevalence in psychiatric inpatients is often similar to that in the general population.[114] Psychiatric inpatients in an Indian institution reported high rates of sexual and drug-related risk behaviours.[115,116]

A fairly consistent association between infection with HIV and poor mental health has been reported. Several mechanisms might be implicated. Apart from psychological trauma (panel 2)[117–123] the infection itself has direct effects on the central nervous system, and causes neuropsychiatric complications;[124] depression,

mania, cognitive disorder, and frank dementia, often in combination. Although the incidence of HIV-associated dementia has halved since the advent of highly active antiretroviral therapy (HAART),[125] and opportunistic infections of the central nervous system are rare,[125,126] the incidence of HIV encephalopathy might have risen,[126] suggesting continued infiltration of the central nervous system. Evidence for neurocognitive impairment in asymptomatic HIV-infected individuals has been found,[127] although the severity and number of domains affected is greater in those with symptomatic disease.[128] HAART, especially with efivarenz, can be associated with a range of side-effects on the central nervous system, including depression, nervousness, euphoria, hallucination, and psychosis.[110] Patients with a previous history of psychiatric disorders could be at greater risk. Death by suicide has occasionally been reported. In a national probability sample of HIV-positive men and women in the USA, the 1-year prevalence of major depression was 36% and that of generalised anxiety disorder was 16%. These prevalences are five and eight times higher, respectively, than those identified by a national household survey that used the same assessment method.[129] In a meta-analysis of studies that compared HIV-positive and HIV-negative control groups[130] the difference in the prevalence of major depression (9·4% in HIV-positive *vs* 5·2% in HIV-negative) was significant (OR 2·0, 95% CI 1·3–3·0). A systematic review of the evidence from low-income and middle-income countries identified 13 studies of mental disorders in HIV-positive people; reported prevalence varied widely.[114] The largest and best designed of these studies (which compared HIV-positive people who accessed HIV services with matched controls in Bangkok, Kinshasa, Nairobi, and Sao Paulo) reported that the rates of depressive disorder and depression symptoms were higher in symptomatic HIV-positive people, compared with either non-symptomatic cases or seronegative controls.[131]

Little evidence on associations between mental disorder and either help-seeking behaviour or uptake of diagnostic and treatment services for HIV/AIDS is available. In US women who were medically eligible, non-receipt of HAART was associated with substance use and with a history of childhood sexual abuse.[132] Injection-drug use has consistently been shown to be associated with low uptake of HAART.[113] Depression symptoms predicted drop out from a HIV-risk-reduction programme for socially deprived Latino women.[133]

Comorbidity affects prognosis. In US cohorts of HIV-positive women, chronic depressive symptoms were associated with increased AIDS-related mortality[134,135] and with rapid disease progression,[134] independent of receipt of treatment, and comorbid substance use. Impairment in cell-mediated immunity (consisting of higher activated CD8 T lymphocyte counts and lower natural killer cell activity) might be implicated (panel 2).[136] Cognitive impairment in HIV has been associated with greatly increased mortality independent of baseline clinical stage, CD4 cell count, serum haemoglobin, antiretroviral treatment, and social and demographic characteristics.[137] Schizophrenia complicates treatment and has been associated with poor prognosis.[110] The incidence of AIDS-defining illnesses in patients on HAART was reported to be especially high in injection-drug users.[113]

Adherence to HAART must be almost perfect to achieve lasting viral suppression. Adherence of less than 95% independently predicts viral resistance, hospital admissions, and opportunistic infections.[138] Drug resistance can be transmitted to other people, which limits treatment options. Strong and consistent evidence from treatment programmes in developed countries now shows that adherence to HAART is adversely affected by depression,[138–140] cognitive impairment,[141,142] and alcohol-use and substance-use disorders.[113] By contrast, adherence in the presence of serious mental illnesses can be good, presumably because of close medical supervision.[110] We need to know more about adherence in low-income and middle-income countries.[114] One study, from Uganda, which used a diagnostic assessment for depression, reported no association with adherence,[143] whereas in Ethiopia depression was associated with less than 95% self-reported adherence in the week before interview.[144] Data from a non-randomised US observational cohort study showed that antiretroviral adherence improved more in 6 months for those with depression who adhered to antidepressant treatment, compared with those not treated.[145] We did not find any trials of the effect of antidepressants on adherence. Randomised controlled trials of motivational interviewing (for patients with alcohol problems) and adherence interventions (for those on methadone maintenance) suggested no sustained benefit for either approach.[113] Modified directly observed treatment has been shown to improve adherence by substance users in one randomised controlled trial and one controlled trial.[113]

Findings on the effect of psychological interventions on psychopathology and HIV prognosis have been mixed. Group cognitive behavioural interventions have been tested extensively and shown to decrease depression-symptom scores,[146] reduce herpes virus IgG titres,[147] improve quality of life related to mental health,[148] and reduce unsafe sexual behaviours.[149] The evidence base for antidepressant treatment is surprisingly small, with only a few small randomised controlled trials and a much larger number of open-label interventions.[124] Both tricyclic antidepressants and SSRI antidepressants seem to improve depression symptoms but have no effect on CD4 cell counts.[150–152] Coverage and uptake are a challenge even in the USA, which has substantial resources; in a national survey of HIV-positive care recipients, about half those with depressive disorders did not receive antidepressants.[153]

Very few studies have investigated mental disorder as a predictor for HIV transmission, especially since the advent of HAART. One study of 168 HIV-infected men with resistance to antiretroviral drugs showed a high rate of high-risk sexual behaviour (such as unprotected anal or vaginal intercourse with an HIV-uninfected or status-unknown partner).[154] These investigators reported strong evidence that depression, younger age, and sildenafil use predicted transmission, and moderate evidence that frequent alcohol use did so.

*Tuberculosis*

People with mental and substance use disorders might be at increased risk of contracting tuberculosis, although few studies have investigated this topic. A case registry study from Nagasaki suggested that the incidence of tuberculosis in patients with schizophrenia was high;[155] similarly, high infection rates were recorded in people with serious mental illness in a psychiatric day programme in New York.[156] Occasional reports of outbreaks in inpatients suggest that institutionalisation might contribute to risk of tuberculosis.[157] A US population-based case-control study reported that heavy drinkers had twice the risk of tuberculosis infection of non-drinkers.[158] Poor adherence to antituberculosis medication is an important barrier to global control of the disease, and increases the risks of morbidity, mortality, and drug resistance in both individuals and communities.[159] Since treatment for multidrug-resistant tuberculosis is long (generally 2 years) and painful (consisting of daily injections for at least 6 months), with many unpleasant side-effects, adherence can be a challenge. A review of 13 treatment cohort analyses identified treatment-default rates of up to 39%, with an average of 12·6%.[160] Alcohol-use disorder has also been reported to be associated with delayed treatment-seeking in Kiev; with poor adherence to directly observed therapy in New York;[161,162] with unfavourable treatment outcomes for pulmonary tuberculosis in Kazakhstan[163] and for multidrug-resistant tuberculosis in Tomsk, Russia;[156] and with increased mortality in a US trial of directly observed therapy (HR 2·9).[164] We identified only one report that did not find an association between psychiatric illness and substance use and poor adherence to tuberculosis treatment in a sample of homeless adults.[165]

Since depression has an important effect on adherence to treatment for many health conditions, the amount of research into comorbidity between tuberculosis and common mental disorders is surprisingly low. Multidrug-resistant tuberculosis, in particular, might be associated with poor mental health, attributed variously to loss of work and social roles and feelings of hopelessness and stigma.[166] In Peru, the incidence of depressive disorder at recruitment into a treatment programme for multidrug-resistant tuberculosis was 52%, with further incidences of 13·3%, 12·0%, and 12·0% for depression, anxiety, and psychosis, respectively, during treatment.[167] In an inpatient study in Turkey, the prevalence of depression, anxiety, or both was assessed to be 19% for recently diagnosed tuberculosis, 22% for defaulted tuberculosis, and 26% for multidrug-resistant tuberculosis.[168] The prevalence of common mental disorders in 53 Nigerian tuberculosis patients recruited in a chest clinic was 30%, compared with 5% in healthy controls.[169] A community-based study in Mali had suggested an even stronger association (OR 9·3), but with self-reported tuberculosis episodes.[170]

The failure of directly observed therapy to deliver improvement in treatment completion or cure[171] has led to calls for rigorous investigation of extended interventions that address other factors known to influence adherence, such as quality of communication with treatment providers, patients' health beliefs, patients' education, and economic barriers.[122] Since patients with multidrug-resistant tuberculosis face a range of difficulties, the development of strategies to support these patients will be essential to ensure treatment adherence. The information–motivation–behavioural skills model, which was originally developed to modify HIV-risk behaviour, has been recommended for use in tuberculosis treatment.[122] Interventions based on cognitive behaviour therapy, which have proved helpful in management of various chronic diseases, have many similarities. In Peru, a non-randomised assessment of a group psychotherapy intervention, coupled with recreation, symbolic celebrations, and family workshops, was associated with a default rate of only 3·5% in a treatment cohort of 276 patients with multidrug-resistant tuberculosis.[172] In India, a psychotherapeutic intervention based on behavioural-modification techniques was tested in a blind controlled trial with alternate allocation.[173] Those who participated in the intervention were more likely than controls to complete treatment (72% *vs* 42%) and to be cured (72% *vs* 42%), and were less likely to default (17% *vs* 53%).[173] The cost of the intervention was US$20 per patient, which was a quarter of the cost of the medication. In another non-randomised controlled trial, in Ethiopia, patients in tuberculosis clubs had significant improvements in treatment completion (69% *vs* 47%) and lower default rates (13% *vs* 41%), compared with controls.[174]

*Malaria*

No studies have investigated the possibility that mental disorders might increase susceptibility for malaria. Possible mechanisms could include effects on immunity, and on adherence to effective preventive measures. Severe *falciparum* malaria is associated with self-limiting psychiatric disorders,[175] including depression,[176,177] schizophrenic and manic syndromes, anxiety attacks,[178] and confusional episodes.[179] Treatment, especially with chloroquine, might be an associated factor.[180] These syndromes might complicate and delay diagnosis.[171] The extent of comorbidity between mental disorders and

recurrent episodes of malaria, parasitaemia, or both has been very little studied. Dugbartey and colleagues[181] compared 142 adult Ghanaians who had had a documented episode of malaria at least 12 months before the study with 30 community controls who had full medical records, no history of record of infection, and no existing parasitaemia. Patients with malaria had high scores for anxiety, depression, and total psychological symptoms, compared with controls.[181] Carta and colleagues,[170] in a small cross-sectional community survey in Mali, reported no association between acute malaria and common mental disorder. A systematic review provided strong evidence that malaria has both short-term effects on cognitive function and longer-term effects on cognitive development in children.[182] Impairment is associated with the severity of the infection; cerebral malaria is especially important. Effects of non-severe malarial disease might be mediated through disrupted school attendance.[182] In adults, a 1-year follow-up of cerebral malaria cases in Ghana reported no deficits,[181] and a 20-year follow-up of Vietnam war veterans reported deficits in memory, language, and attention.[183]

By comparison with work on tuberculosis, research on the effect of mental health on the prevention and effective treatment of malaria is scarce. Antimalaria programmes focus on intensification of preventive measures,[184] (including use of insecticide-treated nets, which can reduce episodes of malaria in children by 50%),[185] and encouragement of access to and uptake of affordable treatment within 24 h of onset.[184] Recognised barriers to adoption of preventive health measures include poverty, inadequate education,[186–188] knowledge and beliefs about malaria, and the complexity of preventive measures.[188] For children, women are often the first to recognise the illness and have responsibility for illness management, although they might not have decisionmaking or financial control. Although the effects of illness-beliefs and attributions on help-seeking[189] and self-treatment are increasingly well understood,[190] three reviews[189–191] suggest that mental health has not been regarded as relevant to help-seeking or self-treatment. Patient adherence is a major determinant of the therapeutic response to antimalarial drugs. A systematic review of 24 studies[192] concluded that adherence was improved by interventions which focused on provider knowledge and behaviour, packaging, and provision of correct dosages. None of these studies discussed whether patients' mental health (or maternal mental health status for children) would affect adherence to treatment.

Inappropriate overdiagnosis of malaria is also well documented: adverse consequences include drug side-effects, drug resistance, increased health-care costs, and failure to treat other causes of fever.[193] In Africa, more than 70% of patients with suspected cases of malaria diagnose and manage their illness with traditional remedies or non-prescription drugs.[193] A review suggests an average overestimation of 61% (range 32–96%) for clinical diagnosis, compared with a microscopy-based gold-standard diagnosis.[193] In one series, 40% of those given a clinical diagnosis did not present with pyrexia.[194] Somatisation might well account for a proportion of misdiagnosed cases.

## Reproductive and sexual health

Women are at heightened risk for common mental disorders: a female to male sex ratio of 1·5 to 2·0 is typical.[195,196] In Pakistan, the prevalence of common mental disorders in men is similar to that in other regions, but women are two to three times more likely than men to suffer from such disorders.[197] Gender affects many of the determinants of mental health, including socioeconomic position, access to resources, social roles, rank, and status; and gender differences in mental disorders diminish after controlling for these mediators.[195,198] The gendered disadvantage experienced by women in many parts of the world[199] might be a relevant factor; for example, a large cross-sectional survey in Goa, India identified strong associations between common mental disorders and indicators of disadvantage, including early age at marriage, intimate partner violence and abuse, and absence of decisionmaking autonomy.[200]

A systematic review identified 122 studies of the association between mental disorder and gynaecological morbidity.[201] Sexual and other forms of abuse, anxiety, depression, and use of substances and alcohol were robustly and consistently reported to be associated with various reproductive health outcomes, including dysmenorrhoea, dyspareunia, and non-cyclical pelvic pain.[200] Studies in south Asia, where abnormal vaginal discharge is a common complaint, report similar associations.[200,202] Gynaecological complaints might be somatic idioms for common mental disorders; in the Goa study, the complaint of vaginal discharge was associated with symptoms of common mental disorder (OR 2·2, 95% CI 1·4–3·2) and somatoform disorders (6·2, 4·0–9·7), but not with reproductive-tract infection diagnosed with gold-standard laboratory tests (1·2, 0·9–1·6).[203] In Asian cultures, explanatory models of reproductive health and mental health experiences might enhance the association between these health domains.

## Maternal and child health

Maternal psychosis affects infant growth and survival. Maternal schizophrenia is consistently associated with preterm delivery[204,205] and low birthweight.[204–206] The effect of maternal psychosis on child survival has also been investigated—a meta-analysis linked maternal psychosis with a two-fold increased risk of stillbirth or infant mortality.[207] Postpartum depression affects 10% to 15% of women in developed countries,[208] with adverse consequences for the early mother–infant relationship and for children's psychological development.[209] In low-income and middle-income countries, the prevalence

of perinatal depression is, if anything, somewhat higher than in the developed world.[210,211] Physical development of infants is a particular problem in Asia.[212] An independent association between antenatal common mental disorder and low birthweight has been shown by two prospective studies: one from Pakistan (RR 1·9, 95% CI 1·3–2·9)[213] and one from India (OR 1·4, 95% CI 1·0–2·1).[214] Findings from high-income countries have been equivocal, with several negative reports.[215] However, associations between maternal depression and preterm birth[216] and between psychosocial stressors and low birthweight,[217] were reported from a disadvantaged African–American community.

In south Asia, two case-control and two cohort studies have consistently shown associations between perinatal common mental disorders and infant undernutrition at 6 months, after controlling for birthweight.[211,218–221] However these studies did not assess the relative, independent contributions of antenatal and postnatal common mental disorders, and only one controlled for maternal nutrition.[219] In the cohort study from Pakistan, 6-month old infants of antenatally depressed mothers were at much higher risk of being underweight (RR 4·0, 95% CI 2·1–7·7) and stunted (4·4, 1·7–11·4), after adjusting for birthweight, socioeconomic status, and frequent diarrhoea.[219] In the same study, children of antenatally depressed mothers were also more likely to have had more than five diarrhoeal episodes in the first year of life (RR 2·3, 95% CI 1·6–3·1).[222] In South Africa, neither postnatal nor current depression was associated with infant growth at 2 months, after adjusting for birthweight; however, there was a non-significant association at 18 months, and the study was small and had low power.[223] A multicountry study that assessed common mental disorders in mothers contemporaneously with child growth at 6–18 months postpartum reported no cross-sectional association, in Ethiopia, between maternal mental health and child malnutrition, but did note that common mental disorders in mothers were associated with infant stunting in India, and with underweight infants in Vietnam.[224] The longer-term effects of maternal mental health on infant growth or mortality have not yet been studied in low-income and middle-income countries.

A *Lancet* review reported that the effect of maternal depression on child cognitive development has been studied less extensively in low-income and middle-income countries than in developed countries.[225] In south India, maternal postnatal common mental disorder was negatively associated with mental-development quotient scores in infants at 6 months, but not with motor development.[211] In Barbados, a long-term prospective study reported associations between maternal common mental disorder and impaired cognitive and motor development in infants at 6 months,[226] and poor performance in high-school entrance examinations in children aged 11–13 years.[227]

Strong but not consistent evidence from developed countries shows that maternal depression reduces adherence to child-health promotion and prevention

| | MD is a risk factor for the HC | MD is a consequence of the HC | Comorbidity (uncertain causal direction) | MD affects adherence to treatment for HC | MD affects prognosis or outcome of the HC | Treatment for MD affects mental health in those with HC | Treatment for MD affects physical HC |
|---|---|---|---|---|---|---|---|
| **Non-communicable diseases** | | | | | | | |
| Depression and CMD with coronary heart disease | 4 | 3 | 3 | 2 | 3 | 1 | –1 |
| Depression with stroke | 3 | 3 | 3 | 0 | 3 | –1 | –1 |
| Common mental disorder with diabetes | 1 | 2 | 3 | 3 | 3 | 1 | 1 |
| Schizophrenia with diabetes | 1 | 1 | 3 | 2 | 0 | 0 | 0 |
| **Communicable diseases** | | | | | | | |
| Depression and CMD with HIV/ AIDS | 2 | 2 | 4 | 3 | 3 | 3 | 1 |
| Serious mental illness with HIV/AIDS | 1 | 3 | 3 | 1 | 2 | 0 | 0 |
| Cognitive impairment and dementia with HIV/AIDS | 0 | 3 | 3 | 3 | 2 | 0 | 0 |
| Alcohol-use and substance use disorder with HIV/AIDS | 2 | 0 | 3 | 3 | 3 | 0 | 2* |
| CMD with malaria | 0 | 2 | 2 | 0 | 0 | 0 | 0 |
| Cognitive impairment with malaria | 0 | 4 | NA | 0 | 0 | 0 | 0 |
| Alcohol-use disorder with tuberculosis | 2 | 0 | 2 | 3 | 3 | 0 | 0 |
| Depression or common mental disorder with tuberculosis | 0 | 2 | 2 | 3 | 0 | 0 | 2 |
| **Maternal and child health** | | | | | | | |
| Maternal depression and CMD with impaired child growth and development | 3 | 0 | 1 | 0 | 0 | NA | 0 |
| Maternal psychosis with infant mortality | 4 | 0 | NA | NA | NA | NA | 0 |

MD=mental disorder. HC=health condition. CMD=common mental disorder. NA=data not available. 4=strong evidence from meta-analysis or systematic review. 3=consistent evidence from several studies. 2=evidence from one study only. 1=inconsistent evidence. 0=no evidence identified. –1=negative reports.*This disorder affects adherence to treatment.

*Table 2:* **Interactions between mental disorders and other health conditions**

measures, including up-to-date vaccination,[228,229] receipt of well-child visits,[229] and use of the recommended back-sleeping position.[230,231] In Pakistan, maternal antenatal depression was associated with failure to update infant immunisation at 1 year.[219] Good evidence from both developed countries[230] and low-income and middle-income countries[232] shows that maternal depression is associated with suboptimal breastfeeding. We need more evidence about effects on children's receipt of health care. However, in the US, a large national cohort study[229] showed that maternal depression was independently associated with increased hospital admissions and emergency department visits in children (OR 1·4, 95% CI 1·2–1·8), in line with findings from smaller studies.[230,233] This evidence suggests that help-seeking for potentially serious childhood illnesses might be delayed when mothers are depressed.

## Injuries

Injury and violence are important causes of death and disability worldwide. The 2005 WHO report estimated that 5·4 million deaths from injury accounted for 9% of deaths worldwide and 12% of the global burden of disease, and that such deaths would increase substantially by 2030.[4] Mental health problems are both a cause and a consequence of injury. Injury and mental disorder also have many determinants in common, such as poverty,[234,235] conflict, violence, and alcohol use. Any public-health approach to injury control must consider mental health.

Road-traffic accidents are responsible for about 1·2 million deaths and perhaps ten times as many permanent disabilities each year.[236] Three-quarters or more of the deaths are in developing countries, where numbers of accidents and fatalities have been increasing at an alarming rate.[237] Within low-income and middle-income countries, poor people (pedestrians, passengers in buses and trucks, and cyclists) suffer a higher burden of morbidity and mortality from traffic injuries.[238] In 1964, a US study showed that alcohol was a strong risk factor for involvement in road traffic accidents,[239] and this finding has been substantiated by subsequent epidemiological studies. Although data are scarce, alcohol is implicated in a large proportion of road traffic accident deaths in low-income and middle-income countries.[237] Nevertheless, variations between countries are apparent; in China the proportion of alcohol-related traffic accidents might be as low as 1%.[240] A proportion of unintentional injuries might be unrecognised suicide attempts; a US study noted that the rate of suicide was ten times higher in those with at least one previous hospital admission for injury, and almost three times higher for drivers who had been injured in a road traffic accident.[241]

Earlier reports of cross-sectional associations between maternal depression and child injury risk[242,243] have been supported by the findings of a 10 000-family cohort study in the UK;[244] maternal postnatal depression was prospectively and independently associated with burns or scalds (1·29, 95% CI 1·01–1·64) and with two or more accidents during the follow-up period (1·39, 1·16–1·66).[244] Up to 98% of child injury deaths happen in low-income and middle-income countries;[3] one study reported strong and consistent cross-sectional associations between common mental disorder in caregivers and injuries in children in India, Peru, Vietnam, and Ethiopia.[245] Evidence for an inverse association between maternal depression and self-reported accident-prevention practices is less consistent. US studies reported an inverse association with preventive practices (such as use of car seatbelts[246,247] and electrical plug covers[246]), but a UK study found no association in socioeconomically deprived families with practices such as use of fireguards, stair gates, smoke alarms, window locks, or safe storage of medicines.[248]

Injury and violence are also important risk factors for mental disorder. Post-traumatic stress disorder is a recognised consequence of non-intentional injury; analysis of data from the 1958 British birth-cohort study showed that injury and burns were strongly associated with psychological distress.[249,250] Child abuse is a potent risk factor for psychiatric disorders and suicidal behaviour; intimate partner violence is a risk factor for depression, anxiety, and suicide; sexual violence is a risk factor for mental health and behavioural problems; and collective violence is a risk factor for depression, substance abuse, and suicide.[251,252] Conflict was responsible for an estimated 184 000 deaths in 2005.[3] Post-traumatic stress disorder is a common psychological outcome of conflict, with a quarter or more of survivors affected;[253]

### *Panel 3:* Modelling the effect of extended coverage of treatment for depression on health outcomes

We did a modelling exercise to assess the possible benefits to public health of extension of the coverage of evidence-based treatments for depression in low-income and middle-income countries.[262–264] We focused on observational research that had produced strong evidence for associations between depression and other health conditions: maternal depression as a risk factor for infant stunting in Pakistan[212] and major depression as a risk factor for suicide in China.[23]

We calculated the population-attributable risk with the method that Morgenstern and Bursic used to estimate deaths that could theoretically be prevented by better coverage of evidence-based management of diabetes.[265] This method allowed us to factor in both partial coverage of the intervention (in a range from 25% to 75%) and partial effectiveness (with a conservative 40% net reduction attributable to the intervention in those covered by the intervention, and no reduction in those with no coverage). We based these estimates on findings of associations from observational research; the prevention benefits estimated in these models would only accrue in reality if the associations were causal and estimated free of confounding, and if the effective treatment for depression reduced the risk of a previously depressed person to the same level as that of someone who had never been exposed. Randomised controlled trials will be needed to establish the real extent of the benefit.

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To model prevention of infant stunting in Pakistan we based our calculations on a 25% prevalence of depression in mothers and a relative risk of 4·4 for the association of maternal depression with infant stunting at 6 months.[219] We predicted that up to 8% of stunting would be averted at 25% coverage, rising to 20% at 75% coverage. Since 92 000 stunted infants are born each year in Pakistan (comprising 31% of all births), this estimate would translate into a maximum of 13 800 cases of stunting averted each year, if 50% coverage could be achieved (figure 2). The developmental and health consequences of stunting are expected to decrease an adult's yearly income by 20% (US$144 at current income per head) which would imply a nationwide saving of $US1·99 million every year. Furthermore, for a 10% reduction in the number of stunted children, the number of children who completed primary school education would be expected to increase by 8%.[266]

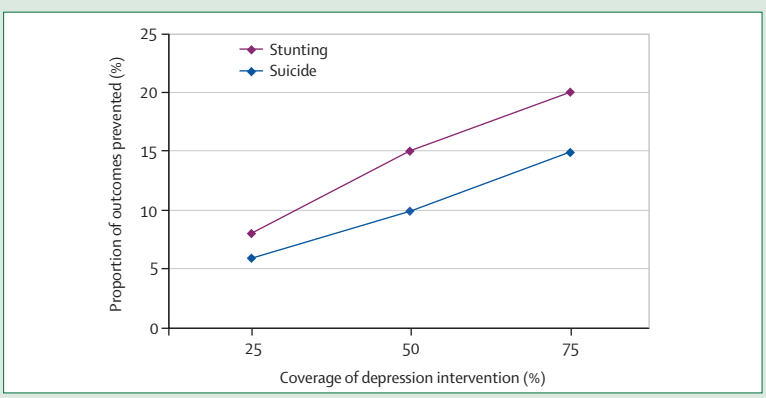


***Figure 2:*** **Proportion of health problems theoretically prevented by increased coverage of evidence-based treatment for depression**

To model prevention of suicide in China we based our calculations on a 4·3% prevalence of major depression[267] and a relative risk of 14·6 for the association of depression with suicide.[23] We predicted that a maximum of 6% of suicides would be averted at 25% coverage of the intervention, rising to 15% at 75% coverage (figure 2). Since 325 581 suicides happen every year in China, we estimated that if 50% coverage with the intervention could be achieved, a maximum of 32 558 suicides would be averted every year. The potential economic effect could be substantial, with 5·8 million productive life-years lost nationally, which would translate to lost productivity of US$10·2 billion per year because of suicide (on the basis of GDP per head of US$1740 in 2006). If 50% treatment coverage was achieved, a 10% reduction in the suicide rate would save 580 000 productive years of life, or US$1·0 billion per year. Alternatively, we used willingness-to-pay estimates[268] and the estimate of US$34 458 as the value of a statistical life in China, to calculate a saving of US$1·1 billion per year.

prevalence of post-traumatic stress disorder rises with the number of traumatic events witnessed.[254,255] These effects are still discernable in displaced refugees up to 20 years after a conflict.[256,257] Apart from post-traumatic stress disorder, common mental disorders are also very frequently reported in populations after conflicts and complex emergencies,[253] even in those who have not been directly exposed to violence.[253]

## Implications for policy, practice, and research

WHO estimates of the global burden of disease have helped to raise awareness of the enormous effect of mental disorders, both in their own right and relative to other health conditions. Much of this effect arises from the commonest disorders, especially depression and alcohol-use disorder. However, the Cartesian dualism that is implicit in the methods used to generate these estimates has meant that what began as a blessing is now, in some respects, a bane. In reality, the interactions between mental disorders and other health conditions are widespread and complex (table 2). Mental disorders are risk factors for the development of communicable and non-communicable diseases, and contribute to accidental and non-accidental injuries. For some infectious diseases, mental disorders in infected persons increase the risk for transmission. Many health conditions increase the risk for mental disorder, or lengthen episodes of mental illness. The resulting comorbidity complicates help-seeking, diagnosis, quality of care provided, treatment, and adherence, and affects the outcomes of treatment for physical conditions, including disease-related mortality. For many health conditions, mental illness makes an independent contribution to disability and quality of life.

Mental health is missing from the policy framework for health improvement –and poverty reduction; missing from health and social research; and missing from targets for interventions. Moreover, mental health has not been acknowledged as an obstacle to achievement of several Millennium Development Goals—notably, promotion of gender equality and empowerment of women, reduction of child mortality, improvement of maternal health, and reversal of the spread of HIV/AIDS, malaria, and other diseases.

Mental health awareness needs to be integrated into all elements of health and social policy, health-system planning, and health-care delivery. Sophisticated evidence-based arguments to increase resources for mental health care should be linked to evidence for its wider importance to public health.[258] Integrated mental health policies, applied across disease categories, and to different levels of care and types of care setting, will maximise the effectiveness of the small number of mental health professionals available in most low-income and middle-income countries.[259] Such policies will also mobilise the forces of public and community health to work for better mental health and reduce redundancies and budgetary and organisational inefficiencies in overstretched health systems. The strengthening of health-care systems to deliver mental health care should focus, where possible, on existing programmes and activities such as HIV prevention, antiretroviral treatment programmes, treatment of multidrug-resistant tuberculosis, campaigns against gender-based violence, antenatal care, integrated management of childhood illness, and innovative chronic-disease management.[260]

Mental health needs to be recognised as an integral component of practice in primary and secondary health care. Beyond this, primary health-care workers need to be trained in recognition and evidence-based treatment of mental disorders, and given suitable supervision and

support. Basic drug and psychotherapeutic treatments need to be made available at all levels of health care—the evidence for treatment of specific disorders is presented later in this Series.[261] Primary and secondary care providers should overcome their reluctance to treat patients with severe mental illnesses, and learn effective ways to interact and communicate with these patients. Inequities in access and provision of good-quality physical-health care for people with mental disorders must be ended. We need to promote holistic models of care, which integrate psychosocial assessments and interventions seamlessly and routinely into the management protocols for major communicable and non-communicable diseases and reproductive and childhood disorders. For example, our modelling exercises indicated that up to 20% of infant stunting could be averted if maternal depression was treated more effectively, and that up to 15% of suicides could be averted by interventions to treat major depression (panel 3). By the same token, mental health professionals should routinely assess their patients to identify and monitor physical-health problems, should encourage them to attend regular checks in primary care, and should generally place a greater emphasis on lifestyle review and management. Current guidelines about the management of patients given antipsychotic drugs should be applied; for example, patients with schizophrenia should be weighed at every visit. Although more mental health specialists are needed, these might never be sufficient to meet the need, especially in low-income countries. The marshalling of this scarce resource will demand careful thought and planning, including clear protocols for referral from primary care.

Evidence for interactions between mental health and other health conditions comes overwhelmingly from the developed world, especially the USA. Whereas 80% of deaths from non-communicable diseases are in low-income and middle-income countries, all but four of the 59 papers cited in the non-communicable disease section of this review describe research from north America and Europe. Although 99% of deaths from HIV/AIDS are in low-income and middle-income countries, nearly all research on the interaction between mental disorders and chronic management of HIV infection comes from the USA. 99% of deaths from malaria are in low-income countries and 90% of these are in children aged younger than 5 years; we identified an absence of evidence, rather than evidence of absence, for what could be, by analogy with other evidence, important interactions between maternal mental health, adherence to malaria prevention measures, and prompt and appropriate help-seeking for childhood infections.

The first priority, therefore, is to increase the evidence-base for interactions between mental health and other health conditions in low-income and middle-income countries. Some existing evidence (eg, that which investigates mental disorders as risk factors and prognostic indicators for non-communicable diseases) might be generalisable to less well developed settings. However, the evidence on maternal depression and infant growth outcomes is reported mainly from low-income and middle-income countries. Only research that is conducted locally can be expected to affect awareness and lead to new policy development.

Second, we need to understand better the mechanisms that underlie interactions between mental health and other health conditions, if we are to develop effective public-health and clinical interventions (panel 2). We need to learn from the experience that, in many instances, interventions designed to treat common mental disorders are effective for reduction of the frequency of these conditions, but not for improvement of downstream physical-health outcomes with which associations had been reported.[76–79,105–108,150–152] Explicit targeting of illness representations and associated behaviours through cognitive behavioural techniques might be effective.

Third, we are as yet at a very early stage in the development and trialling of adjunctive psychosocial, psychological, and mental health interventions. Despite strong evidence for relevance of mental health to HIV/AIDS, well designed trials to investigate effects of mental illness on the important downstream health outcomes are scarce; for example, presentation for voluntary testing and counselling, access to and acceptance into HAART programmes, adherence, adoption of low-risk behaviours, virological and immune status, and survival.

We have stressed the potential capacity for psychosocial interventions to improve physical-health outcomes (eg, as shown for glycaemic control in diabetes,[104] and as modelled in panel 3 for infant stunting in Pakistan,[219] and suicide prevention in China[23]). However, we need also to act immediately on the existing robust evidence that treatment of comorbid mental disorder is highly effective for improvement of mental health and quality of life outcomes across a range of disorders including cancer,[269] diabetes,[105] heart disease,[76,79] and HIV/AIDS.[146,148] The moral and ethical case for redressing the imbalance in provision for people with mental disorders can brook no delay.[270] Practical steps such as those discussed in this Series must be accompanied, wherever possible, by high quality assessments of efficacy and cost-effectiveness.

**Acknowledgments**

We thank the *Lancet* Global Mental Health Group, Michael Dewey for advice on the modelling exercise, and Simon Wessely and Ian Roberts for comments and contributions to the draft manuscript. VP is supported by a Wellcome Trust Senior Clinical Research Fellowship in Tropical Medicine. AR is supported by a Wellcome Trust Career Development Fellowship in Tropical Medicine. The *Lancet* Global Mental Health Series was supported by a grant from the John and Catherine MacArthur Foundation. SS is an employee of WHO; the views expressed in this article do not necessarily represent the decisions, policy, or views of WHO.

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