

Research report

Depression–anxiety relationships with chronic physical conditions: Results from the World Mental Health surveys[☆]

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Abstract

Background: Prior research on the association between affective disorders and physical conditions has been carried out in developed countries, usually in clinical populations, on a limited range of mental disorders and physical conditions, and has seldom taken into account the comorbidity between depressive and anxiety disorders.

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Methods: Eighteen general population surveys were carried out among adults in 17 countries as part of the World Mental Health Surveys initiative ($N=42,249$). DSM-IV depressive and anxiety disorders were assessed using face-to-face interviews with the Composite International Diagnostic Interview (CIDI 3.0). Chronic physical conditions were ascertained via a standard checklist. The relationship between mental disorders and physical conditions was assessed by considering depressive and anxiety disorders independently (depression without anxiety; anxiety without depression) and conjointly (depression plus anxiety).

Results: All physical conditions were significantly associated with depressive and/or anxiety disorders but there was variation in the strength of association (ORs 1.2–4.5). Non-comorbid depressive and anxiety disorders were associated in equal degree with physical conditions. Comorbid depressive–anxiety disorder was more strongly associated with several physical conditions than were single mental disorders.

Limitations: Physical conditions were ascertained via self report, though for a number of conditions this was self-report of diagnosis by a physician.

Conclusions: Given the prevalence and clinical consequences of the co-occurrence of mental and physical disorders, attention to their comorbidity should remain a clinical and research priority.

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1. Introduction

It is now well established that there is significant comorbidity (co-occurrence) of mental disorders, particularly mood disorders, with chronic physical conditions (Wells et al., 1989a,b; Dew, 1998; Katon and Ciechanowski, 2002; Harter et al., 2003; McWilliams et al., 2003; Buist-Bouwman et al., 2005; Simon et al., 2006; Ortega et al., 2006). These associations have considerable individual and public health significance in their impact on role impairment (Sullivan et al., 1997; Kessler et al., 2003), treatment costs and adherence (Simon et al., 1995; Ciechanowski et al., 2000) and premature mortality risk (Harris and Barraclough, 1998; van Melle et al., 2004; Zhang et al., 2005). However, prior research on the strength of the association between mental disorders and physical conditions has been limited by a preponderance of clinical relative to general population studies, a restricted range of mental or physical conditions explored and an absence of information from developing countries.

There is a further limitation to the earlier research on this topic. Anxiety and depressive disorders often co-occur. Population surveys have found that about half those with a current mood disorder also have a comorbid anxiety disorder (Kessler et al., 1996; Scott et al., 2006). Since prior research has not usually taken this depression–anxiety comorbidity into account, it is not known whether the association of anxiety disorders with chronic physical conditions might be due to comorbid mood disorder, or conversely, whether the association of mood disorders with chronic physical conditions might be due to comorbid anxiety disorder. Additionally, comorbid depression–anxiety is believed to be a more severe and chronic form of psychological disorder than

non-comorbid depressive or anxiety disorders (Angst, 1997), so it is of interest to determine if comorbid depressive–anxiety disorder is associated with increased risks of chronic physical conditions. Lastly, since prior research has typically studied single or small numbers of chronic physical conditions, it is not clear whether there are substantial differences in mental–physical comorbidity patterns across different chronic physical conditions.

This paper addresses these issues by using data from 18 surveys participating in the World Mental Health Surveys to investigate the association of 10 chronic physical conditions with depressive and anxiety disorders, taking the comorbidity between depressive and anxiety disorders into account. The objectives of this paper are: 1) to determine whether non-comorbid depressive disorder and/or non-comorbid anxiety disorder are associated with specific physical conditions; 2) to determine whether comorbid depressive–anxiety disorder is more strongly associated than is non-comorbid depressive or anxiety disorder with physical conditions; and 3) to contrast the strength of association of different chronic physical conditions with depressive and anxiety disorders.

2. Methods

The methods employed in the World Mental Health surveys relevant to this report have been described in detail in prior reports (Kessler et al., 2004). Here we provide a brief overview of the key methodologic features.

2.1. Samples

Eighteen surveys were carried out in 17 countries in the Americas (Colombia, Mexico, United States), Europe (Belgium, France, Germany, Italy, Netherlands,

Spain, Ukraine), the Middle East (Israel, Lebanon), Africa (Nigeria, South Africa), Asia (Japan, People's Republic of China: Beijing, Shanghai), and New Zealand. An effort was made to recruit as many countries as possible in the initiative. The final set of countries was determined by availability of collaborators in the country who were able to obtain funding for the survey. All surveys were based on multi-stage, clustered area probability household samples. All interviews were carried out face-to-face by trained lay interviewers. The combined total sample size was 85,052. Survey response rate varied, with a weighted average response rate across surveys of 71%.

Internal sub-sampling was used to reduce respondent burden by dividing the interview into two parts. Part 1 included the core diagnostic assessment of mental disorders. Part 2 included additional information relevant to a wide range of survey aims, including assessment of chronic physical conditions. All respondents completed Part 1. All Part-1 respondents who met criteria for any mental disorder and a probability sample of other respondents were administered Part 2. Part-2 respondents were weighted by the inverse of their probability of selection for Part 2 of the interview to adjust for differential sampling. Analyses in this article were based on the weighted Part-2 sample ($N=42,249$). Additional weights were used to adjust for differential probabilities of selection within households and to match the samples to population socio-demographic distributions.

2.2. Training and field procedures

The central World Mental Health (WMH) staff trained bilingual supervisors in each country. Consistent interviewer training documents and standardized translation protocols were used across surveys. The institutional review board of the organization that coordinated the survey in each country approved and monitored compliance with procedures for obtaining informed consent and protecting human subjects.

2.3. Mental disorder status

All surveys assessed mental disorders with the World Mental Health version of the WHO Composite International Diagnostic Interview (WMH-CIDI, now CIDI 3.0) (Kessler and Ustun, 2004), a fully structured diagnostic interview. Disorders considered in this paper include 12-month anxiety disorders (generalized anxiety disorder, panic disorder and/or agoraphobia, posttraumatic stress disorder, and/or social phobia) and 12-month depressive

disorders (dysthymia and/or major depressive disorder). Disorders were assessed using the definitions and criteria of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* (APA, 1994). CIDI organic exclusion rules were imposed in making all diagnoses. Methodological evidence collected in the WHO-CIDI Field Trials and later clinical calibration studies showed that all the disorders considered herein were assessed with acceptable reliability and validity in the WMH-CIDI (Kessler et al., 2004).

2.4. Mental disorder comorbidity status

The analyses in this paper consider persons in three mutually exclusive groups, those with: 1) a depressive disorder in the absence of comorbid anxiety disorder; 2) an anxiety disorder in the absence of comorbid depressive disorder; and 3) comorbid depressive and anxiety disorder.

2.5. Chronic physical conditions

Physical conditions were assessed with a standard chronic disorder checklist, of the kind commonly used in national health surveys (NCHS, 1994). For the conditions reported here respondents were asked if they had ever had arthritis, chronic back or neck problems, frequent or severe headaches (referred to here as 'chronic headaches'), other chronic pain, stroke, heart attack, or whether they had ever been told by a doctor they had heart disease, high blood pressure, asthma, diabetes or ulcer. The category 'multiple pains' includes two or more of arthritis, chronic back or neck problems, chronic headaches, or other chronic pain. Prior research has demonstrated reasonable correspondence between self-reported chronic conditions such as diabetes, heart disease and asthma, and general practitioner records (Kriegsman et al., 1996). Obesity was defined as a body mass index (BMI) of 30 kg/m² or greater. Height and weight were self-reported.

2.6. Analytic methods

Analyses were run for all ten physical conditions on a country-by-country basis (data available on request). Odds ratios for the association of the three mental disorder groups with each of the physical conditions were estimated for each survey adjusting for age and sex. Associations were not further adjusted for socio-economic status as this may be part of the vulnerability for mental–physical comorbidity and the purpose of this paper was descriptive rather than explanatory. Countries

were included in a particular analysis if they had at least 25 respondents with the physical condition. Some countries did not collect obesity data. Ninety-five percent confidence intervals for the odds ratios were estimated using the Taylor Series method (Wolter, 1985) with SUDAAN software (SUDAAN, 2002) to adjust for clustering and weighting.

Using meta-analytic methods to summarise results across surveys, pooled estimates of the odds ratios were developed describing the association of each of the mental disorder groups with the specific physical condition across surveys. The pooled estimate of the odds ratio was weighted by the inverse of the variance of the estimate for each survey (DerSimonian and Laird, 1986). Tests were carried out to assess whether heterogeneity among the country-specific odds of association between each of the mental disorder status groups and a given physical condition was greater than that expected by chance (DerSimonian and Laird, 1986), using a conservative alpha value of $p < 0.05$.

Table 1
Sample characteristics

Country	Part-2 subsample (N)	Mean age ^a	% (60 years or older)	% (women)	Education (secondary or greater)
<i>Americas</i>					
Colombia	2381	36.6	5.3	54.5	46.4
Mexico	2362	35.2	5.2	52.3	31.4
United States	5692	45.0	21.2	53.0	83.2
<i>Asia and South Pacific</i>					
Japan	887	51.4	34.9	53.7	70.0
PRC — Beijing	914	39.8	15.6	47.5	61.4
PRC — Shanghai	714	42.9	18.7	48.1	46.8
New Zealand	7312	44.6	20.7	52.2	60.4
<i>Europe</i>					
Belgium	1043	46.9	27.3	51.7	69.7
France	1436	46.3	26.5	52.2	NA
Germany	1323	48.2	30.6	51.7	96.4
Italy	1779	47.7	29.2	52.0	39.5
Netherlands	1094	45.0	22.7	50.9	69.7
Spain	2121	45.5	25.5	51.4	41.7
Ukraine	1720	46.1	27.3	55.1	79.5
<i>Middle East and Africa</i>					
Lebanon	602	40.3	15.3	48.1	40.5
Nigeria	2143	35.8	9.7	51.0	35.6
Israel	4859	44.4	20.3	51.9	78.3
South Africa	4315	37.1	8.8	53.6	38.9

^a Age range ≥ 18 , except for Colombia, Mexico (18–65), Japan (≥ 20) and Israel (≥ 21).

Table 2

Association of mental disorders with chronic physical conditions—odds ratios pooled across 17 countries, adjusted for age and sex (95% confidence intervals)

Type of physical condition	Type of mental disorder		
	Non-comorbid depressive disorder	Non-comorbid anxiety disorder	Comorbid depression–anxiety
Obesity	1.1 (0.9, 1.2)	1.2 (1.1, 1.4)*	1.2 (1.0, 1.4)*
Diabetes	1.3 (1.1, 1.6)*	1.3 (1.1, 1.5)*	1.4 (1.1, 1.8)*
Asthma	1.7 (1.4, 2.0)*	1.6 (1.4, 1.8)*	1.6 (1.4, 1.9)*
Hypertension	1.5 (1.4, 1.8)*	1.7 (1.5, 1.9)*	1.8 (1.5, 2.1)*
Arthritis	1.6 (1.4, 1.8)*	1.7 (1.5, 1.9)*	2.5 (2.2, 2.9)*
Ulcer	1.8 (1.6, 2.2)*	1.9 (1.7, 2.3)*	2.7 (2.3, 3.2)*
Heart disease	2.0 (1.7, 2.3)*	1.9 (1.6, 2.3)*	2.8 (2.3, 3.4)*
Back/neck problems	2.2 (1.9, 2.4)*	2.0 (1.8, 2.3)*	2.9 (2.5, 3.3)*
Chronic Headache	2.5 (2.2, 2.8)*	2.3 (2.1, 2.5)*	4.0 (3.5, 4.7)*
Multiple pains	2.5 (2.2, 2.9)*	2.3 (2.1, 2.6)*	4.5 (4.0, 5.1)*

Reference group: persons with neither a depressive nor an anxiety disorder.

* $p < 0.05$.

The first set of analyses (shown in Table 2) determined the association of physical conditions with non-comorbid depressive or anxiety disorder and with comorbid depressive–anxiety disorder, where the reference group was those with neither a depressive nor an anxiety disorder. The second set of analyses (shown in Table 3) determined the association of physical conditions with comorbid depressive–anxiety disorder, and also with no mental disorder, where the reference group was persons with a non-comorbid depressive or anxiety disorder. This second set of analyses established whether the association between physical conditions and comorbid depressive–anxiety disorder was significantly greater than the association between physical conditions and non-comorbid depressive or anxiety disorder.

3. Results

Information on sample characteristics is provided in Table 1. The sample size numbers refer to the Part-2 subsample that completed the section of the interview containing the physical condition checklist. The proportion of the sample that was age 60 or greater was higher in the developed countries than the developing countries, and the percent with 12 or more years of education was also generally higher in the developed countries.

The majority of heterogeneity tests assessing whether the variability in odds ratio estimates across surveys was

greater than chance were non-significant (data available on request). Where they were significant this was due to obviously outlying estimates from one or two countries with very small numbers with the comorbid conditions. Such extreme estimates do not make a significant contribution to the pooled estimate as this is weighted by the inverse of the variance of the estimate for each survey. The pooled results across countries for the association between the mental disorder groups (non-comorbid depression or anxiety and comorbid depressive–anxiety disorder) and the ten physical conditions are presented in Table 2.

Considerable variability in the strength of association between specific physical conditions and mental disorders is apparent. The chronic pain conditions (back/neck problems, chronic headache and multiple pains) show the strongest associations with depressive and anxiety disorders. Non-comorbid depressive and anxiety disorders are remarkably similar to each other in their strength of association with the ten physical conditions examined. They are both independently related to each physical disorder, with the one exception that non-comorbid depressive disorder was not significantly associated with obesity. For the physical conditions with generally weaker associations with mental disorder (e.g., obesity, diabetes, asthma), the association with comorbid depressive–anxiety disorder is roughly equal to the strength of association of the physical condition with non-comorbid depression or anxiety. For those physical conditions with stronger overall relationships with mental disorder (e.g., chronic

pain conditions, ulcer, heart disease), their relationship with comorbid depressive–anxiety disorder appears stronger than with depression or anxiety alone, though the formal test for that is presented in Table 3.

The results in Table 3 confirm that for six of the ten physical conditions (arthritis, ulcer, heart disease, back/neck problems, chronic headache and multiple pains), their association with comorbid depressive–anxiety disorder is significantly stronger than with depression or anxiety alone. This table also confirms that having neither a depressive nor an anxiety disorder is protective in terms of the likelihood of experiencing any of the ten physical conditions, relative to those with a single mental disorder.

4. Discussion

Despite great diversity in demographic, socioeconomic and health patterns among the 17 countries surveyed, the pooled cross-national results consistently showed that depressive and anxiety disorders were independently and comparably related to a wide range of chronic physical conditions. Comorbid depressive–anxiety disorder was more strongly associated with several physical conditions than was non-comorbid depression and anxiety. There was considerable variability between physical conditions in their strength of association with mental disorders. The findings observed here that heart disease and the chronic pain conditions, among the physical conditions studied, showed the strongest associations with depressive and anxiety disorders is consistent with research highlighting the robust links between these physical conditions and major depressive disorder (Evans et al., 2005). The particular contributions of this report are two-fold. First, it confirms that both anxiety and depressive disorders are independently associated with chronic physical conditions: comorbidity research has often focused on one (Harter et al., 2003) or the other (Evans et al., 2005). Second, this research produces the novel finding that having both depression and anxiety further increases the risk of a number of physical conditions co-occurring.

A limitation of this study is that physical conditions were ascertained by a standard checklist, rather than physician's examination. A distinction may be drawn between those conditions which were ascertained via self-report of symptoms (the pain conditions) and those ascertained via self-report of a physician's diagnosis (asthma, heart disease, high blood pressure, diabetes, ulcer). Self-report of chronic pain conditions has reasonable validity given that these are largely self-defined. For the other conditions, while acknowledging the limitation of self-report, methods research indicates

Table 3
Association of no depressive or anxiety disorder, and of comorbid depressive–anxiety disorder, with physical conditions— odds ratios pooled across 17 countries, adjusted for age and sex (95% confidence intervals)

Type of physical condition	Type of mental disorder	
	Neither depression nor anxiety	Both depression and anxiety
Obesity	0.9 (0.8, 1.0)*	1.0 (0.8, 1.2)
Diabetes	0.8 (0.7, 0.9)*	1.1 (0.9, 1.4)
Asthma	0.6 (0.5, 0.7)*	1.1 (0.9, 1.4)
Hypertension	0.6 (0.6, 0.7)*	1.0 (0.9, 1.2)
Arthritis	0.6 (0.6, 0.7)*	1.6 (1.3, 1.8)*
Ulcer	0.5 (0.5, 0.6)*	1.4 (1.1, 1.7)*
Heart disease	0.5 (0.5, 0.6)*	1.5 (1.2, 1.8)*
Back/neck problems	0.5 (0.4, 0.5)*	1.4 (1.2, 1.6)*
Chronic headache	0.4 (0.4, 0.5)*	1.7 (1.5, 2.0)*
Multiple pains	0.4 (0.4, 0.4)*	1.9 (1.6, 2.1)*

Reference group: persons with non-comorbid depressive or anxiety disorder.

* $p < 0.05$.

that self-report of diagnosis generally shows good agreement with medical records data (Kehoe et al., 1994; NCHS, 1994; Kriegsman et al., 1996), and importantly, the presence of depressive or anxiety symptoms has not been found to bias or inflate the self-report of diagnosed physical conditions (Kolk et al., 2002). A further limitation is that there were no measures of the severity of the chronic conditions. The associations reported are therefore averaged across the full spectrum of physical condition severity.

A strength of this study is that the estimates are pooled across a large number of consistently conducted surveys. For a given physical condition, whether or not the country-specific odds ratios were statistically significant varied (data available on request), largely as a function of variation in sample or cell size. But the heterogeneity tests indicated that the majority of the country-specific odds ratios did not differ significantly from each other, allowing confidence in the pooled estimates. This reflects the usefulness of a meta-analytical approach when investigating the co-occurrence of mental and physical problems (where the smaller number of people with both disorders reduces power in an individual survey).

The cross-sectional nature of this study limits conclusions about the direction or causal nature of the relationships between mental disorder and physical conditions. Other research suggests that for many of the physical conditions studied here the relationship with mental disorder may be bi-directional, involving a combination of biological and psychosocial mechanisms (Cohen and Rodriguez, 1995; Dew, 1998; Kiecolt-Glaser et al., 2002). However, with regard to our finding that the association between mental disorder and many physical conditions is strengthened in the presence of both anxiety and depression relative to either alone, the following observation may be made. This finding seems more comprehensible within a framework of mental disorder leading to physical condition (whereby the odds of a physical condition are increased with the experience of more mental disorders), than within a framework of physical condition leading to mental disorder (which would imply that a physical condition is more likely to result in both depression and anxiety than either alone). Another possible interpretation is that the combination of factors (both internal and external to the individual) that is conducive to the experience of multiple mental disorders is also conducive to the occurrence of a number of physical conditions. Further research is required to test these possibilities.

What is clear is that mental–physical comorbidity is clinically consequential; it has been shown to complicate treatment, alter disease course, contribute to disability and

increase mortality risks (Harris and Barraclough, 1998; Cassano and Fava, 2002; Evans et al., 2005). From this clinical standpoint, the concurrent presentation of mental with physical disorder may be the critical issue, rather than the question of which disorder came first. However, many countries manage the delivery of mental health services separately from that of general medical services, which is not optimal for the adequate recognition and treatment of mental–physical comorbidity (Kathol and Clarke, 2005). Even where depressive and anxiety disorders are predominantly treated within general practice settings, they are typically under-detected there (Ormel et al., 1991; Cassano and Fava, 2002). Moreover, while many primary care clinicians may be aware of the associations between depression and physical conditions, they may be less aware of the connections observed in this study between anxiety disorders and physical conditions, despite the greater prevalence of anxiety disorders relative to depressive disorders (Demyttenaere et al. 2004). Given the increasing prevalence of chronic conditions (Popkin, 1998) and possibly also of anxiety and depressive disorders (Kessler et al., 2005), improved understanding of the determinants, consequences and management of their comorbidity remains a research priority.

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