Low prevalence of major depressive disorder in Taiwanese adults: possible explanations and implications

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Background. This study examined the prevalence of major depressive disorder (MDD), and the correlations and co-morbid conditions associated with MDD, in the adult Taiwanese population, which a previous estimate in the 1980s had found to be at the lower end of the spectrum worldwide. Possible explanations for the reported low prevalence of MDD were evaluated.

Method. As part of a survey of common psychiatric disorders in a nationally representative sample of individuals aged ⩾18 years who were non-institutionalized civilians in Taiwan, a face-to-face interview using the paper version of the World Mental Health Survey of the World Health Organization (WHO) Composite International Diagnostic Interview (WMH-CIDI) was conducted between 2003 and 2005. Functional impairment and help-seeking behaviors were compared between Taiwanese subjects with MDD and their counterparts in the USA.

Results. Among the 10 135 respondents, the lifetime prevalence of MDD was 1.20% [standard error (S.E.)=0.2%]. Individuals who were divorced or widowed, aged ⩽40 years, and female were at increased risk, whereas rural residents were at lower risk for MDD. The proportion of MDD cases co-morbid with other psychiatric disorders in this study was much lower than in the US study. Only one-third of Taiwanese individuals with MDD sought help despite having twice the number of lost workdays compared with the US sample.

Conclusions. Despite the low prevalence of MDD in Taiwanese adults, the pattern of low help-seeking behavior and profound functional impairment indicates much room for improvement in the early detection of and intervention in major depression in this population.

Introduction

The prevalence of major depressive disorder (MDD) varies widely across different cultures (Weissman *et al.* 1996; Andrade *et al.* 2003). In the 1980s, the lifetime prevalence of MDD as determined by the Diagnostic Interview Schedule (DIS) ranged from 1.1% in Taiwan to 19% in Beirut (Hwu *et al.* 1996; Weissman *et al.*

1996). In the 2000s, the estimated lifetime prevalence of MDD increased in most countries, but a considerable cross-national variability in the lifetime prevalence of MDD still existed (Weissman *et al.* 1996; Andrade *et al.* 2003; Kessler *et al.* 2003).

When possible explanations for the wide variation in the prevalence of MDD were considered, one intriguing explanation put forward was that the low prevalence might be due to culturally determined response biases, as indicated by the finding of the lower prevalence of a variety of mental disorders in Taiwanese adults compared with their counterparts in the USA (Compton *et al.* 1991). This cultural difference

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was postulated to be accounted for, in part, by oriental 'stoicism', meaning a relatively high tolerance for or denial of emotional sufferings in these cultures (Hwu *et al.* 1996). This was supported by the finding that greater acculturation was associated with a greater tendency to report persistent and impairing depressive episodes among Chinese people living in Australia (Parker *et al.* 2005); however, in the low-prevalence countries, the tolerance for or denial of depressive symptoms was seldom evaluated directly using empirical indicators such as self-rated symptom-related disability or loss of workdays.

Another possible explanation for the wide variation in the estimated prevalence of MDD was that the threshold used to define clinical significance varied among instruments and diagnostic criteria (Regier *et al.* 1998). For example, 53.9% of the MDD cases identified by the DIS in the Epidemiological Catchment Area (ECA) study had sought treatment (Regier *et al.* 1993), whereas the corresponding figure was only 36.4% for those cases diagnosed by the Composite International Diagnostic Interview (CIDI) in the National Comorbidity Survey (NCS; Kessler *et al.* 1999). Furthermore, greater prevalence seemed to be correlated with a lower percentage of help-seeking behaviors (Regier *et al.* 1998). To decrease the impact of varying thresholds for clinical significance (Narrow *et al.* 2002), some standardized instruments for the evaluation of clinical severity, functional impairment and help-seeking behavior were incorporated into the newer versions of diagnostic interview scales such as the World Mental Health Survey of the World Health Organization (WHO) CIDI (WMH-CIDI; Kessler & Ustun, 2004). This provided an opportunity to examine the concept of stoicism relative to depression in the low-prevalence countries.

To do this, we used a mental health survey that included the WMH-CIDI in a nationally representative sample of Taiwanese adults. In addition to determining the prevalence and correlates of MDD in this population, we examined the concept of stoicism by comparing detailed measurements of disability and help-seeking behaviors between the subjects with MDD in Taiwan and their counterparts in the USA.

Method

Participants

The current study was based on the Taiwan Psychiatric Morbidity Survey (TPMS), a survey of common psychiatric disorders in a nationally representative sample of individuals who were aged ≥18 years, available for a face-to-face interview, and were non-institutionalized civilians in Taiwan. Stratified

multistage sampling with the principle of probability proportional to size was used for the TPMS. A comprehensive registration data system in Taiwan ensured a sampling frame of good quality (Spain, 1984). The 26 counties in Taiwan were stratified into seven major geographic clusters (Liu *et al.* 2006). These seven groups were derived through cluster analysis based on five urbanicity-related variables (population density, population ratio of people with educational levels of college or above, population ratio of people over the age of 65, population ratio of agricultural workers, and the number of physicians per 100 000 people), with cluster 1 representing the highest and cluster 7 the least urbanicity. Some clusters were further divided into subclusters according to the level of urbanicity, resulting in a total of 19 urbanicity–homogeneous strata.

In each sampling stratum, we made use of the household registration data updated by the Department of Interior in 2001 as the sampling frame. The primary, secondary, and basic sampling units in our study were township ($n=359$), neighborhood ($n=7758$), and address of the individual household respectively. Once the address of a household was chosen, the Kish Selection Table was applied to select a random respondent living at this address (Kish, 1949). Written informed consent was obtained from each participant after they had received a complete description of the study. The TPMS was approved by the Research Ethics Committee of the National Taiwan University Hospital (NTUH-REC no. 9100205884).

Instruments

In the TPMS, we used the paper version of the WMH-CIDI to collect information to make diagnoses of several common mental disorders and a wide variety of instruments including the Quick Inventory of Depressive Symptomatology (QIDS; Rush *et al.* 2003) and the Sheehan Disability Scale (SDS; Demyttenaere *et al.* 2004; Kessler *et al.* 2004; Kessler & Ustun, 2004) to measure risk factors, clinical severity and functional impairment. The WMH-CIDI is a structured diagnostic interview that was specifically devised for trained interviewers without clinical experience. After its authors granted permission, the WMH-CIDI was translated into a traditional Chinese version by the research team of TPMS. In November 2002, two researchers (including S.-C.L.) went to the Social Survey Institute at the University of Michigan for training in the use of the WMH-CIDI. In assessing the agreement between the original English version and the back translation from the traditional Chinese version, more than 90% of the initially translated items were rated to be excellent or good in the quality of translation.

Reappraisal study

A reappraisal study was conducted with 121 subjects randomly resampled from among the respondents of the WMH-CIDI in the community. These subjects were reinterviewed by trained psychiatrists who were blind to the subjects' diagnoses on the WMH-CIDI and used the Structured Clinical Interview for DSM-IV (SCID-IV) (Tseng *et al.* 2007). With the MDD diagnosis derived from SCID-IV as the standard, the WMH-CIDI-based MDD diagnosis had a sensitivity of 0.64 and a specificity of 0.96. When the MDD diagnoses from the two instruments were evaluated for inter-rater agreement, a Cohen's κ of 0.60 [95% confidence interval (CI) 0.27–0.93] was obtained.

Fieldwork

The fieldwork for the TPMS was conducted between February 2003 and December 2005 as dictated by the funding agency due to yearly budget constraints. To avoid uneven distribution of incident cases during the 3-year study period, we randomly split the entire final sampling units (household addresses) into two parts, with one part set to be finished in the first 18 months, and the other part in the later 18 months.

Interviewers were recruited and received structured training at headquarters and were then dispatched to different regions. The interviewers were primarily college graduates with majors in medicine, public health, social work, psychology, or other health-related specialties. The training program was similar to the one that the seed trainers had attended at the Social Survey Institute at the University of Michigan.

To increase accessibility to community residents, a letter of introduction was sent from the research team to the administrative heads of the sampled neighborhoods asking for their assistance in the fieldwork. Another letter of introduction was sent to the sampled households offering basic information about the survey and the contact methods to be used by interviewers. Participants received an honorarium of NT\$300 (approximate US\$10) after completing the interview.

In addition to the structured training course for the interviewers, several other attempts were made to assure the quality of the fieldwork. First, the major psychiatric departments or institutes located in the selected counties were invited to be in charge of on-site personnel supervision and administrative support. The directors of these institutes were appointed as associate investigators in the study. Second, a company specializing in statistical services (iStat Healthcare Consulting Co. Ltd, Taipei) was contracted for data management. All the manually recorded questionnaires were entered twice using Blaise version 4.6 (Statistics Netherlands), which contained the whole algorithm of WMH-CIDI with an automatic checking mechanism to identify item omissions and unusual responses. The errors and missing information were rechecked, and fieldwork leaders asked the corresponding interviewers to correct the data in the field. Third, a 24-hour hotline was established for interviewers to communicate rapidly with the fieldwork leaders, and meetings to discuss and solve problems encountered during the fieldwork were held regularly. Finally, community respondents were contacted by headquarters by telephone to validate the conduct of the field interviews and confirm key demographic information. A considerable portion of each interviewer's salary was based on the accuracy rate of their field interviews.

Data analysis

Adjustment of sampling probability by post-stratification was performed to approximate the demographic distribution of the sampled subjects to the community population. The results of the Taiwan Household Census in 2000 were used to calculate the probability of selection for subjects belonging to different strata classified by age, sex and educational level. The reverse of the probability of selection was then used as the frequency weight for subsequent analyses.

Diagnostic algorithms for WMH-CIDI in SAS 9.1.2 syntax, provided by Prof. R. Kessler of Harvard Medical School, were used to generate DSM-IV diagnoses for each respondent. The item-total correlation coefficient and Cronbach's α of overall symptoms of MDD syndrome were applied to evaluate the internal consistency of the CIDI section of MDD. Design-based analyses of proportion, cross-tabulation and multi-variable logistic regression analyses were performed using STATA version 10.0 (Stata Corporation, USA). The design of the survey, which included sampling stratification, primary sampling units (township) and frequency weights, was incorporated in the design-based analyses to adjust for the cluster effects of a complex survey. Taylor-series linearization was applied to calculate the standard error of the estimated proportions, ratios and coefficients in the logistic regression analysis.

Results

Representativeness of the sample

The sociodemographic features of the 10 135 participants in this study are shown in Table 1. Females and the elderly were more likely to respond to the

Table 1. *Distribution of sociodemographic features in the sample of the Taiwan Psychiatric Morbidity Survey (n = 10 135), in comparison with that of the Taiwan population in 2000*

Demographic variables	Taiwan Psychiatric Morbidity Survey		Taiwan population in 2000[b] (%)
	Unweighted % (S.E.)	Weighted % wt (S.E.)[a]	
Age (years)			
18–29	10.97 (0.31)	25.94 (0.63)	27.84
30–44	30.81 (0.46)	32.29 (0.77)	34.39
45–59	32.70 (0.47)	21.74 (0.50)	21.51
⩾60	25.52 (0.43)	16.03 (0.67)	16.27
Sex			
Female	53.71 (0.50)	49.44 (0.51)	49.44
Male	46.29 (0.50)	50.56 (0.51)	50.56
Education			
Elementary school and below	33.77 (0.47)	24.60 (1.00)	28.35
Junior high school	41.46 (0.49)	49.14 (0.86)	45.67
Senior high school	13.18 (0.34)	14.21 (0.69)	16.07
College and above	11.58 (0.32)	12.05 (0.92)	19.90
Marital status			
Married	73.34 (0.44)	63.26 (0.64)	62.15
Divorce or widowed	12.93 (0.33)	9.49 (0.36)	8.71
Single	13.73 (0.34)	27.25 (0.64)	29.14
Employment status			
Employed	55.18 (0.49)	58.98 (0.88)	62.06
Unemployed or not in the labor force	44.82 (0.39)	41.02 (0.54)	37.94
Urbanicity			
Urban	19.03 (0.39)	21.03 (0.57)	23.18
Suburban	53.23 (0.50)	54.00 (0.62)	49.53
Rural	27.74 (0.44)	24.97 (0.48)	27.29

S.E., Standard error.

[a] Estimated percentages were derived using design-based analysis of complex survey data with frequency weighting and information about stratum and primary sampling units, and variances were estimated using the Taylor series linearization method.

[b] Obtained from the Taiwan Population Census carried out in 2000.

survey, but their weighted proportions using post-stratification weighting were equivalent to those of the whole population. Based on the weighted percentage, our sample was representative of the Taiwanese population in 2000. About 1.7% (S.E. = 0.4%) of the respondents in this study considered themselves as belonging to an ethnic minority in Taiwan.

Psychometric properties of the MDD symptoms in the CIDI

Cronbach's α, a measure of internal consistency, of overall items for the MDD symptoms in the CIDI was 0.95 in this study. Table 2 displays the prevalence and the item-total correlation coefficient of individual MDD symptoms in our sample along with their counterparts from the NCS in the USA and the ECA study in South Korea (Chang *et al.* 2008). The results reveal that the prevalences of individual MDD symptoms in this study were the lowest, followed by those in the Korean study, and those in the US study were the highest. Nevertheless, the item-total correlation coefficients in this study, ranging from 0.60 to 0.91, were comparable to those in the two previous studies (ranging from 0.64 to 0.78 for the US population, and from 0.61 to 0.90 for the Korean population).

MDD and its correlates

Among the respondents, 109 had ever had symptoms meeting the diagnostic criteria for MDD according to DSM-IV. The lifetime prevalence was 1.20%

Table 2. *Prevalence and internal consistency of nine symptoms of DSM-IV major depressive disorder* (MDD) *in the Taiwan Psychiatric Morbidity Survey* (TPMS), *the National Comorbidity Survey* (NCS)[a] *and the Korean Epidemiologic Catchment Area Study* (KECAS)[a]

DSM-IV-defined symptoms of MDD	Prevalence of positive responses (%)			Item-total correlation coefficient		
	TPMS	NCS	KECAS	TPMS	NCS	KECAS
Appetite/weight	1.6	36.7	7.2	0.88	0.72	0.83
Concentration	1.7	28.8	8.6	0.87	0.74	0.90
Depressed mood	2.1	49.2	7.8	0.91	0.71	0.79
Guilt/worthless	0.9	22.0	4.6	0.69	0.65	0.66
Low energy	1.4	31.9	7.9	0.84	0.74	0.87
Loss of interest	2.0	38.8	7.6	0.82	0.68	0.80
Psychomotor change	0.6	20.9	3.6	0.60	0.64	0.61
Sleep disturbance	1.8	36.2	7.5	0.91	0.78	0.86
Thought of death	1.4	35.2	4.6	0.80	0.69	0.68

[a] The data from the NCS in the USA and the KECAS in South Korea were adapted from Chang *et al.* (2008).

Table 3. *Sociodemographic correlates of lifetime DSM-IV major depressive disorder* (MDD) *in the sample from the Taiwan Psychiatric Morbidity Survey* (n = 10 135)

Variable	Respondents		Subjects with MDD		
	n	%wt (s.e.)[a]	*n*	%wt (s.e.)[a]	Adjusted OR (95% CI)
Age (years)					
⩽40	3227	51.86 (0.87)	51	1.56 (0.28)	1.00
>40	6908	48.14 (0.87)	58	0.82 (0.14)	0.49 (0.26–0.92)*
Sex					
Female	5444	49.44 (0.53)	72	1.59 (0.26)	1.00
Male	4691	50.56 (0.53)	37	0.82 (0.14)	0.54 (0.35–0.85)*
Education level					
Junior high and below	7625	73.74 (1.10)	66	1.04 (0.20)	1.00
Senior high and above	2510	26.26 (1.10)	43	1.65 (0.34)	1.28 (0.66–2.50)
Marital status					
Married	7433	63.26 (0.59)	62	0.77 (0.12)	1.00
Divorce or widowed	1310	9.49 (0.33)	25	2.77 (0.82)	4.34 (2.18–8.63)**
Single	1392	27.25 (0.59)	22	1.65 (0.37)	1.47 (0.88–2.44)
Employment status					
Employed	5592	58.98 (0.88)	62	1.19 (0.18)	1.00
Unemployed or not in the labor force	4543	41.02 (0.88)	47	1.22 (0.37)	0.96 (0.59–1.57)
Urbanicity					
Urban	1929	21.03 (4.16)	22	1.65 (0.49)	1.00
Suburban area	5395	54.00 (4.46)	69	1.30 (0.21)	0.78 (0.38–1.60)
Rural	2253	24.97 (3.12)	18	0.61 (0.20)	0.40 (0.16–1.00)*
Trend test of urbanicity[b]					*p* = 0.06

s.e., Standard error; OR, odds ratio; CI, confidence interval.

[a] Estimated percentages were derived using design-based analysis of complex survey data with frequency weighting and information about stratum and primary sampling units.

[b] Using multiple logistic regression with recoded level of urbanicity (urban = 0, suburban = 1, rural = 2).

* *p* < 0.05, ** *p* < 0.01.

(s.e. = 0.2%). If only symptoms in the past year were counted, 46 met the criteria and this resulted in a 12-month prevalence of 0.6% (s.e. = 0.1%), with the ratio of this to lifetime prevalence being around 0.5.

Table 3 shows the sociodemographic correlates of lifetime MDD in our sample. The results of multivariable logistic regression analysis revealed that individuals who were divorced or widowed, aged

Table 4. *Co-morbidity of DSM-IV major depressive disorder (MDD) with other DSM-IV mental disorders in this study versus the US National Comorbidity Survey Replicated (NCS-R)*[a]

	Taiwan Psychiatric Morbidity Survey (TPMS)			US National Comorbidity Survey Replicated (NCS-R)		
Type of co-morbid condition	Anxiety disorders[b] % wt (95 % CI)[e]	Substance use disorders[c] % wt (95 % CI)	Impulse control disorders[d] % wt (95 % CI)	Anxiety disorders % (95 % CI)	Substance use disorders % (95 % CI)	Impulse control disorders % (95 % CI)
Lifetime co-morbidity	23.1 (12.1–34.1)	15.0 (6.6–23.4)	7.2 (1.7–12.7)	59.2 (56.2–62.1)	24.0 (21.8–26.2)	30.0 (27.9–32.1)
12-month co-morbidity	23.7 (10.8–36.6)	10.5 (0.3–20.7)	10.5 (1.0–20.1)	67.8 (63.6–72.0)	27.1 (23.1–31.1)	37.3 (33.8–40.8)
Temporal priority of MDD	20.5 (9.3–31.7)	37.7 (23.2–52.2)	28.6 (17.0–40.2)	13.7 (11.0–18.8)	41.3 (35.5–47.1)	16.9 (12.5–21.3)

CI, Confidence interval.

[a] Adapted from the data reported by Kessler *et al.* (2003).

[b] Including panic disorder, generalized anxiety disorder, phobias (specific, social and agoraphobia) and post-traumatic stress disorder.

[c] Including alcohol or drug abuse and dependence.

[d] Including intermittent explosive disorder and conduct disorder.

[e] Estimated percentages were derived using design-based analysis of complex survey data with frequency weighting and information about stratum and primary sampling units.

$\leqslant$40 years, and female were at significantly increased risk for MDD during their lifetime. Rural residents had a significantly lower risk for MDD in their lifetime, with the trend of decreasing risk for MDD with decreasing level of urbanicity reaching borderline significance ($p = 0.06$).

Psychiatric co-morbidity

For individuals with lifetime MDD, 35% reported at least one additional lifetime DSM-IV psychiatric diagnosis as revealed by the WMH-CIDI. Table 4 shows the types of conditions co-morbid with MDD, in comparison with the corresponding results in the US National Comorbidity Survey Replicated (NCS-R; Kessler *et al.* 2003). For lifetime co-morbidity, the most prevalent psychiatric co-morbid condition was anxiety disorders (23%), followed by substance use disorders (15.0%) and impulse control disorders (7.2%), whereas for 12-month co-morbidity, the corresponding frequency remained similar for anxiety disorders, but decreased for substance use disorders and increased for impulse control disorders. These proportions were much lower than in the US study, particularly for anxiety disorders (59.2–67.8%). In terms of temporal priority of MDD, that is the situation where MDD occurred prior to the onset of co-morbid psychiatric diagnoses, the proportion ranged from 20.5% to 37.7%, indicating that the majority of co-morbid psychiatric diagnoses of individuals with MDD in this study tended to occur before the onset of MDD. A similar pattern was found in the US study.

Functional impairment and help-seeking behaviors

For subjects with an episode of MDD within the past year, their distributions in three SDS categories are displayed in Table 5. The percentages of those having no impairment to mild impairment on the SDS tended to be the highest in individual role domains, with 38.5% in the domain of home, 53.3% at work, 37.7% in relationships, and 42.5% in social function. The corresponding percentages of those having severe to very severe impairment were 25.1, 19.0, 38.5 and 35.7% respectively. In terms of overall role impairment (i.e. the highest category of severity across all four SDS role domains), those having severe to very severe impairment (58.4%) became the majority. In comparison, for individual domains, the percentage of those having severe to very severe impairment in the US study was higher than that of the counterparts in our sample except in the domain of relationships; however, in terms of overall severity of functional impairment, the percentage of those with a more severe category of impairment in the US study was only slightly higher than that in this study.

In terms of lost workdays, those with MDD in Taiwan reported more days of such loss, ranging from 5.8 for no impairment to mild impairment to 61.3 for those with severe impairment. These were longer than the counterparts in the US study, ranging from 2.1 to 53.5 (Table 5). Overall, MDD cases reported a mean of 74.9 lost workdays (S.E. = 31.1) in this study, much more than in the US study (35.2 days, S.E. = 4.3). If stratified by urbanicity, the mean workday loss of

Table 5. *Past 12-month DSM-IV major depressive disorder (MDD)-associated disability measured using the Sheehan Disability Scale (SDS) and the mean number of days out of role due to major depression in the past 12 months*

Variable	Taiwan Psychiatric Morbidity Survey (No. of MDD cases = 46; %wt = 0.6%)			US National Comorbidity Survey Replicate[a] (No. of MDD cases = 622; %wt = 6.6%)		
	MDD cases in SDS category, % (s.e.)[b]			MDD cases in SDS category, % (s.e.)		
	None to mild	Moderate	Severe to very severe	None to mild	Moderate	Severe to very severe
Domains of role impairment						
Home	38.5 (8.1)	36.4 (8.1)	25.1 (7.6)	32.0 (2.1)	34.8 (2.4)	33.2 (2.2)
Work	53.3 (7.3)	27.6 (7.8)	19.0 (7.6)	46.3 (2.1)	25.6 (1.8)	28.1 (1.5)
Relationships	37.7 (9.4)	23.8 (11.2)	38.5 (10.2)	36.7 (2.1)	29.0 (1.7)	34.3 (1.6)
Social	42.5 (8.1)	21.9 (7.0)	35.7 (9.0)	28.8 (1.7)	27.7 (1.9)	43.4 (1.8)
Overall[c]	14.9 (6.7)	26.7 (7.6)	58.4 (9.0)	12.6 (1.2)	28.1 (2.3)	59.3 (1.9)
Workdays lost in the past year,[d] mean (s.d.)	5.8 (2.5)	51.2 (32.7)	61.3 (31.6)	2.1 (1.3)	11.4 (6.0)	53.52 (9.6)

s.e., Standard error; s.d., standard deviation.

[a] Adapted from the data reported by Kessler *et al*. (2003).

[b] The means and proportions were estimated using design-based analysis of survey data and variances were calculated using Taylor's series linearization.

[c] Highest severity category across all four SDS role domains.

[d] Mean number of days out of role due to depression in the past year.

MDD patients from urban, suburban and rural Taiwan was 27.4 (s.e. = 26.9), 50.3 (s.e. = 16.9) and 169.6 days (s.e. = 70.5) respectively.

When asked if they had ever sought professional help such as mental health, general medical, health care, human services, or complementary/alternative medicine, only 20.0% of 46 subjects with MDD in the past year had done so. Among the 31 subjects with MDD who also completed the QIDS, their symptom severity was classified as mild in seven (23%) and moderate or above in 24 (77%), and their frequencies of ever seeking professional help were 0% and 21.7% respectively. As to the reason for not seeking treatment among the subjects with MDD, low perceived need (68.9%) was the most common one, followed by structured barriers (7.4%) and attitudinal/evaluative barriers (6.2%).

Discussion

This survey of mental health in a nationally representative sample of the adult population in Taiwan, the first one of its sort in the country, has shown that the estimated lifetime prevalence of MDD is relatively low, whereas some correlates, such as being divorced or widowed, female, and aged <40 years, are similar to those found in previous studies in Taiwan (Hwu *et al*. 1996) and other countries as well (Weissman *et al*.

1996; Andrade *et al*. 2003; Kessler *et al*. 2003). A unique feature of the subjects with MDD in this study was that they had a high loss of workdays and a low likelihood of seeking professional help during the episode of illness. Furthermore, the increased risk of MDD for people living in urban areas was in the opposite direction to the trend found in a previous study (Hwu *et al*. 1989). These findings may help to shed light on our understanding of the cross-cultural differences in the development of MDD and the relevant detection and intervention strategies for the general population.

The finding of a low prevalence of MDD in this study is similar to that in the previous study by Hwu *et al*. (1989). This is contrary to the much higher prevalence of MDD found in industrialized countries (Kessler *et al*. 1994, 2003; Weissman *et al*. 1996; Andrade *et al*. 2003). One possibility for the low estimated prevalence of MDD might be related to the quality of sampling design and fieldwork. For comparison, we obtained a very close estimate for the prevalence of current tobacco smokers to that found in another face-to-face community household survey (the National Health Interview Survey, NHIS) in Taiwan (Wen *et al*. 2005). In our study, the prevalence of current tobacco smokers was 46.5% (s.e. = 0.9%) for males and 7.0% (s.e. = 0.6%) for females. The corresponding estimates were 46.8% (s.e. = 0.6%) for males and 4.3% (s.e. = 0.2%) for females in the NHIS. As the

sampling designs of TPMS and NHIS were almost identical, the similarity in the estimates of the prevalence of tobacco use indicated that this survey was able to reach a representative sample of the national population to the same extent that a national survey of physical health did.

A second possibility for the low prevalence of MDD was that the prevalence of MDD-related risk factors remained low over the decades; however, this is not supported by empirical data. For example, the rate of divorce, which has been a potent risk factor for MDD in community studies, increased from 2% in the 1980s to 5% in the 2000s in Taiwan. In terms of other risk factors for MDD, the presence of anxiety disorders (Fava *et al.* 2000) and also the temporal relationship between MDD and other co-morbid mental disorders in this study were comparable to the US survey (Kessler *et al.* 2003); however, the proportion of MDD cases co-morbid with other psychiatric disorders in this study was much lower than in the US study. This is consistent with previous findings that the lifetime prevalence rates for common psychiatric illnesses in Taiwan were generally lower than those in the USA (Compton *et al.* 1991).

A third possibility for the low prevalence of MDD in the Taiwanese population is cultural stoicism (Compton *et al.* 1991). This suggests that when a Western-designed structured diagnostic interview is applied to people who tend to repress their feelings, the culturally determined 'response bias' may lead to a lower estimate of the prevalence of emotional problems. The MDD cases in our study exhibited many features compatible with this characterization of stoicism. Indeed, the MDD cases in our study reported a much longer period of being unable to carry out daily activities than did their counterparts in the USA, despite the similarity in the distribution of severity in self-rated functional impairment by SDS scores. Another study in a Korean population also found higher workday loss to be associated with lower prevalence of MDD (Chang *et al.* 2008), further illustrating the influence of a diagnostic threshold for cross-cultural differences in the prevalence of MDD.

Furthermore, Taiwanese adults' stoicism was reflected in their much lower percentage of help-seeking behaviors as compared to their counterparts in US studies. In Taiwan, only 20% of MDD cases sought help, whereas the corresponding figure was 57.3% in the US NCS (Kessler *et al.* 2003). Even after stratification by severity, the percentages of MDD cases ever seeking professional help in this study (0% for mild severity and 21.7% for moderate severity or above) remained much lower than their counterparts in the US study, 35.2% for those with mild severity and 54.6–70.5% for those with moderate severity or above

(Kessler *et al.* 2003). Consistent with this picture of stoicism, the 1-year prevalence of MDD based on the claims data from the national health insurance system in Taiwan was found to be 0.35% (Chien *et al.* 2004). The tendency that low prevalence of MDD is accompanied by low help-seeking behavior is found not only in Taiwan but also in China, Korea and Japan (Naganuma *et al.* 2006; Lee *et al.* 2007; Chang *et al.* 2008). The picture of cultural stoicism is also supported by the finding that the percentage of MDD cases who reported low perceived need as the reason for not seeking professional help in this study (68.9%) was higher than the 25.9% reported in the US NCS-R (Mojtabai *et al.* 2011). These findings are compatible with a commonly held belief that stoical people are more likely to be indifferent to pain and sufferings. However, the stigma of mental disorder does not seem to be a major barrier to seeking help for MDD patients in this study (e.g. only 6.2% due to attitudinal/ evaluative barriers). Our findings seem to lend more direct support to the cultural stoicism rather than the social stigma, two possibilities proposed in an earlier study (Compton *et al.* 1991), as the explanation of the low prevalence of MDD in Taiwan. However, what remains unknown is whether cultural stoicism also applied to those people who did not meet the criteria of MDD in the past year or people with physical distress because such information was not required in the CIDI. Taken together, there is much room for improvement in raising the Taiwanese public's awareness about major depression and encouraging their willingness to seek professional help.

Regarding the degree of urbanicity, our results revealed that more advanced urbanicity was associated with a greater risk for MDD, even after adjustment for age. This pattern linking urbanicity and depression is different from the results of an earlier survey (Hwu *et al.* 1989), which found that suburban dwellers were at a higher risk for MDD than were urban and rural residents in Taiwan. A possible explanation for this was that individuals in suburban areas might have experienced more stress due to transition and migration during the era of rapid urbanization in the 1980s in Taiwan. Given that the trend toward urbanization has been slowing down since the early 2000s (Liu & Tung, 2003), the increased risk for MDD, particularly for suburban dwellers, might then be diminished. Another explanation might lie in the reverse relationship between urbanicity and the mean of workday loss, with MDD patients from suburban/ rural Taiwan reporting much higher workday loss than their counterparts from urban areas. Intriguingly, the workday loss of MDD patients who lived in urban Taiwan is similar to that reported in a previous survey in metropolitan China (Lee *et al.* 2009), which was

limited to residents of Beijing and Shanghai. To some extent, increasing urbanicity might lead to decreasing cultural stoicism among Asian populations, and hence less tolerance of the mental suffering and higher prevalence of MDD. Further investigation of the mechanisms that link the degree of urbanicity and risk of lifetime MDD is warranted (Weich, 2005).

There are limitations to this study. First, our results were based on self-reported psychopathology, which is subject to recall bias. Second, even though the response rate of this study (66.07%) was close to the average at other sites of the WMH survey (45.9–87.7%), some selective non-response might have been associated with other psychiatric morbidity and hence account, in part, for the decrease in the estimated prevalence of MDD (Kessler *et al.* 1995; Demyttenaere *et al.* 2004). Furthermore, our sampling method spontaneously excluded, for example, those who lived in military institutes, prisons, chronic care units, or boarding schools. Third, because of the small number of cases, we analyzed only those cases with diagnostic agreement with regard to a major depressive episode in our reappraisal study. This is a common limitation encountered at other research sites in the WMH survey in developing countries (Lee *et al.* 2007; Nock *et al.* 2009). Fourth, because cultural stoicism is not a psychometrically well-defined construct, we did not have a direct measurement of it. Whether the pattern of low help-seeking behavior and profound functional impairment is attributed to elevated threshold or decreased expression of emotional distress (Janal, 1996) requires further investigation. Finally, the paper version of the WMH-CIDI did not contain the diagnoses of obsessive–compulsive disorder, eating disorders, antisocial personality disorder, oppositional defiant disorder, and pathological gambling, which were included in the computer-assisted version of the WMH-CIDI used in the NCS-R (Kessler *et al.* 2003). This might have influenced the accuracy in comparing co-morbidity between Taiwan and the USA.

In conclusion, this national survey revealed that the prevalence of MDD in Taiwanese adults was stable at the lower end of the spectrum worldwide over the past two decades. Our data provided indirect support for the concept of stoicism as an explanation for the culturally determined response bias that might account for the low prevalence rate of MDD among Taiwanese adults, particularly the lower rate of help-seeking behaviors by individuals with MDD despite their greater loss of workdays when compared with their counterparts in the USA. These findings indicate that there is much room for improvement in the early detection of and intervention in major depression in Taiwan.

Appendix

The TPMS was co-investigated by the following researchers (in alphabetic order): Dr C.-J. Chang, Department of Psychiatry, Cathay General Hospital; Dr T.-J. Chang, Tsaotun Psychiatric Center, Department of Health; Dr C.-C. Chen, Department of Psychiatry, Chung-Ho Memorial Hospital, Kaohsiung Medical University; Dr C.-C. Chen, Pfizer Pharmaceutical Company; Dr C.-H. Chen, National Health Research Institutes; Dr H. Chen, Hospital Administration Commission, Department of Health; Dr H.-S. Chen, Institute of Preventive Medicine College of Public Health, National Taiwan University; Dr T.-L. Chiang, National Taiwan University, College of Public Health; Dr P.-C. Fan, Faculty of Medicine at National Yang-Ming University; Dr S. S.-F. Gau, Department of Psychiatry, National Taiwan University Hospital; Dr H.-G. Hwu, Department of Psychiatry, National Taiwan University Hospital; W.-C. Liu, Yuli Veterans Hospital; Dr R.-B. Lu, Department of Psychiatry, National Cheng Kung University Hospital; Dr W.-C. Ouyang, Department of Geriatric Psychiatry, Jianan Mental Hospital, Department of Health; Dr W.-T. Soong, St. Joseph's Hospital, Department of Psychiatry, National Taiwan University Hospital; Dr T.-P. Su, Department of Psychiatry, Taipei Veterans General Hospital; Dr H. K.-L. Tan, Taoyuan Mental Hospital, Department of Health; Dr S.-H. Tu, Office of Survey Research, Academia Sinica; Dr J.-K. Wen, Department of Psychiatry, Tsyr-Huey Mental Hospital; and Dr T.-T. Yang, Department of Psychiatry, Cardinal Tien Hospital.

Acknowledgments

Declaration of Interest

None.

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