Changing trends in the prevalence of common mental disorders in Taiwan: a 20-year repeated cross-sectional survey

Tiffany Szu-Ting Fu, Chau-Shoun Lee*, David Gunnell, Wen-Chung Lee, Andrew Tai-Ann Cheng*

Summary

Background Macrosocial changes might affect mental health. We investigated whether the prevalence of common mental disorders (CMDs) changed over a 20-year period of industrialisation in Taiwan.

Methods We used the 12-item Chinese Health Questionnaire to assess mental status of Taiwanese adults in 1990, 1995, 2000, 2005, and 2010. Respondents with scores of 3 or higher were classified as having probable CMDs. We assessed trends of probable CMDs with the Cochran-Armitage test and their risk factors (sex, age, marital status, educational level, employment status, and physical health) with multivariable logistic regression. The trends were compared with national rates of unemployment, divorce, and suicide.

Findings Of 10 548 respondents, 9079 (86·1%) completed questionnaires. The prevalence of probable CMDs doubled from 11·5% in 1990 to 23·8% in 2010 (time trend p<0·001). Increases paralleled rises in national rates of unemployment, divorce, and suicide at all five timepoints. Significant risk factors for probable CMDs were female sex (adjusted odds ratio 1·6, 95% CI 1·4–1·8), 6 or fewer years of education (1·3, 1·1–1·5), unemployment (1·4, 1·1–1·7), and poor physical health that limited daily activities (6·5, 5·4–8·0). When we controlled for these factors in multivariable models, the time trends remained significant (p<0·0001).

Interpretation National rates of unemployment, divorce, and suicide increased in parallel with prevalence of probable CMDs in Taiwan. Therefore, clinical and social preventive measures both seem important during times of change to the economy and labour market.

Funding Taiwan National Science Council.

Lancet 2013; 381: 235–41

Published Online
November 12, 2012
http://dx.doi.org/10.1016/S0140-6736(12)61264-1

See Comment page 185

*TS-TF and C-SL contributed equally to the writing of the paper

Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan (T S-T Fu PhD); **Taipei Municipal University of Education, Taipei, Taiwan** (T S-T Fu); **Department of Psychiatry, Mackay Memorial Hospital, Taipei, Taiwan** (C-S Lee MD); **Kainan University, Taoyuan and Mackay Medical College, New Taipei City, Taiwan** (C-S Lee); **School of Social and Community Medicine, University of Bristol, Bristol, UK** (Prof D Gunnell PhD); **Research Centre for Genes, Environment and Human Health and Institute of Epidemiology and Preventive Medicine, College of Public Health, National Taiwan University, Taipei, Taiwan** (Prof W-C Lee PhD); **and Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan** (Prof A T-A Cheng FRCPsych)

Correspondence to:
Prof Andrew Tai-Ann Cheng, Institute of Biomedical Sciences, Academia Sinica, No 128, Section 2, Academia Road, Nankang, Taipei 11529, Taiwan
bmandrew@gate.sinica.edu.tw

Introduction

The term common mental disorders (CMDs) is a broad diagnostic category for non-psychotic, depressive, and anxiety disorders that covers most psychiatric morbidity in the general population.[1] CMDs lead to substantial morbidity worldwide. WHO estimates that depression will be the leading cause of disability-adjusted life years by 2020.[2] Whether the prevalence of CMDs is increasing in industrialised nations[3–6] and the extent to which trends in population mental health are reflected by trends in suicide have been debated.

Studies of trends in the prevalence of CMDs worldwide have yielded inconsistent findings. Changes in socioeconomic characteristics of different countries over time might contribute to discrepancies between studies. Research has also been limited to local communities[3] and analysis of trends over short time periods.[6] Increasing prevalence of CMDs was reported from the 1970s to the 1990s in countries as diverse as India and the Netherlands,[3,4] whereas later assessments in the UK and Australia showed no notable changes or falls in prevalence of CMDs and major depression.[5,6] The upward trends in prevalence might have been due to changes in attitudes to mental health because of increasing public awareness and in diagnostic criteria owing to so-called medicalisation of CMDs.[7] Another possibility is that social, economic, and employment changes related to industrialisation brought about increased feelings of stress and anxiety.[8] Increased frequency of CMDs has been reported in women, unemployed or unmarried individuals, and in people who have low levels of education or who are in poor physical health.[9–11] Moreover, macrosocial factors, such as economic instability and income inequality are proposed to increase the risk of CMDs.[12]

Since the 1990s, Taiwan, which has a population of 23 million, has experienced a rapid transformation in its economy, and a predominantly labour-intensive production base has moved towards capital-intensive, high-technology production. Despite economic growth, the rapid industrialisation has led to reduced employment, particularly among low-skilled workers,[13] and increased inequality, although less markedly so than in South Korea and Thailand, two of the region's other emerging economies.[14] Similar rapid economic growth is occurring in countries such as Brazil, China, India, Poland, Russia, and Turkey,[15] but whether population mental health has been affected has received little attention.[16]

In 1983, the Taiwan Social Change Survey (TSCS)[17] was established by a team of social scientists. Questionnaires were administered every 5 years to assess changes in economic attitudes, family, globalisation, national identity, political participation, social networks, and social problems. From 1990, a mental health section was included in the TSCS survey. Here we report the secular trends in the prevalence of CMDs and their associations with social trends in Taiwan.

Panel 1: The 12 items in the CHQ

Score as follows: not at all, 0; same as usual, 0; rather more than usual, 1; or much more than usual, 1[24]

Have you recently:

- CHQ 01* Been suffering from headache or pressure in your head?
- CHQ 02* Had palpitations and worried that you might have heart trouble?
- CHQ 03* Had discomfort or a feeling of pressure in your chest?
- CHQ 04* Been suffering from shaking or numbness of your limbs?
- CHQ 05† Lost much sleep over worry?
- CHQ 06† Been taking things hard?
- CHQ 07* Been getting along well with your family or friends?
- CHQ 08† Been losing confidence in yourself?
- CHQ 09† Been feeling nervous and strung-up all the time?
- CHQ 10† Been feeling hopeful about your future?
- CHQ 11* Been worried about your family or close friends?
- CHQ 12† Felt that life is entirely hopeless?

CHQ=Chinese Health Questionnaire. *Item specifically designed for CHQ. †Items taken directly from the General Health Questionnaire.[24]

Methods

Administration of questionnaires

The methodology of the TSCS has been described in detail elsewhere.[17] In brief, the 12-item Chinese Health Questionnaire (CHQ-12)[18,19] was administered every 5 years from 1990 to 2010 to representative samples of Taiwanese citizens aged 18 years and older in 358 townships, cities, and villages. A new group of respondents was randomly selected each time by methods of clustering and systematic sampling. Specifically, the 358 townships and cities were separated into six clusters. The number of target respondents was estimated each time the questionnaire was administered, according to the size of populations in the townships and cities as the primary sampling unit and then in villages and down to individuals. Sampling was weighted by sex, age, urban setting, and education to match the characteristics of the general population of Taiwan. Ethics approval for the TSCS was obtained from the Taiwan National Science Council. All respondents gave oral informed consent to participate before interviews were started.

The CHQs were administered between July and August in 1990, 1995, 2000, 2005, and 2010. Responses were recorded in face-to-face interviews by trained interviewers. Follow-up interviews were done by telephone with a

	1990 (n=2247)		1995 (n=1777)		2000 (n=1588)		2005 (n=1583)		2010 (n=1884)		*Z* score†
	Total respondents	CHQ-12 score ≥3 (%)*	Total respondents	CHQ-12 score ≥3 (%)*	Total respondents	CHQ-12 score ≥3 (%)*	Total respondents	CHQ-12 score ≥3 (%)*	Total respondents	CHQ-12 score ≥3 (%)*	
Sex											
Male	1073	104 (9·7%)	941	116 (12·3%)	800	112 (14·0%)	782	162 (20·7%)	971	189 (19·5%)	7·6‡
Female	1174	154 (13·1%)	836	169 (20·2%)	788	187 (23·7%)	801	244 (30·5%)	913	259 (28·4%)	9·9‡
Age (years)											
18–34	1035	104 (10·0%)	561	83 (14·8%)	367	69 (18·8%)	221	60 (27·1%)	598	145 (24·2%)	8·5‡
35–39	856	102 (12·0%)	727	118 (16·2%)	687	128 (18·6%)	612	145 (23·7)	531	130 (24·5%)	7·0‡
50–64	356	52 (14·6%)	289	50 (17·3%)	312	59 (18·9%)	462	120 (26·0%)	500	118 (23·6%)	4·1‡
≥65	No data	No data	200	34 (17·0%)	222	43 (19·4%)	288	81 (28·1%)	255	55 (21·6%)	1·8
Marital status											
Single	457	54 (11·8%)	290	54 (18·6%)	208	29 (13·9%)	154	39 (25·3%)	581	130 (22·4%)	4·5‡
Married	1690	186 (11·0%)	1352	197 (14·6%)	1198	228 (19·0%)	1258	311 (24·7%)	1092	251 (23·0%)	10·7‡
Previously married	100	18 (18·0%)	135	34 (25·2%)	182	42 (23·1%)	171	56 (32·7%)	211	67 (31·8%)	3·0§
Education level¶											
>6 years	1530	160 (10·5%)	1147	157 (13·7%)	1106	193 (17·5%)	1077	234 (21·7)	1319	308 (23·4%)	10·4‡
≤6 years	717	98 (13·7%)	630	128 (20·3%)	482	106 (22·0%)	506	172 (34·0%)	565	140 (24·8%)	6·8‡
Employment status											
Employed	1707	187 (11·0%)	1331	207 (15·6%)	1113	204 (18·3%)	1054	258 (24·5%)	1319	296 (22·4%)	10·0‡
Unemployed	49	9 (18·4%)	69	20 (29·0%)	78	15 (19·2%)	76	33 (43·4%)	127	43 (33·9%)	2·5‖
Other	491	62 (12·6%)	377	58 (15·4%)	397	80 (20·2%)	453	115 (25·4%)	438	109 (24·9%)	5·9‡
Poor health with limitation in daily activities											
No	2175	221 (10·2%)	1665	233 (14·0%)	1511	259 (17·1%)	1482	335 (22·6%)	1762	366 (20·8%)	11·0‡
Yes	72	37 (51·4%)	112	52 (46·4%)	77	40 (51·9%)	101	71 (70·3%)	122	82 (67·2%)	3·7§

CHQ-12=12-item Chinese Health Questionnaire. *Indicates probable cases of common mental disorders. †Cochran-Armitage trend test. ‡p<0·001. §p<0·01. ¶Primary school education (6 years' duration) starts at age 6 years in Taiwan. ‖p<0·05.

Table 1: **Prevalence of common mental disorders in relation to major sociodemographic and physical health variables among adults in Taiwan, 1990–2010**

random sample of participants to assess validity of the data. One investigator (AT-AC) trained all interviewers on the mental health section.

Assessment of common mental disorders

The CHQ-12 has been widely used in Chinese populations worldwide.[20–23] The items in the CHQ-12 were selected from the 30-item General Health Questionnaire (GHQ)[24] and an additional 30 newly generated items designed to be relevant to the presentation of CMDs in Chinese populations. We used discriminant function analysis on data collected from a community survey in Taiwan[25] to select six items from the GHQ and six from the specifically designed items (panel 1). The CHQ-12 was scored in the same way as the GHQ, where scores of 0 or 1 are assigned to the responses (panel 1).[24] We classified respondents with total CHQ-12 scores of 3 or more as being likely to have CMDs. Thus, in relation to the study, we term these cases probable CMDs. This cutoff score is supported by two validation studies, one in primary care patients in Taiwan[26] and the other in a Chinese community in Brazil.[13] For diagnosis of anxiety and depressive disorders as classified in the 10th revision of the International Classification of Diseases,[27] the sensitivity, specificity, and positive predictive value were 87%, 77%, and 67% in the Taiwan study[26] and 75%, 71%, and 86% in the Brazil study,[13] respectively.

Sociodemographic and health-related risk factors

We obtained data for specific sociodemographic risk factors from the TSCS databank and converted them into categorical variables. We assessed sex (male or female), age (18–34, 35–49, 50–64 or 65 years or older), marital status (single, married, or previously married [ie, divorced or widowed]), educational level (more than 6 years or 6 years or less), employment status (employed, unemployed, or other). To obtain information on the overall physical health of respondents, one item in the mental health section of TSCS questionnaire asked whether daily activities (studying, working, housekeeping, etc) had been greatly limited by any physical illness in the past 2 weeks.

Additionally, we compared trends in the prevalence of probable CMDs with those of specific macrosocial and health indices. At the time of each survey we retrieved national data on rates of divorce, suicide, and unemployment.[28–30]

Statistical analyses

Statistical analyses were done with SAS (version 9.2) and SPSS (version 18). The Cochran-Armitage trend test was used to assess time trends in prevalence of probable CMDs across surveys. A multivariable logistic regression model was used to investigate whether risk factors were independently associated with probable CMDs. The results are reported as odds ratios (OR) and 95% CI.

Because of the 5-year intervals between surveys, we separated respondents into 11 birth cohorts based on respondents' birth years. We did an age-period-cohort analysis to investigate whether the prevalence of probable CMDs was affected by the respondents' age, the survey year, or the year of birth. We used the method of Osmond and Gardner (incidence, Poisson distribution)[31] with modification to reflect the binomial distribution of probable cases (prevalence).

We also did a series of sensitivity analyses by calculating potential (hypothetical) prevalence rates of probable CMDs to investigate whether time trends were limited to any particular group or groups of the sociodemographic and health risk factors. To calculate prevalence values we reduced the observed risks of individual factors to their minimum levels (appendix).[32] For example, in the calculation of the potential prevalence of probable CMDs in relation to employment status, we assumed that the risk would be lowest if all respondents were employed.

See Online for appendix

	Crude odds ratio (95% CI)	Adjusted odds ratio† (95% CI)
Survey year‡		
1990	1·0	1·0
1995	1·5 (1·2–1·8)§	1·4 (1·2–1·7)§
2000	1·8 (1·5–2·1)§	1·8 (1·5–2·2)§
2005	2·7 (2·2–3·2)§	2·8 (2·3–3·3)§
2010	2·4 (2·0–2·8)§	2·4 (2·0–2·9)§
Sex		
Male	1·0	1·0
Female	1·6 (1·5–1·8)§	1·6 (1·4–1·8)§
Age (years)		
18–34	1·0	1·0
35–49	1·1 (1·0–1·3)	1·0 (0·8–1·2)
50–64	1·3 (1·1–1·5)§	0·9 (0·7–1·1)
≥65	1·4 (1·2–1·7)§	0·7 (0·6–1·0)¶
Marital status		
Single	1·0	1·0
Married	1·0 (0·9–1·1)	1·0 (0·8–1·2)
Previously married	1·7 (1·4–2·1)§	1·2 (0·9–1·5)
Educational level		
>6 years	1·0	1·0
≤6 years	1·4 (1·2–1·6)§	1·3 (1·1–1·5)§
Employment status		
Employed	1·0	1·0
Unemployed	2·0 (1·6–2·5)§	1·4 (1·1–1·7)‖
Other	1·1 (1·0–1·3)¶	0·8 (0·7–0·9)‖
Poor health with limitation in daily activities		
No	1·0	1·0
Yes	7·0 (5·8–8·4)§	6·5 (5·4–8·0)§

*Indicated by scores of ≥3 on the 12-item Chinese Health Questionnaire. †Adjusted for all shown measures. ‡Likelihood ratio test for trend p<0·0001. §p<0·001. ¶p<0·05. ‖p<0·01.

Table 2: **Multivariable logistic regression analysis of relation between probable common mental disorders* and sociodemographic factors, physical health, and year of survey**

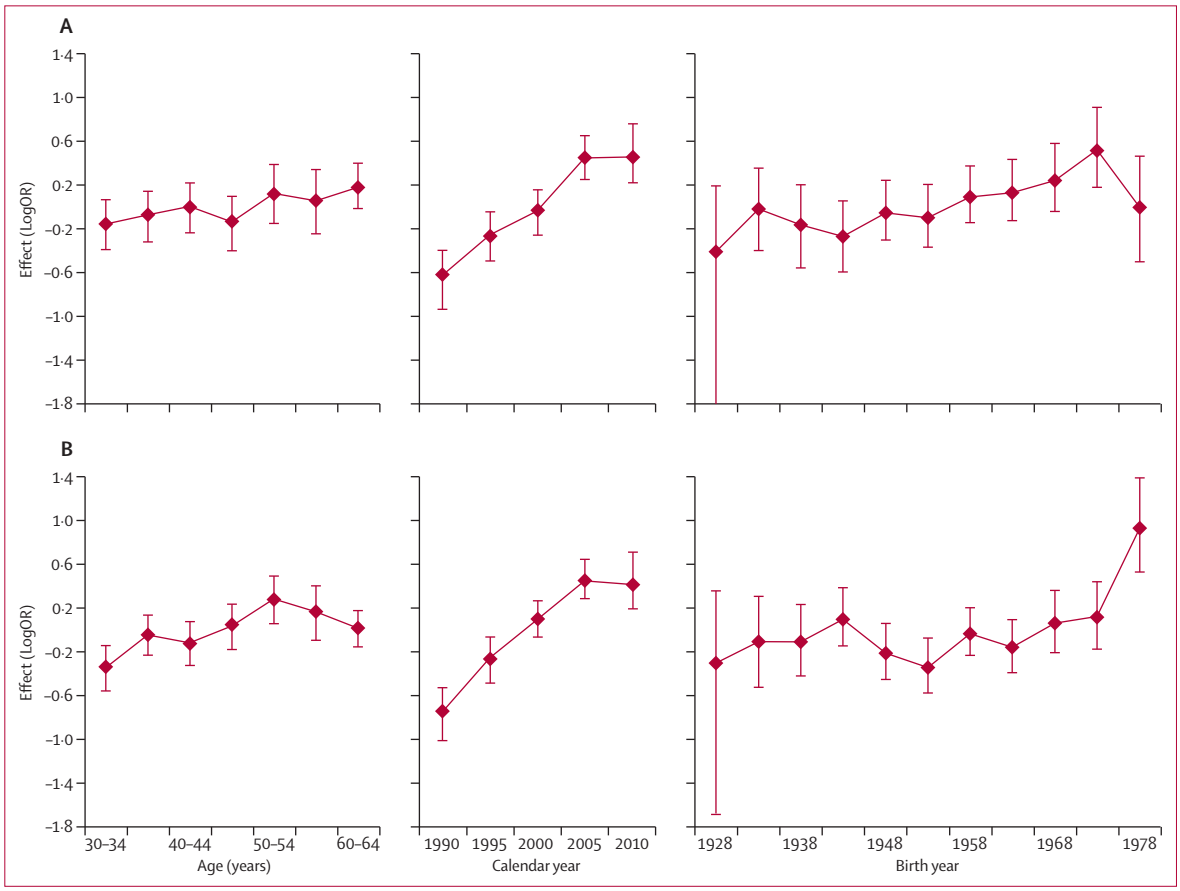

Figure 1: **Age-period-cohort analysis of prevalence of probable common mental disorders in men (A) and women (B) in Taiwan, 1990–2010**
Data are LogOR (95% CI). The figure is presented with the constraint that the summation of LogOR is 0, in accordance with the convention of age-period-cohort analysis, and, therefore, for any two points in the figure the odds ratio is calculated for the second relative to the first. LogOR=log odds ratio.

Role of the funding source
The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had full responsibility for the decision to submit for publication.

Results
A total of 10 548 people were interviewed (a total of 17044 citizens were invited). Of these, 9079 (86·1%) provided complete information and were included in data analysis. The complete response rates by survey year were as follows: 2531 (75·0%) of 3374 in 1990; 2081 (65·0%) of 3201 in 1995; 1895 (64·0%) of 2960 in 2000; 2146 (52·0%) of 4126 in 2005; and 1895 (56·0%) of 3383 in 2010. The age and sex of responders and non-responders (ie, people invited who did not participate) were generally similar (appendix).

The prevalence of probable CMDs rose in each study period except for the last, and more than doubled overall: 11·5% (95% CI 10·2–12·8) in 1990; 16·0% (14·3–17·7) in 1995; 18·8% (16·9–20·7) in 2000; 25·6% (23·5–27·8) in 2005; and 23·8% (21·9–25·7) in 2010 (time trend p<0·001). Prevalence increased significantly in all sociodemographic and health groups, except age 65 years or older, in which the number of respondents was low for the whole time period and no data were recorded in 1990 (table 1).

In the multivariable logistic regression, female sex, 6 or fewer years of education, unemployment, and impairment of daily activities by poor physical health were the strongest risk factors for probable CMDs (table 2). The significant effect of year of survey on the risk of probable CMDs was independent from the effects of all other variables. The association between level of education and probable CMDs differed by survey year (interaction p=0·02), but there was no clear pattern of change; the strongest interaction was in 2005 (OR 1·9, 95% CI 1·5–2·3) and the weakest in 2010 (1·1, 0·9–1·4). There was no evidence that associations between unemployment and CMDs differed in different survey years ($p_{interaction}$=0·61); in 1990, when unemployment levels were lowest the OR in relation to unemployment was 1·8 (95% CI 0·9–3·8), the same as that in 2010 (1·8, 1·2–2·6). The sensitivity analysis confirmed that the overall probability of having a probable CMD increased over time after controlling for all risk factors (appendix).

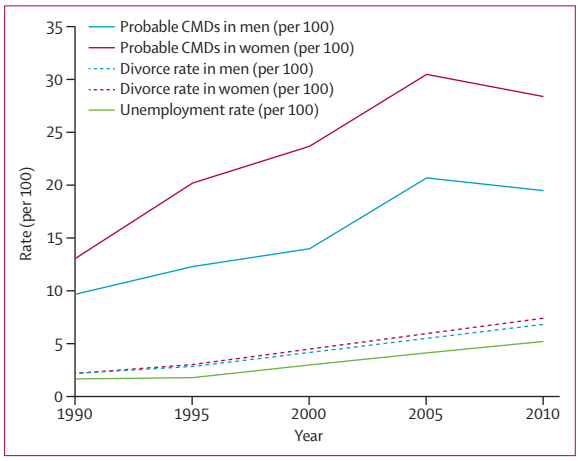

Figure 2: **Time trends for probable CMDs, divorce, and unemployment in Taiwan, 1990–2010**
CMDs=common mental disorders.

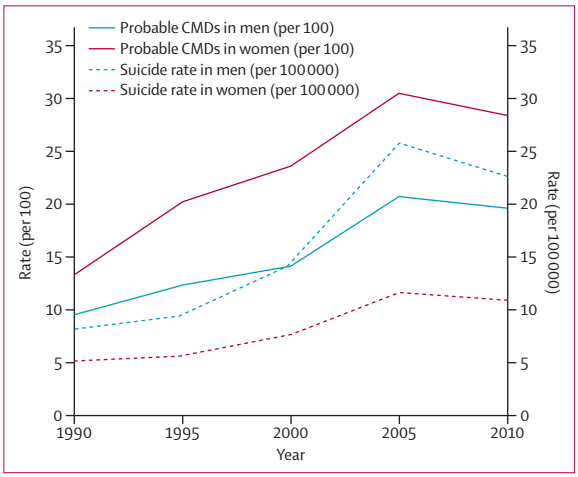

Figure 3: **Time trends in probable CMDs and suicide rates in Taiwan, 1990–2010**
CMDs=common mental disorders.

In the age-period-cohort analysis, we noted a steeply increasing trend for prevalence of probable CMDs (period effect) in relation to survey period, even after we controlled for the effects of age and birth cohort (figure 1).

The increase in prevalence of probable CMDs paralleled increases in national overall unemployment (from 1·7% to 5·2%; figure 2), divorce rates (from 2·2% to 6·8% in men and from 2·2% to 7·4% in women; figure 2), and suicide rates (from 8·1 to 19·5 per 100 000 in men and from 5·1 to 10·9 per 100 000 in women; figure 3). The small decline in the prevalence of probable CMDs between 2005 and 2010 paralleled declines in suicide rates for men and women (figure 3).

The six risk factors combined (sex, age, marital status, educational attainment, employment status, and physical health) exerted the greatest effect on the difference between observed and potential (hypothetical) prevalence rates, but did not diminish the time trend for potential prevalence of probable CMDs (appendix). The range of potential prevalence was 9·5% to 21·7% for lower risk gender, 10·1% to 22·4% for lowest risk age, 10·8% to 25·2% for lowest risk marital status, 11·2% to 23·8% for lower risk educational level, 11·2% to 23·3% for lowest risk employment status, 10·2% to 22·8% for lower risk physical condition, and 5·9% to 17·0% for all the six lowest risks combined (appendix).

Discussion

Five cross-sectional surveys administered over 20 years revealed a significant time trend in the prevalence of probable CMDs in Taiwan (panel 2). This effect was apparent in men and women and in all the socio-demographic and health groups assessed. The time trend remained significant after we controlled for risk factors in the multivariable regression model. We found no interaction between employment status and year of survey. Age and birth year had no effect on the significance of the time trend, which indicates that the survey period had the greatest effect. In our calculation of hypothetical prevalence rates we also noted a time trend, which implies that rates increased over time independently of the risk factors investigated. Finally, the increases in prevalence of CMDs paralleled rises in national rates of unemployment, divorce, and suicide over the study period. The period effect might, therefore, have been related to changes in national levels of unemployment.

The employment market in Taiwan declined continuously from the early 1990s. Many industries in Taiwan have relocated labour-intensive activities to China and southeast Asia and in Taiwan have moved towards information-intensive and technology-based industries.[33] The reduced job availability that has resulted from these changes, together with the Asian financial crisis in 1998 and the worldwide recession in the early 2000s, have increased unemployment in Taiwan.[13]

The rapid economic changes during this period might have adversely affected mental health. Unemployment in Taiwan rose to the unprecedented levels after 2000. An associated sense of insecurity could have increased the risk of probable CMDs.[12] Unemployed individuals are at two to four times higher risk of depression than are employed people,[34] and many studies have linked rises in unemployment with escalation of suicide rates.[35,36] By contrast, stable or declining levels of unemployment in Australia (from 7·7% to 5·1%)[6] and the UK (from 10·3% to 5·3%)[5] in a similar period to this study have been associated with little variation in the prevalence of CMDs and major depression.

The increasing prevalence of probable CMDs in women in our study might be explained by social changes other than increased unemployment. Educational opportunities in Taiwan have improved vastly since the 1960s. While this change has probably led to improved economic

***Panel 2:* Research in context**

Systematic review

We searched Medline and Google Scholar for published articles with the terms "repeated cross-sectional surveys" and "mental disorder". We identified four existing studies[3-6] in which valid screening instruments for mental illness or standardised psychiatric interviews were used to assess prevalence of common mental disorders (CMDs). Results from an Indian regional survey[3] and a Dutch study[4] showed increasing rates of CMDs from the 1970s to the 1990s. Two national surveys in Australia[6] (1998–2004) and the UK[5] (1993–2007) showed little variation in the prevalence of CMDs. These studies were limited by short study periods or focus on selected communities. We aimed to study long-term trends in the prevalence of CMDs in the general population and associations with sociodemographic features and physical health.

Interpretation

We administered the 12-item Chinese Health Questionnaire every 5 years from 1990 to 2010, to a representative sample of Taiwanese adults. This questionnaire is designed specifically to screen for probable CMDs in Chinese populations. Respondents with scores of 3 or higher were classified as having probable CMDs. We found an increasing time trend of probable CMDs that paralleled national rises in rates of unemployment, divorce, and suicide across the study period. In accordance with other studies, female sex, low level of education, unemployment, and poor physical health that limited daily activities were significant risk factors for probable CMDs. These findings emphasise the need to implement effective clinical and social preventive measures to prevent decline in mental health, especially in developing countries.

wellbeing, for married women it might have also led to a conflict between work and family. Having a child younger than 11 years is one of the leading causes of work–life conflict for employed mothers.[37] The increasing number of women entering the labour market in the 1990s was associated with a rise in divorce rates in Taiwan between 1990 and 2010.[38] We found parallel time trends for divorce rates and probable CMDs (figure 2). Additionally, although employment makes the dissolution of unhappy marriages easier for women,[38] single motherhood after divorce might increase the risks of depression and suicide.[39] Of note, the increase in suicide rate in women was similar to that in men during the period of our study. To the best of our knowledge, the association between the prevalence of CMDs in the general population and the incidence of suicide has not previously been studied over such a long period of time as in this study.

Poor physical health that limits daily activities was a strong risk factor for probable CMDs in the multivariable logistic regression model, which is similar to findings in previous studies.[40] Poor physical health seems, therefore, to play an important part in the development of mental illness. Poor health-related quality of life has strong associations with life dissatisfaction, depression, and anxiety[41] and, therefore, limitations on daily activities might have compounded the risk of probable CMDs.

An advantage of the current study was the use of a validated screening instrument specifically designed to assess probable cases of CMDs. Trained interviewers did surveys face to face and the validity of data was assessed with follow-up telephone interviews in a sample of respondents from each survey. Nevertheless, the study had limitations. Owing to the nature of cross-sectional data, temporal relations between probable CMDs and potential physical and social risk factors cannot be established. Second, as our analysis is based on only five surveys, we could not undertake a formal time-series analysis. Third, although the diagnostic criteria we used remained unchanged throughout the study, use of the same cutoff point on CHQ-12 in all five surveys might not have reflected specific changes over time. For instance, the stigma associated with mental illness might have declined as education about mental health improved over the 20-year study period, which in turn could have resulted in secular changes in the reliability of responses. Younger generations might be more affected by such changes than older generations. Nevertheless, we found an increasing time trend for the prevalence of probable CMDs even after we controlled for the effects of age and birth cohort (figure 1).

The magnitude of probable CMDs significantly increased over the 20 years of the study across most major sociodemographic groups in Taiwan. The greatest risk factors for probable CMDs were female sex, unemployment, low level of education, and poor physical health. The time trends remained significant after we control for multiple risk factors, and paralleled national trends in suicide, unemployment, and divorce. Our findings suggest that mental health is important to overall health and wellbeing. Effective clinical and social preventive measures should be considered.[42]

Contributors

AT-AC was responsible for the concept, design, and supervision of the study, and was the guarantor for the paper. TS-TF and W-CL did the statistical analyses. TS-TF prepared the first draft of the manuscript. C-SL developed the strategy for the statistical analysis. C-SL and WC-L helped with interpretation of the results. C-SL helped with preparation of the final draft and W-CL helped with the preparation of figures. DG gave advice on the statistical analysis and revised the drafts of the manuscript.

Conflicts of interest

We declare that we have no conflicts of interest.

References

1 Goldberg DP, Huxley P. Common mental disorders: a bio-social model. London: Routledge, 1992.

2 Murray CJL, Lopez AD, eds. The global burden of disease and injury series, volume 1: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Cambridge: Harvard University Press, 1996.

3 Nandi DN, Banerjee G, Mukherjee SP, Ghosh A, Nandi PS, Nandi S. Psychiatric morbidity of a rural Indian community: changes over a 20-year interval. *Br J Psychiatry* 2000; **176:** 351–56.

4 Hodiamont PP, Rijnders CA, Mulder J, Furer JW. Psychiatric disorders in a Dutch health area: a repeated cross-sectional survey. *J Affect Disord* 2005; **84:** 77–83.

5 Spiers N, Brugha TS, Bebbington P, McManus S, Jenkins R, Meltzer H. Age and birth cohort differences in depression in repeated cross-sectional surveys in England: the National Psychiatric Morbidity Surveys, 1993 to 2007. *Psychol Med* 2012; published online Feb 17. DOI:10.1017/S003329171200013X.

6 Hawthorne G, Goldney R, Taylor AW. Depression prevalence: is it really increasing? *Aust NZ J Psychiatry* 2008; **42:** 606–16.

7 Mukherjea A, ed. Understanding emerging epidemics: social and political approaches (advances in medical sociology), vol 11. Bingley: Emerald Publishing group, 2010.

8 Aghaei A, Hasanzadeh R, Mahdad A, Atashpuor SH. Occupational stress and mental health of employees of a petrochemical company before and after privatization. *Int J Occup Environ Health* 2010; **1:** 75–79.

9 Cheng TA. A community study of minor psychiatric morbidity in Taiwan. *Psychol Med* 1988; **18:** 953–68.

10 Araya R, Rojas G, Fritsch R, Acuna J, Lewis G. Common mental disorders in Santiago, Chile: prevalence and socio-demographic correlates. *Br J Psychiatry* 2001; **178:** 228–33.

11 Pevalin DJ, Goldberg DP. Social precursors to onset and recovery from episodes of common mental illness. *Psychol Med* 2003; **33:** 299–306.

12 Patel V, Kleinman A. Poverty and common mental disorders in developing countries. *Bull World Health Organ* 2003; **81:** 609–15.

13 Wang WC. Socio-economic changes in the transition to an information economy: the influence of informationalization on occupations, employment and wage structure in Taiwan. *J Cyber Culture Inform Soc* 2008; **14:** 69–100.

14 UN Department of Economic and Social Affairs. Industrial development for the 21st century: sustainable development perspectives. New York, NY: United Nations, 2007.

15 Kearney C. Emerging markets research: trends, issues and future directions. *Emerg Market Rev* 2012; **13:** 159–83.

16 Brockmann H, Delhey J, Welzel C, Yuan H. The China puzzle: falling happiness in a rising economy. *J Happiness Stud* 2009; **10:** 387–405.

17 Hou PC, Tu SH, Liao PS, Hung YT, Chang YH. The typology of townships in Taiwan: the analysis of sampling stratification of the 2005–2006 "Taiwan Social Change Survey". *Survey Res Method Appl* 2008; **23:** 7–32.

18 Cheng TA, Williams P. The design and development of a screening questionnaire (CHQ) for use in community studies of mental disorders in Taiwan. *Psychol Med* 1986; **16:** 415–22.

19 Cheng TA, Wu JT, Chong MY, Williams P. Internal consistency and factor structure of the Chinese Health Questionnaire. *Acta Psychiatr Scand* 1990; **82:** 304–08.

20 Wang YP, Gorenstein C, Andrade LH. Patterns of psychopathological manifestations among ethnic Chinese living in Brazil. *Eur Arch Psychiatry Clin Neurosci* 2004; **254:** 36–42.

21 Abbott MW, Wong S, Williams M, Au M, Young W. Chinese migrants' mental health and adjustment to life in New Zealand. *Aust NZ J Psychiatry* 1999; **33:** 13–21.

22 Green G, Bradby H, Chan A, Lee M. "We are not completely westernised": dual medical systems and pathways to health care among Chinese migrant women in England. *Soc Sci Med* 2006; **62:** 1498–509.

23 Barbato A, Aresu A, Battino RN, Troisi E, Tettamanti M, Parabiaghi A. A tool for cross-cultural psychiatry research: a pilot study of adaptation of 12-item Chinese Health Questionnaire (CHQ-12) for Chinese population in Italy. *Riv Psichiatr* 2009; **44:** 249–57 (in Italian).

24 Goldberg DP, Williams P. A user's guide to the General Health Questionnaire. Windsor: NFER-Nelson, 1988.

25 Cheng TA. A pilot study of mental disorders in Taiwan. *Psychol Med* 1985; **15:** 195–203.

26 Liu SI, Prince M, Blizard B, Mann A. The prevalence of psychiatric morbidity and its associated factors in general health care in Taiwan. *Psychol Med* 2002; **32:** 629–37.

27 WHO. ICD-10: the ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. Geneva: World Health Organization, 1992.

28 Department of Health, Executive Yuan, ROC (Taiwan). 2010 Statistics of Causes of Death. http://www.doh.gov.tw/EN2006/DM/DM2.aspx?now_fod_list_no=12228&class_no=390&level_no=2 (accessed Dec 28, 2011).

29 National Statistics, Taiwan. Labour force. http://eng.stat.gov.tw/lp.asp?ctNode=1608&CtUnit=758&BaseDSD=7&MP=5 (accessed July 8, 2011).

30 Ministry of the Interior. Statistical yearbook of interior. http://sowf.moi.gov.tw/stat/year/elist.htm (accessed July 5, 2011).

31 Osmond C, Gardner MJ. Age, period and cohort models applied to cancer mortality rates. *Stat Med* 1982; **1:** 245–59.

32 Greenland S, Rothman KJ, Lash TL. Measures of effect and measures of association. In: Rothman KJ, Greenland S, Lash TL, eds. Modern epidemiology, 3rd edn. Philadelphia: Lippincott Williams & Wilkins, 2008: 51–70.

33 Jenkins GP, Kuo CY, Sun KN. Taxation and economic development in Taiwan. Cambridge, MA: Harvard University Press, 2003.

34 Mirowsky J, Ross CE. Social causes of psychological distress (social institutions and social change), 2nd edn. Piscataway, NJ: Aldine Transaction, 2003.

35 Chang SS, Gunnell D, Sterne JAC, Lu TH, Cheng ATA. Was the economic crisis 1997–1998 responsible for rising suicide rates in East/Southeast Asia? A time–trend analysis for Japan, Hong Kong, South Korea, Taiwan, Singapore and Thailand. *Soc Sci Med* 2009; **68:** 1322–31.

36 Stuckler D, Basu S, Suhrcke M, Coutts A, McKee M. The public health effect of economic crises and alternative policy responses in Europe: an empirical analysis. *Lancet* 2009; **374:** 315–23.

37 Crompton R, Lyonette C. Mothers' employment, work-life conflict, careers, and class. In: Scott J, Dex S, Joshi H, eds. Women and employment: changing lives and new challenges. Cheltenham: Edward Elgar, 2008.

38 Schoen R, Astone NM, Rothert K, Standish NJ, Kim YJ. Women's employment, marital happiness, and divorce. *Soc Forces* 2002; **81:** 643–62.

39 Cairney J, Boyle M, Offord DR, Racine Y. Stress, social support and depression in single and married mothers. *Soc Psychiatry Psychiatr Epidemiol* 2003; **38:** 442–49.

40 Amoran OE, Lawoyin TO, Oni OO. Risk factors associated with mental illness in Oyo State, Nigeria: a community based study. *Ann Gen Psychiatry* 2005; **4:** 19.

41 Strine TW, Chapman DP, Balluz LS, Moriarty DG, Mokdad AH. The associations between life satisfaction and health-related quality of life, chronic illness, and health behaviors among U.S. community-dwelling adults. *J Community Health* 2008; **33:** 40–50.

42 Prince M, Vikram P, Saxena S, et al. No health without mental health. *Lancet* 2007; **370:** 859–77.