



Individual and societal impact on earnings associated with serious mental illness in metropolitan China

Sing Lee ^{a,*}, Adley Tsang ^a, Yue-qin Huang ^b, Yan-ling He ^c, Zhao-rui Liu ^b, Ming-yuan Zhang ^c, Yu-cun Shen ^b, Ronald C. Kessler ^d

^a Hong Kong Mood Disorders Center, 7A, Block E, Staff Quarters, Prince of Wales Hospital, Shatin, NT, Hong Kong

^b Institute of Mental Health, Peking University, No.51 Hua Yuan Bei Road, Haidian District Beijing, 100083, PR China

^c Shanghai Mental Health Center, 600 Wan Ping Nan Lu, Shanghai, 20030, PR China

^d Department of Health Care Policy, Harvard Medical School, 180 Longwood Avenue, Suite 215, Boston, MA 02115, USA

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ABSTRACT

To evaluate individual-level and societal-level losses of income associated with serious mental illness in metropolitan China, a multi-stage probability survey was administered to adults aged 18–70 years in Beijing and Shanghai. We used data to estimate individual-level expected earnings from a model that included information about the respondents' education level, marital status, age, and gender. Expected earnings were compared to observed earnings among respondents with mental illness and serious disability. The result shows that the 12-month prevalence of such serious mental illness was 0.6%. Its impact on earnings was significant in the total sample and was higher for males (76% of gender-specific expected salary was lost) than for females (32%). When projected to societal level, the annual impact was estimated to be 466 million *Renminbi* (RMB 8.27 = USD 1), less than 0.2% of the gross domestic product (GDP) of the two cities. Serious mental illness was associated with a substantial decrease in individual-level earnings, but the burden that resulted from societal-level loss of earnings was not large enough to help drive mental health policy and programs in China.

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1. Introduction

A fast growing body of research has shown that mental illness is associated with substantial functional impairments that are costly to society (Greenberg et al., 1993; Harwood et al., 2000; Eaton et al., 2008; Kessler et al., 2008). Using various econometric indices, researchers have argued that, from the perspective of societal investment, it is cost-justified to expand efforts to treat mental illness. Of the different measures of the costs of impairments associated with mental illness, lost earnings may be particularly relevant to the cost-saving argument. This is because earnings are readily quantifiable and to a good extent capture the cumulative effects of mental disorders on educational, occupational, social, and other impairments that society could reduce by treating mental illness adequately. However, studies of the association between mental illness and loss of earnings are largely confined to the U.S. (Rice et al., 1990; Harwood et al., 2000; Kessler et al., 2008).

Studies on the economic burden of mental illness in Asian countries are limited despite the enormous size of their populations. This is partly because of the paucity of specific epidemiological information

required for making econometric estimations (Hu, 2004). Although the Global Burden of Disease (GBD) study reported that in China unipolar depressive disorder was the fourth highest leading cause of Disability Adjusted Life Years (DALYs – the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability, Mathers et al., 2003), the data sources from which this estimate (4.5% of total DALYs) was derived can be questioned (Eaton et al., 2008). Epidemiological studies of mental disorders in China have focused on prevalence estimates of severe disorders and their basic socio-demographic correlates. Severity was usually based on diagnosis (especially psychotic disorders) rather than measures of high levels of disability arising from a range of mental disorders. This is not surprising because the notions of severe non-psychotic disorders defined by disability, dimensional measures of severity, and direct versus indirect economic costs are relatively new in China. From a search of the Chinese psychiatric literature, we found several clinical studies of the economic burden of patients with schizophrenia (Tan et al., 2005) and only two recent clinical studies of the economic burden of anxiety and depression diagnosed using the Chinese Classification of Mental Disorders (Chinese Society of Psychiatry, 2001). One showed that Chinese outpatients with anxiety disorders had higher overall health care costs than those with depressive disorder, but the two groups did not differ on indirect cost as calculated by income lost because of absence from work (Zhang and Ou, 2008). The

* Corresponding author. Tel.: +852 2144 5338; fax: +852 2144 5129.

E-mail address: singlee@cuhk.edu.hk (S. Lee).

other study estimated the economic burden of 652 outpatients with depression in Shanghai (Chen et al., 2006). Direct cost was based on consultation and treatment fee (“direct medical cost”), health products, transportation, and payment for care-taker (“direct non-medical cost”). Indirect cost consisted of lost income because of absence from work for patients and their family members. The results showed that the total annual economic burden of each depressed outpatient was RMB 6808.56 (approximately USD 825 [RMB 8.27–USD 1], equivalent to 33.1% of the average annual salary in Shanghai in 2003). The estimated total economic burden of depression was RMB 396 millions. In this study, direct medical cost (RMB 197 million) was nearly half (49.7%) of the total cost. The proportion was high compared to studies of the direct costs of depression (about 20–40% of total) in other countries (Nuijten, 2001; Hu, 2004). This may be because the effects of mental illness on reduction in labor force participation (i.e., reduced probability of being employed) was not considered, thereby under-estimating the indirect costs of depression (Kessler et al., 2008).

The usefulness of the above Chinese studies for formulating policy and programs on mental disorders is limited for several reasons. First, they could under-estimate economic burden because indirect cost was only estimated from loss of income due to absence from work. Second, since the great majority of people with depression did not receive any medical treatment in China (Lee et al., 2007a,b; Lee et al., 2009), the generalizability of findings from these clinical studies to the community is greatly limited. Third, the findings cannot be compared with those of other countries because the studies did not use standardized definitions of mental disorders and methods of cost estimation. Finally, these studies did not use a control group and did not examine the proportions of direct/indirect cost and lost earnings associated with mental disorders.

As part of the World Mental Health (WMH) Survey Initiative, which is a cross-national epidemiological survey of mental disorders on prevalence, risk correlates, course, and consequences (Kessler and Üstün, 2008), the present study aims to estimate the cost of mental disorders on earnings at both individual and societal levels in metropolitan China.

2. Methods

2.1. Sample

A three-stage clustered area probability sampling strategy according to household register was employed to survey 18- to 70-year-old adults in the metropolitan areas of Beijing and Shanghai (Heeringa et al., 2008). In first-stage sampling, 4162 neighborhood committees (NCs) in Beijing (containing 2,009,253 households) and 2319 NCs in Shanghai (containing 2,507,416 households) were designated in the sampling pool. According to probabilities proportional to size (PPS) measures, 47 NCs in Beijing and 44 NCs in Shanghai were selected and the field samplers went to these NCs to check their actual residential distribution against the obtained demographic data. In the second stage, a sample of household was selected randomly for each NC according to pre-decided sampling intervals and the random starting point. In the third stage, all eligible members of the selected household were recorded by the field sampler and one eligible person was randomly chosen (Shen et al., 2006). Finally, 5201 interviews (Beijing: $n=2633$; Shanghai: $n=2568$) were administered face to face by trained lay interviewers in the homes of respondents between November 2001 and February 2002. The response rates were 74.8% (Beijing) and 74.6% (Shanghai). The interviews were in two parts. Part one included the core diagnostic assessment. Part two, which was administered to all part-one respondents with any core disorder and a 25% probability sub-sample of other part one respondents ($n=1628$), included information about social demographic correlates (including income and financial status of the respondents) and disorders of secondary interest such as conduct disorder and separation anxiety disorder. Earnings were assessed in part two. The sample was weighed to adjust for differential probability of sample selection, including those in part two, and discrepancies on socio-demographic distribution between the sample and the census population (see Shen et al., 2006 for details of weighting).

All respondents provided written informed consent after the nature of the interview was fully explained. Training and assessment of interviewers, sampling, and field procedure were undertaken according to the standardized procedures of the surveys conducted by all participants of the WMH Consortium (Heeringa et al., 2008; Pennell et al., 2008). Ethical approval for conducting the survey in both cities was obtained from the Peking University Institute of Mental Health and Shanghai Institute of Mental Health, respectively.

2.2. Measures

2.2.1. Mental disorder

The WMH version of the WHO Composite International Diagnostic Interview (WMH-CIDI, Kessler and Üstün, 2004) is a fully structured diagnostic interview for assessing DSM-IV mental disorders, including anxiety disorders, mood disorders, impulse-control disorders, substance use disorders, and a screen for non-affective psychotic symptoms. One-year and lifetime prevalences of these disorders were previously reported (Shen et al., 2006; Lee et al., 2007b). The WMH-CIDI was translated into Chinese using the standard WHO protocol in which a team of survey experts completed the initial translation and a separate team carried out an independent back translation to ensure preservation of the meaning of the original English version. Discrepancies between translation and back translation were reviewed and adjusted. Blind clinical reappraisal interviews were administered to psychiatric patients and normal controls. WMH-CIDI diagnoses were found to have good concordance with diagnoses generated by semi-structured diagnostic interviews (Huang et al., 2008).

Respondents are categorized as having serious mental illness (SMI) if they (1) were diagnosed with 12-month bipolar I, (2) attempted suicide in the last 12 months and had any core 12-month diagnosis (core disorders are defined as any of the following in the past 12 months: major depressive episode, agoraphobia, PTSD, generalized anxiety disorder, social phobia, specific phobia, intermittent explosive disorder, adult separation anxiety, dysthymia, bipolar I, bipolar II, or bipolar sub-threshold), or (3) had one or more core 12-month diagnosis and a high level of impairment on the Sheehan Disability Scale (SDS, Leon et al., 1997).

2.2.2. Earnings

All part-two respondents were asked to report their personal pre-tax earnings in the previous 12 months. Only wages and other stipends from employment, but not pensions, investments, or other financial assistance, were counted. Twenty-three respondents with missing values on earnings were excluded from analysis.

2.3. Analysis

As in our previous publications of the same survey, data from the two cities were combined for analysis because of the relatively low prevalence of mental disorders (Shen et al., 2006; Lee et al., 2007b). We used regression analysis to predict monthly personal earnings. The predictors included 12-month SMI, age, gender, substance use disorders, and interactions between sex and all other model variables (Goldsmith et al., 1997; Bowles et al., 2001). The inclusion of interactions allowed us to estimate the effect of SMI for men and women separately. Although educational and marital status might be influenced by mental disorders (Forthofer et al., 1996), we included these variables in the multivariate model in order to estimate the extent to which they mediated the total effects of SMI. We also used the generalized linear model (GLM) because the earnings distribution was highly skewed and included a number of people with no earning at all. Then we simulated two estimates of predicted earnings for each respondent within the best-fitting models: one based on the actual characteristics of the respondent and another based on the counterfactual assumption that the respondent had no SMI. Individual-level differences between the two estimates were averaged across all respondents with SMI to estimate the mean individual-level decrease in earnings associated with SMI. This estimate was projected to the societal level by multiplying the estimated prevalence of SMI with the size of population. Because the sample design was geographically clustered and the data were weighted, the method of jackknife repeated replication was used to generate design-based standard errors (Wolter, 1985). Statistical significance was evaluated using two-tailed tests with an alpha level of 0.05.

3. Results

3.1. Distributions of SMI, earnings, and demographic variables

The 12-month prevalence estimate of SMI was 0.6% ($SE=0.24\%$), whereas the 12-month prevalence estimate of mental disorder of other severity was 5.7% ($SE=0.85\%$). Another 3.4% ($SE=0.47\%$) of the sampled population was estimated to have a lifetime history of mental disorders (Table 1). Among those with SMI, the three most prevalent disorders were major depressive episode (68%), intermittent explosive disorder (43.3%), and specific phobia (25.3%) for male; for female they were specific phobia (76.4%), major depressive episode (29%), and social phobia (10.9%) (further details of distribution are available upon request). There was no significant difference between genders on having SMI ($\chi^2_{df=1}=1.8, P=0.16$). However, males outnumbered females on 12-month alcohol abuse ($\chi^2_{df=1}=73.2, P<0.01$) and dependence ($\chi^2_{df=1}=10.7, P<0.01$), lifetime alcohol abuse ($\chi^2_{df=1}=20.9, P<0.01$), and lifetime illicit drug abuse ($\chi^2_{df=1}=6.1, P=0.02$). Females outnumbered males on 12-month illicit drug abuse ($\chi^2_{df=1}=4.8, P=0.03$).

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