The epidemiology of depression across cultures

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Abstract

Epidemiological data are reviewed on the prevalence, course, socio-demographic correlates, and societal costs of major depression throughout the world. Major depression is estimated in these surveys to be a commonly-occurring disorder. Although estimates of lifetime prevalence and course vary substantially across countries for reasons that could involve both substantive and methodological processes, the cross-national data are clear in documenting meaningful lifetime prevalence with wide variation in age-of-onset and high risk of lifelong chronic-recurrent persistence. A number of socio-demographic correlates of major depression are found consistently across countries and cross-national data also document associations with numerous adverse outcomes, including difficulties in role transitions (e.g., low education, high teen child-bearing, marital disruption, unstable employment), reduced role functioning (e.g., low marital quality, low work performance, low earnings), elevated risk of onset, persistence, and severity of a wide range of secondary disorders, and increased risk of early mortality due to physical disorders and suicide.

Keywords

Burden of illness; depression; epidemiology

INTRODUCTION

Major depression is a commonly occurring, serious, recurrent disorder linked to diminished role functioning and quality of life, medical morbidity, and mortality (115, 122). The World Health Organization (WHO) has ranked depression the 4th leading cause of disability worldwide (90) and projects that by 2020, it will be the second leading cause (91). Although direct information on the prevalence and correlates of major depression does not exist for most countries, the available data reviewed below indicate that there is wide variability in prevalence estimates, but that other aspects of descriptive epidemiology (e.g., age-of-onset, persistence) are quite consistent across countries. A number of consistent socio-demographic correlates have also been found across countries. Evidence for a wide range of adverse effects of major depression has also been found consistently across countries.

Before turning to the review, it is noteworthy that epidemiological surveys sometimes focus on major depressive episodes (MDE) and others on major depressive disorders (MDD). MDE includes depressive episodes that occur as part of a bipolar disorder while MDD excludes bipolar depression. As the vast majority of lifetime MDE is MDD, the difference between the two is not of great importance when examining lifetime prevalence estimates. However, as bipolar depression is considerably more persistent than non-bipolar depression (83), the proportion of MDE cases due to bipolar depression increases as the time frame of assessment decreases, making it important to distinguish MDE from MDD in examining current prevalence and correlates. We consequently distinguish between MDD and MDE in summarizing the literature.

PREVALENCE

Weissman et al. (134) published the first cross-national comparison of major depression from 10 population-based surveys that administered the Diagnostic Interview Schedule (DIS) (107) to representative community samples. DSM-III criteria were used to define depression. Lifetime prevalence estimates of MDE ranged from 1.5% (Taiwan) to 19.0% (Beirut) in these studies, with the midpoints at 9.2% (West Germany) and 9.6% (Edmonton, Canada). Twelve-month prevalence estimates ranged from 0.8% (Taiwan) to 5.8% (Christchurch, New Zealand), with the midpoints at 3.0% (US) and 4.5% (Paris). A subsequent cross-national comparison (7) included 10 population-based studies that administered the WHO Composite International Diagnostic Interview (CIDI) for DSM-III-R and DSM-IV (62). Lifetime prevalence estimates of MDD ranged from 1.0% (Czech Republic) to 16.9% (US), with midpoints at 8.3% (Canada) and 9.0% (Chile). The 12-month prevalence estimates ranged from 0.3% (Czech Republic) to 10% (US), with midpoints at 4.5% (Mexico) and 5.2% (West Germany). Moussavi et al. (87) subsequently summarized data on ICD-10 depressive episode (MDE) in the WHO World Health Survey across 60 countries. Twelve-month prevalence averaged 3.2% in participants without comorbid physical disease and 9.3% to 23.0% in participants with chronic conditions.

As noted in the introduction, the wide variability in the above prevalence estimates is presumably due to a combination of substantive, measurement, and study design factors. The WHO World Mental Health (WMH) Survey Initiative tried to control the latter two sets

of factors in order to study cross-national differences in true prevalence, by carrying out coordinated community epidemiological surveys using a common protocol and instrument, the WHO Composite International Diagnostic Interview (CIDI) Version 3.0 (59), to assess a set of DSM-IV disorders in countries from every continent (60). The 12-month prevalence estimate of DSM-IV MDE in 18 WMH countries ranged from 2.2% (Japan) to 10.4% (Brazil) (53). The mid-point across all countries was similar to that in previous surveys (5%), as was the weighted average 12-month prevalence for the ten high income (5.5%) and eight low-middle income (5.9%) countries.

The WMH investigators also examined cross-national differences in diagnostic stem question reports to investigate the possibility that cross-national differences in prevalence estimates of MDE are due, at least in part, to differences in optimal threshold of diagnostic interview symptom scores detecting clinical cases (16). If such variation exists, the WMH investigators reasoned, we would expect much smaller cross-national differences in endorsement of diagnostic stem questions, which merely ask respondents if they had episodes of several days of being sad or depressed or losing interest in usual activities, than in diagnoses of MDE, arguing indirectly that cross-national differences exist in optimal diagnostic thresholds of symptom questions used in the interview scheduled that assess MDE in these surveys, leading to biased estimates of cross-national differences in MDE prevalence.

A justification for this line of thinking comes from an earlier cross-national WHO study of major depression among primary care patients, which found strong similarity in the latent structure of depressive symptoms across 14 different countries in different parts of the world, but also found that countries with the highest prevalence estimates generally reported the lowest impairment associated with depression (113). The authors concluded from these results that while cross-national differences in the estimated prevalence of depression cannot be attributed to differences in the nature or validity of the concept of a depressive episode, it is possible that DSM criteria may define different levels of depression severity in different countries.

A close look at WMH results shows that on average about half of the respondents in both high income (52.3%) and low-middle income (54.1%) countries endorsed at least one depression diagnostic stem question (screen-positive). (Table 1) However, the screen-positive rate ranged widely, from less than 30% in Japan and the Pondicherry region of India to 60% or more in France, New Zealand, the US, São Paulo, and Ukraine. The ratio of the highest to lowest screen-positive rates across countries was 3.3. On average, the estimated lifetime prevalence in the WMH surveys was higher in high income (14.6%) than low-middle income (11.1%) countries. Indeed, the four lowest lifetime prevalence estimates (<10%) were in low-middle income countries (Pondicherry, Mexico, Shenzen, South Africa). Conversely, with the exception of São Paulo, the highest rates (>18%) were in 4 high income countries (France, the Netherlands, New Zealand, the US).

The percent of WMH respondents with lifetime MDE among screen-positives was also higher in surveys carried out in high income (28.1%) than low-middle income (19.8%) countries, although both the lowest and the highest percentages were in low-middle income

countries (12.0%, Shenzhen vs. 35.9%, Pondicherry). The ratio of the highest to lowest conditional prevalence scores among screened positives was 3.0. Among high income countries, these conditional prevalence estimates were relatively low (<25%) in Germany, Italy, Israel and Japan, and higher (>30%) in the Netherlands and US. Among the screen-positives, the percent with 12-month MDE was also similar for high income (10.6%) and low-middle income (10.5%) countries. The lowest rate was 6.7% (Italy) and the highest 18.0% (Pondicherry). In 10 countries, these percentages were between 8–12%.

As noted above, a cross-national WHO study carried out in primary care waiting room samples found that depressed respondents in countries where the prevalence of depression was estimated to be highest reported the lowest average levels of impairment associated with their depression, while the highest impairment was reported by depressed respondents in countries where the prevalence of depression was estimated to be lowest (113). This finding raised the possibility that the severity threshold for reporting depression in epidemiological surveys might vary across countries. The WMH investigators recently examined this issue by creating a small data file in which each WMH survey was treated as a separate observation and the variables were the measures of prevalence reported in Table 1 and a measure of impairment associated with MDE reported in the surveys (16). The impairment scores represented the *difference* in mean impairment scores of respondents with 12-month MDE compared to those with no lifetime history of MDE in the survey. This difference was taken to represent the effect of recent MDE as assessed in the survey on impairment. Unlike the earlier primary care study, this analysis found that the association between prevalence and impairment was positive. This was true not only in the total sample of all countries ($r = .48$) but also separately in high income ($r = .34$) and low-middle income ($r = .80$) countries. In addition, when these associations were decomposed into correlations of impairment with the two components of prevalence – the percent of respondents endorsing an MDE stem question and the conditional prevalence estimate of MDE among screen-positives –the first correlation was found to be considerably stronger than the second in the total sample of countries ($r = .45, .11$) as well as in low-middle income countries ($r = .76, .04$), while the first correlation is stronger than the second in high income countries ($r = .17, .45$). These results argue indirectly for a substantive rather than a methodological interpretation of the cross-national differences in prevalence found in the surveys.

ILLNESS COURSE

Few large-scale longitudinal general population studies of major depression exist, but clinical studies show that a substantial proportion of people who seek treatment for major depression have a chronic-recurrent course of illness (42, 120). The community survey finding that lifetime prevalence is two-three times that of 12-month prevalence suggests that between one-third and one-half of lifetime cases have recurrent episodes in a given year. However, long-term longitudinal studies also show that some people with lifetime MDD fail to report their history of depression in cross-section studies (85, 98).

The ratio of 12-month to lifetime prevalence estimates in the WMH surveys was significantly lower on average in surveys carried out in high income (37.7%) than low-middle income (53.3%) countries. Within high-income countries, the ratio ranged from

30% in France, Germany, Italy, and the Netherlands to >40% in the US and Israel. Within low-middle income countries, the lowest ratios were in Colombia (46.7%) and South Africa (49.6%) and the highest (57–58%) in São Paulo, Shenzhen, and Ukraine. Consistent with these results, the 30-day prevalence estimate was somewhat lower in high income (1.8%) than low-middle income (2.6%) countries. We would expect that recall failure would be lower in the WMH surveys than in many other community epidemiological surveys because of special probes used for lifetime recall (65), but it would nonetheless be prudent to consider the WMH 12-month-to-lifetime prevalence ratios upper-bound estimates on persistence and WMH lifetime prevalence estimates lower-bound estimates on true lifetime prevalence because of likely recall failure in retrospective reports of lifetime prevalence.

AGE-OF-ONSET

Many mental disorders have ages-of-onset (AOO) in childhood or adolescence and the median AOO of ever having *any* mental disorder in the general population is during the teenage years in most countries (51). MDE usually has a later AOO than this average, with the median AOO typically in the early to mid 20s. In addition, the AOO distribution for MDE is typically a good deal wider than for many other mental disorders. For example, while the vast majority of anxiety disorders and disruptive behavior disorders start in child-adolescence and the vast majority of substance use disorders start either in late adolescence or early adulthood, meaningful proportions of lifetime MDE cases start in late adolescence, in early-middle adulthood, and in late adulthood. In the WMH surveys, for example, median retrospectively-reported age of onset (AOO) of MDE in the middle 20s, with the inter-quartile range indicating that across all countries the peak risk period for onset of MDE ranged from mid-late adolescence to the early 40s. In high income countries, the earliest median AOO estimates in the WMH surveys were in the US (22.7) and New Zealand (24.2), while the latest were in Spain (30.0) and Japan (30.1). In low-middle income countries, the earliest median AOO estimates were in Shenzhen (18.8) and South Africa (22.3) and the latest in Ukraine (27.8) and Pondicherry (31.9). Median AOO was similar for high income and low-middle income countries (25.7 vs. 24.0, respectively).

SOCIO-DEMOGRAPHIC CORRELATES

Almost all community epidemiological studies find that gender, age, and marital status are associated with depression. Women typically have a two-fold increased risk of major depression compared to men (123), individuals who are separated or divorced have significantly higher rates of major depression than the currently married (7, 134), and prevalence of major depression generally goes down with age (7, 134), This evidence, however, comes primarily from studies conducted in Western countries. The sparse data available from low-middle income countries suggest that the age pattern might either be non-monotonic or reversed compared to other countries, with depression increasing with age (17, 53). Other socioeconomic factors have less consistent relationships with major depression in different countries (7).

A closer look at socio-demographic correlates of MDE in the WMH surveys illustrates these general patterns (16). Women were twice as likely as men in the WMH surveys to be

classified as having MDE. This difference was statistically significant in 15 of the 18 countries, and even in the three exceptions (Belgium, Germany, and Shenzhen), women had higher rates than men. In the developed countries, the significant odds-ratios (ORs) ranged from 1.6 in Israel to 2.7 in Spain. In the developing countries, they range was from 1.9 in Pondicherry and Colombia to 2.6 in São Paulo. The association between sex and MDE did not differ significantly between high income and low-middle income countries ($\chi^2_1 = 2.3$, p = .13).

The associations between age group and MDE, in comparison, varied considerably across countries in the WMH series. In two high income and 5 low-middle income countries there was no significant association between age and MDE. In six high income countries and in São Paulo, in comparison, respondents in the youngest age group (18–34) were 3–5.5 times as likely to have MDE as those in the oldest age group (65+), while in Pondicherry and Ukraine young age was associated with low risk. The 35–49 year age group was also at increased risk for MDE, especially in New Zealand (OR=4.4), the US (OR=3.9), and São Paulo (OR=3.3); in Ukraine, however, those ages 35–49 had a significantly lower risk than those in the oldest age group. The mid-life group, ages 50–64, encompasses a period of transition from work to retirement in many countries. Compared to respondents age 65+, they had an increased risk of MDE in 8 high income countries as well as São Paulo, with ORs ranging from 1.6 (Spain) to 3.1 (US). Overall, the association between age and MDE was significantly stronger in high income than low-middle income countries ($\chi^2_3 = 67.1$, p < .001).

As in the vast majority of other community epidemiological surveys, marital status was consistently associated with MDE in the WMH surveys. Being separated was associated with elevated risk of MDE in 12 countries, with ORs varying from < 4.0 in five countries to >8.0 in Pondicherry (OR=8.2), Japan (OR=10.8), and Lebanon (OR=19.3). Being divorced was associated with MDE in 7 of the 10 developed and 4 of the 8 developing countries, with unusually high ORs in Japan (OR=5.1), Shenzhen (OR=6.2) and Ukraine (OR=4.2). Being widowed, in comparison, was less consistently and more modestly associated with MDE with the exception of Ukraine, where widows were eight times as likely as the married to have MDE. In five high income countries there was a significantly elevated OR of MDE among the never married. However, Pondicherry and South Africa were the only two low-middle income samples in the WMH series with significant ORs, and in these countries being never married was associated with low MDE risk. Overall, the association between marital status and MDE differed significantly between high and low-middle income countries ($\chi^2_3 = 124.4$, p < .001) due to stronger associations of being separated and never married with MDE in high income countries and stronger associations of being divorced and widowed with MDE in low-middle income countries. In contrast to marital status, living arrangements per se were more modestly associated with MDE in the WMH surveys. This association was significant in 8 of the high income countries and in Ukraine and Shenzhen, with the overall difference in the association between high and low-middle income countries significant ($\chi^2_2 = 39.0$, p < .001) due to a higher OR between being unmarried but living with others in high than low-middle income countries.

The poorest respondents in the WMH surveys carried out in France, Germany, New Zealand, and the US had about two-fold increased odds of MDE compared to those in the highest income group. In the low-middle income countries, in comparison, income was not significantly related to MDE. This stronger association between income and MDE in higher income countries was statistically significant overall ($\chi^2_3 = 19.3$, p < .001). Similarly, among the non-Asian countries, low education was significantly associated with MDE only in Israel, the US, Mexico and Ukraine. The findings for the Asian countries were more complex, as in Pondicherry, respondents with the lowest education were 14 times as likely to have MDE as those with the highest education whereas in Japan and Shenzhen the reverse pattern is found; that is, the least educated had the lowest risk of MDE in those surveys. However, the association between education and MDE overall did not differ significantly between high and low-middle income countries in the WMH series.

THE ADVERSE CONSEQUENCES OF MAJOR DEPRESSION

Life course role incumbency, timing, and transitions

Given their typically early AOO, mental disorders might be expected to have adverse effects on critical developmental transitions, such as educational attainment and timing of marriage. A number of epidemiological studies have examined these effects, with a focus on four domains: education, marital timing and stability, childbearing, and occupation.

Education—Several studies show early-onset mental disorders associated termination of education (13, 15, 54, 68, 79, 101, 126, 143). While disruptive behavior disorders and bipolar disorder tend to have the strongest associations in these studies, MDD (and in some studies MDE) also is significantly associated with a roughly 60% elevated odds of failure to complete secondary school than otherwise comparable youth in high income countries. These adverse effects are weaker, though, in lower-income countries.

Marital timing and stability—Several studies have examined associations of pre-marital mental disorders with subsequent marriage (14, 36, 138). Early-onset mental disorders predict low probability of ever marrying, but are either positively associated (36) or unrelated (14) with early (before age 18) marriage, which is known to be associated with a number of adverse outcomes, and negatively associated with on-time and late marriage, which are known to be associated with a number of benefits (e.g., financial security, social support). These associations are largely the same for men and women and across countries. MDD is one of the most important of these pre-marital mental disorders. A separate set of studies has shown that pre-marital history of mental disorders predicts divorce (19, 61), again with associations quite similar for husbands and wives across all countries and MDD among the most important disorders in this regard (14).

Teen childbearing—We are aware of only one study that examined the association between child-adolescent mental disorder and subsequent teen child bearing (52). MDD and a number of other early-onset mental disorders were significant predictors of increased teen childbearing. Disaggregation found that the overall associations were due to disorders predicting increased sexual activity but not decreased use of contraception.

Employment status—Although depression is known to be associated with unemployment, most research on this association has emphasized the impact of job loss on depression rather than depression as a risk factor for job loss (33). A recent analysis from the WMH surveys documented the latter association by showing that history of mental disorders as of the age of completing schooling predicted current (at the time of interview) unemployment and work disability (49). However, these associations were only significant in high income countries, raising the possibility that MDD becomes more detrimental to work performance as the substantive complexity of work increases.

Role performance

A great deal of research has been carried out on the associations of mental disorders with various aspects of role performance, with a special focus on marital quality, work performance, and financial success.

Marital functioning—It has long been known that marital dissatisfaction and discord are strongly related to depressive symptoms (e.g. 29, 137), with an average correlation between marital dissatisfaction and depressive symptoms of approximately r = .4 across studies and very similar patterns for men and women (140). Longitudinal studies show that the association is bidirectional (75, 139), but with a stronger time-lagged association of marital discord predicting depressive symptoms than vice versa (103). Fewer studies have considered the effects of clinical depression on marital functioning (27, 67, 99), but those studies consistently document significant adverse effects.

Considerable research documents that both perpetration of and victimization by physical violence in marital relationships are significantly associated with depression (119). While these studies have generally focused on presumed mental health *consequences* of relationship violence (1, 64, 104), a growing body of research has more recently suggested that marital violence is partly a consequence of pre-existing mental disorders (58, 73, 93, 105). Indeed, longitudinal studies consistently find that pre-marital history of mental disorders, including depression, predict subsequent marital violence perpetration (34, 73) and victimization (69, 93, 105, 119). However, few of these studies adjusted for comorbidity. A recent study in the WMH surveys (84) found that the association between premarital history of MDD and subsequent marital violence disappears after controls are introduced for disruptive behavioral disorders and substance use disorders, suggesting that depression might be a risk marker rather than a causal risk factor.

Parental functioning—A number of studies have documented significant associations of both maternal (74) and paternal (142) depression with negative parenting behaviors. These associations are found throughout the age range of children, but most pronounced for the parents of young children. Although only an incomplete understanding exists of pathways, both laboratory and naturalistic studies of parent-infant micro-interactions have documented subtle ways in which parent depression leads to maladaptive interactions that impede infant affect regulation and later child development (121).

Days out of role—Considerable research has examined days out of role associated with various physical and mental disorders in an effort to produce data on comparative disease burden for health policy planning purposes (2, 82). These studies typically find that MDD is associated with among the highest number of days out of role at the societal level of any physical or mental disorder due to its combination of comparatively high prevalence and comparatively strong individual-level association (26, 88, 130). In the WMH surveys, for example, 62,971 respondents across 24 countries were assessed for a wide range of common physical and mental disorders as well as for days out of role in the 30 days before interview (4). MDD was associated with 5.1% of all days out of role, the fourth highest population attributable risk proportion of all the disorders considered (exceeded only by headache/migraine, other chronic pain conditions, and cardiovascular disorders) and by far the largest among the mental disorder. A number of epidemiological surveys in the US have estimated the workplace costs of either MDE or MDD on absenteeism and low work performance (often referred to as *presenteeism*) (39, 50, 117, 132). All these studies found that MDE and MDD significantly predict overall lost work performance. Several studies attempted to estimate the annual salary-equivalent human capital value of these losses. These estimates were in the range $30.1 billion (117) to $51.5 billion (39).

Financial success—One of most striking aspects of the impairment associated with MDD is that the personal earnings and household income of people with MDD are substantially lower than those of people without depression (35, 45, 56, 72, 78, 80). However, it is unclear whether depression is primariry a cause, consequence, or both in these associations due to the possibility of reciprocal causation between income-earnings and MDD (89). Causal effects of low income on depression have been documented in quasi-experimental studies of job loss (33). Time series analyses have also documented aggregate associations between unemployment rates and suicide rates (46). Previous studies of the effects of mental disorders on reductions in income have not controlled for these reciprocal effects, making the size of the adverse effects of depression on income-earnings uncertain. One way to sort out this temporal order would be to take advantage of the fact that depression often starts in childhood or adolescence and use prospective epidemiological data to study long-term associations between early-onset disorders and subsequent income-earnings. Several such studies exist, all of them suggesting that depression in childhood-adolescence predicts reduced income-earnings in adulthood (38, 114).

Comparative impairments—A number of community surveys, most of them carried out in the US, have examined the comparative effects of diverse diseases on various aspects of role functioning (55, 70, 82, 118, 127, 130). MDE was included in a number of these studies and the results typically showed that musculoskeletal disorders and MDE were associated with the highest levels of disability at the individual level among all commonly occurring disorders assessed. The most compelling study of this sort outside the US was based on fifteen national surveys carried out as part of the WMH surveys (95). Disorder-specific disability scores were compared across people who experienced each of ten chronic physical disorders and ten mental disorders in the year before interview. MDD and bipolar disorder (BPD) were the mental disorders most often rated severely impairing in both developed and developing countries. None of the physical disorders considered had impairment levels as

high as those for MDD or BPD despite the fact that the physical disorders included such severe conditions as cancer, diabetes, and heart disease. Nearly all the higher mental-than-physical ratings were statistically significant at the .05 level. Comparable results were obtained when analyses focused exclusively on sub-samples of cases in treatment and when comparisons were restricted to respondents who had both disorders in a given pair (e.g., respondents who had both MDD and cancer or both MDD and heart disease).

Another set of surveys examined comparative decrements in perceived health associated with a wide range of disorders (3, 77, 87). MDD was the focus of two such studies. The first study was part of the WHO World Health Surveys of nearly one-quarter of a million respondents across 60 countries (87). A consistent pattern was found in these surveys across countries and socio-demographic subgroups within countries for MDD to be associated with a larger decrement in perceived health than any of the four physical disorders compared with it (angina, arthritis, asthma, diabetes). The second study was part of the WMH surveys, where MDD was compared with 18 other physical (e.g., cancer, cardiovascular disorders, diabetes) and mental (e.g., BPD, panic disorder, post-traumatic stress disorder) disorders in predicting a summary measure of perceived health (5). MDD was one of the three disorders associated with the highest decrements in perceived health, the other two being severe insomnia and neurological disorders (epilepsy, Parkinson's disease, multiple sclerosis).

Morbidity and mortality

It is now well established that MDD is significantly associated with a wide variety of chronic physical disorders, including arthritis, asthma, cancer, cardiovascular disease, diabetes, hypertension, chronic respiratory disorders, and a variety of chronic pain conditions (6, 18, 22, 31, 32, 81, 92, 96, 136). Although most of the data documenting these associations comes from clinical samples in the US, similar data also exist from community epidemiological surveys carried out throughout the world (112, 128). These associations have considerable individual and public health significance and can be thoughts of as representing costs of depression in at least two ways. First, to the extent that MDD is a causal risk factor, it leads to an increased prevalence of these physical disorders, with all their associated financial costs, impairments, and increased mortality risk. Evidence about MDD as a cause of these physical disorders is spotty, though, although we know from meta-analyses of longitudinal studies that MDD is a consistent predictor of the subsequent first onset of coronary artery disease (124, 144), stroke (94), diabetes (20), heart attacks (102, 110) and certain types of cancer (40). A number of biologically plausible mechanisms have been proposed to explain the prospective associations of MDD with these disorders (21, 25, 28, 47, 116). These include a variety of poor health behaviors known to be linked to MDD, such as elevated rates of smoking and drinking (30), obesity (23), low compliance with treatment regimens (111, 146), and a variety of biological dysregulations, such as hypothalamic-pituitary-adrenal hyperactivity and impaired immune function (63). Based on these observations, there is good reason to believe that MDD might be a causal risk factor for at least some chronic physical disorders. Second, even if depression is more a consequence than a cause of chronic physical disorders, as it appears to be for some disorders based on stronger prospective associations of depression onset subsequent to, rather than before, onset of the physical disorder, comorbid depression is often associated

with a worse course of the physical disorder (37, 76, 100). A number of reasons could be involved here, but one of the most consistently documented is that depression is often associated with non-adherence to treatment regimens (12, 24, 146).

Based on these considerations, it should not be surprising that MDD is associated with significantly elevated risk of early death (21, 28, 145). This is true not only because people with MDD have high suicide risk (11, 86, 106), but also because depression is associated with elevated risk of onset, persistence, and severity of a wide range of physical disorders. There has been particular interest in MDD as a risk factor for cardiovascular disease (CVD) (8, 41, 71, 125). Indeed, a number of interventions have been developed to detect and treat depression among people with CVD in an effort to prolong their lives, although the results of these studies have so far been mixed (9).

DISCUSSION

The data reviewed here show clearly that major depression is a commonly occurring and burdensome disorder. Methodological studies reviewed here find no evidence that the substantial cross-national variation in prevalence estimates reviewed here, with the highest prevalence estimates found in some of the wealthiest countries in the world, is due as methodological factors, adding indirect support to a substantive interpretation of observed cross-national differences in MDE prevalence estimates. Why these differences exist is less clear, as on one level it seems counter-intuitive that people in high income countries would experience more stress than those in low-middle income countries. However, it has been suggested that depression is to some extent an illness of affluence (66). A related argument is that income inequality, which is for the most part greater in high than low-middle income countries, promotes a wide variety of chronic conditions that includes depression (141). It is hoped that future epidemiological research sheds light on these perspectives.

In considering a substantive interpretation of the international data on prevalence of major depression, it is noteworthy that while lifetime prevalence estimates were higher in high than low-middle income countries overall, no significant difference was found in 12-month prevalence, which means that the ratio of 12-month to lifetime prevalence estimates was higher in low-middle than high income countries. It might be that these results reflect genuinely lower lifetime prevalence but higher persistence of depression in low-middle than high income countries, but another plausible and more parsimonious explanation is that error in recall of prior lifetime episodes in epidemiological surveys carried out in higher in low-middle than high income countries. Longitudinal data collection would be required to document such a difference rigorously (97, 135). Although such data do not currently exist, it is important to recognize this possibility of cross-national variation in recall error before launching an extensive investigation of substantive explanations.

Another implication of the methodological limitation of existing cross-national epidemiological surveys of major depression is that the cross-sectional nature of these surveys makes it impossible to determine the temporal direction of associations between depression and socio-demographic variables. This means that even though variables such as education and marital status are typically considered predictors of depression, they might

actually be consequences or involved in reciprocal causal relationships with depression. A final noteworthy limitation of existing epidemiological studies is that the assessments of major depression were almost certainly suboptimal, although interview translation, back-translation, and harmonization procedures have improved in recent cross-national surveys (43) and that blinded clinical reappraisal interviews in a number of recent surveys document good concordance between survey diagnoses of major depression and independent clinical diagnoses (44).

Despite these limitations, existing epidemiological data show clearly that major depression is a commonly occurring and seriously impairing disorder. The high prevalence and persistence of major depression in the many different countries where epidemiological surveys have been administered confirm the worldwide importance of this disorder. Although evidence is not definitive that major depression plays a causal role in its associations with the many adverse outcomes reviewed here, the indirect evidence is sufficiently strong to argue for the likely cost-effectiveness of expanded depression treatment from a societal perspective (131). Two separate large-scale randomized workplace depression treatment effectiveness trials have been carried out in the US to evaluate the cost-effectiveness of expanded treatment from an employer perspective (109, 133). Both trials had positive returns-on-investment to employers. A substantial expansion of worksite depression care management programs has occurred in the US subsequent to the publication of these trials (108).

Yet the proportion of people with depression who receive treatment remains low in much of the world. A recent US study found that only about half of workers with MDD received treatment in the year of interview and that fewer than half of treated workers received treatment consistent with published treatment guidelines (57). Although the treatment rate was higher for more severe cases, even those with severe MDD often failed to receive treatment (10). The WMH surveys show that treatment rates are even lower in many other developed countries and consistently much lower in developing countries (129). Less information is available on rates of depression treatment among patients with chronic physical disorders, but available evidence suggests that expanded treatment could be of considerable value (48). Randomized controlled trials are needed to increase our understanding of the effects of detection and treatment of major depression among people in treatment for chronic physical disorders. In addition, controlled effectiveness trials with long-term follow-ups are needed to increase our understanding of the effects of early detection and treatment on changes in life course role trajectories, role performance, and onset of secondary disorders.

Acknowledgments

Important Acronyms

DSM   Diagnostic and Statistical Manual of the American Psychiatric Association

MDE   Major depressive episode

MDD   Major depressive disorder

WHO   World Health Organization

WMH   World Mental Health Surveys

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Summary Points

- Major depression is a commonly occurring disorder in all countries where epidemiological surveys have been carried out

- However, lifetime prevalence estimates of major depression vary widely across countries, with prevalence generally higher in high income versus low-middle income countries

- Age-of-onset (AOO) distributions show consistent evidence for a wide age range of risk with median AOO typically in early adulthood

- Course of major depression is often chronic-recurrent

- Women consistently across countries have lifetime risk of major depression roughly twice that of men

- Other socio-demographic correlates are far less consistent

- Major depression is associated with a wide range of indicators of impairment and secondary morbidity, although some of these individual-level associations are stronger in high income than low-middle income countries.

Table 1

Prevalence of DSM-IV/CIDI major depressive episodes in the 18 countries participating in the WMH surveys

	Screen+[a]		Lifetime prevalence[a]		Lifetime/ screen+[a]		12-month prevalence[a]		12-month/ screen+[a]		12-month/ lifetime[a]		Age of onset	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)	%	(SE)	Median	(IQR)[b]
I. High income[c]														
Belgium	49.4	(2.5)	14.1	(1.0)	28.5	(1.9)	5.0	(0.5)	10.0	(1.0)	35.2	(2.8)	29.4	(20.9–41.3)
France	65.0	(1.7)	21.0	(1.1)	32.3	(1.4)	5.9	(0.6)	9.0	(0.9)	27.9	(2.6)	28.4	(19.3–38.9)
Germany	43.1	(1.4)	9.9	(0.6)	23.0	(1.3)	3.0	(0.3)	6.9	(0.6)	30.1	(2.1)	27.6	(18.6–39.6)
Israel	45.1	(0.8)	10.2	(0.5)	22.6	(1.0)	6.1	(0.4)	13.5	(0.8)	59.6	(2.3)	25.5	(18.1–38.5)
Italy	44.9	(1.7)	9.9	(0.5)	22.1	(1.0)	3.0	(0.2)	6.7	(0.5)	30.2	(1.9)	27.7	(19.1–39.1)
Japan	29.9	(0.8)	6.6	(0.5)	22.2	(1.4)	2.2	(0.4)	7.4	(1.2)	33.3	(4.2)	30.1	(20.8–45.3)
Netherlands	53.2	(1.6)	17.9	(1.0)	33.6	(1.8)	4.9	(0.5)	9.2	(1.0)	27.3	(2.6)	27.2	(19.3–39.5)
New Zealand	61.9	(0.6)	17.8	(0.4)	28.7	(0.6)	6.6	(0.3)	10.6	(0.5)	37.0	(1.5)	24.2	(16.1–34.5)[c]
Spain	37.7	(1.0)	10.6	(0.5)	28.2	(1.2)	4.0	(0.3)	10.6	(0.8)	37.5	(1.9)	30.0	(19.7–44.3)
United States	62.0	(0.9)	19.2	(0.5)	30.9	(0.7)	8.3	(0.3)	13.3	(0.5)	43.1	(1.2)	22.7	(15.1–34.6)
Total	52.3	(0.4)	14.6	(0.2)	28.1	(0.3)	5.5	(0.1)	10.6	(0.2)	37.7	(0.7)	25.7	(17.3–37.2)
II. Low-middle income[c]														
Brazil (Sao Paulo)	66.0	(1.0)	18.4	(0.8)	27.9	(1.1)	10.4	(0.6)	15.8	(0.8)	56.7	(1.5)	24.3	(17.2–35.8)
Colombia	58.6	(1.1)	13.3	(0.6)	22.6	(1.0)	6.2	(0.4)	10.6	(0.7)	46.7	(2.6)	23.5	(15.6–33.6)
India (Pondicherry)	25.0	(0.9)	9.0	(0.5)	35.9	(1.5)	4.5	(0.4)	18.0	(1.4)	50.0	(3.0)	31.9	(24.5–42.7)
Lebanon	57.7	(1.8)	10.9	(0.9)	18.9	(1.3)	5.5	(0.7)	9.5	(1.2)	50.0	(3.7)	23.8	(17.5–32.8)
Mexico	40.6	(1.1)	8.0	(0.5)	19.6	(1.2)	4.0	(0.3)	9.8	(0.8)	50.0	(2.7)	23.5	(16.7–34.0)
PRC[d] (Shenzhen)	54.6	(0.9)	6.5	(0.4)	12.0	(0.7)	3.8	(0.3)	6.9	(0.5)	58.0	(2.6)	18.8	(14.9–23.4)
South Africa	56.1	(1.3)	9.8	(0.7)	17.4	(1.2)	4.9	(0.4)	8.6	(0.8)	49.6	(2.7)	22.3	(15.8–33.8)
Ukraine	82.4	(1.1)	14.6	(0.7)	17.7	(0.8)	8.4	(0.6)	10.2	(0.7)	57.8	(2.2)	27.8	(18.7–39.6)
Total	54.1	(0.4)	11.1	(0.2)	19.8	(0.4)	5.9	(0.2)	10.5	(0.3)	53.3	(0.9)	24.0	(17.0–34.8)

[a] Screen+, the proportion of respondents who reported ever having a time lasting several days when they were sad, depressed, or lost all interest in their usual activities; Lifetime prevalence, the proportion of respondents who met criteria for major depressive episode (MDE) at any time in their life; Lifetime/screen+, lifetime prevalence of MDE among respondents with a positive lifetime screen; 12-month prevalence, the proportion of respondents who met criteria for MDE at any time in the 12 months before interview; 12-month/screen+, 12-month prevalence of MDE among respondents with a positive lifetime screen; 12-month/lifetime, 12-month prevalence of MDE among respondents with lifetime MDE.

[b]IQR, interquartile range

[c]The World Bank Development Index was used to distinguishing high from low-middle income countries (www.worldbank/indicators).

[d]PRC, Peoples Republic of China

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