

Research Article

Equity of Compensation in Hospitalization Expenses for Patients with Mental Disorders: The Effect of Health Insurance

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ABSTRACT

Objective: Improving the equity of the health insurance system has been a key policy goal for the Chinese government. With mental health increasingly becoming a significant public health issue in China, equity of health insurance within the field of mental health has received increasing attention. In order to inform the current ongoing health care reform, we conducted this study to provide empirical evidence concerning the equity of three basic health insurances regarding the compensation of hospitalization expenses among mental health patients in China.

Methods: This retrospective study used hospital electronic health records (EHR) data from two major psychiatric hospitals in Shandong province, Shandong Center for Mental Health (SCMH) and DaiZhuang Psychiatric Hospital (DZPH) between the years of 2005 and 2014. The concept of economic risk of disease, and the methods of the indirect standardization of health services and the concentration index were used to analyze the equity of the impact of health insurance compensation on hospitalization expenses.

Results: After compensation of health insurances, adjusted economic risk for mental patients with low expenses (-0.01) and high expenses (-0.22) decreased, which implies that health insurance decreased the economic burden for patients in cases of both low and high hospitalization expenses. The adjusted economic risk for urban patients decreased (-0.10) whilst for rural patients (0.67) it increased. This implies that health insurance did not reduce the economic burden for rural patients. Moreover, health insurance reduced the economic burden for patients with urban employees' basic medical insurance (UEBMI) (-0.14) rather than urban residents 'basic medical insurance (URBMI) (0.08) and new rural cooperative medical insurance (NRCMI) (0.62). For the measurement of equity for reimbursement, standardization insurance expenses of UEBMI was the highest (14783.01 RMB), and the equity level of NRCMI was lowest (CI=0.189).

Conclusions: In the field of mental health, inequity within compensation from health insurance for hospitalization expenses does exist. Health insurances shared the economic risk of disease of patients living in urban areas, and patients with high and low hospitalization expense rather than medium hospitalization expense. The well-known phenomenon of health insurances benefiting the rich also exists in the sphere of mental health. Comprehensive strategies including the task of providing appropriate reimbursement for disadvantaged patients is urgent in order to improve the equity of compensation for hospitalization expenses in China.

MeSh Headings/ Key words: Health insurance; Mental disorders; Hospitalization expenses; Equity

Introduction

Mental health has become an increasingly significant public health issue throughout the world. A report by the World Health Organization (WHO) in 2007 estimated that 450 million people suffer from mental or behavioural disorders worldwide, placing mental disorders among the leading causes of ill-health and disability [1]. The global burden of mental disorders has increased by 37% from 1990 to 2010 [2]. A survey undertaken within four provinces in China (2001-2005) revealed that mental disorders affected 17.5% of adults aged 18 years and above; that is, more than 173 million people suffer from a mental disorder in China [3]. In 2014, 4.3 million people were registered as having a severe mental illness in China [4].

Income related disparities in healthcare have been a major policy concern worldwide. To address this, many countries have been developing social health insurance system as a way to narrow the impact of health expenditures [5]. In 2001, total health expenditure in China was 502.5 billion RMB; with 60% of that being in the form of out-of-pocket expenses (OOP) paid

by the patient [6]. Moreover, the health care reform beginning in the 1980s led to the collapse of the Cooperative Medical Scheme (CMS) - a collective, pre-paid health security system set up for the rural parts China. After this, rural health care reverted back to primarily private financing and China did not develop separate health insurance systems for urban and rural areas again until 2003. Starting from 2003, the Chinese government started to implement the New Rural Cooperative Medical Insurance (NRCMI) among rural population. For urban residents, the previous health insurances were integrated into Urban Employee Basic Medical Insurance (UEBMI) and Urban Resident Basic Medical Insurance (URBMI) [7]. UEBMI mainly targets urban employees of the government and other public institutions, public and private enterprises and joint ventures with foreign companies, and URBMI mainly covers those who are not officially employed, the elderly, students and underage children. By the end of 2012, 89% of urban residents and 97% of rural residents were covered by one of the country's three main medical insurance schemes (UEBMI, URBMI and NRCMI), up from only 55% of urban residents and 21% of rural residents in 2003. However, given the vast differences in terms of economic development across urban and rural areas, insurance policy in terms of coverage, reimbursement level, premium, and regulations vary a lot across different insurances. While the UEBMI and URBMI provide coverage for both inpatient and outpatient services with coinsurance rate in the range of 50-95%, the NRCMI mainly provides coverage for inpatient treatment, with coinsurance rate in the range of 40-70%. Outpatient service may be covered by NRCMI depending on benefit package design in some regions [8].

There is evidence however that the specific design of health insurance schemes within particular contexts has an impact on equity in access to the utilization of health services [9-11]. From an equity perspective, one of the major concerns is whether disadvantaged groups can get benefit from health insurance in terms of improved access to services [12]. In terms of inequalities of health insurance for mental health, limited informative data is available in China, as with most other developing countries. This study aims to analyze medical compensation within three basic health insurance schemes and its effect on hospitalization expenses for inpatients with mental disorders, as well as further analyze the equity of three basic health insurances to identify the disadvantaged population.

Method

Study design

To assess the equity of health insurance, we designed a retrospective cohort study among patients hospitalized with mental illnesses. Our study site included two major psychiatric hospitals in Shandong, China: Shandong Center for Mental Health (SCMH) and Daizhuang Psychiatric Hospital (DPH). SCMH is the only provincial psychiatric hospital in Shandong, and DPH is one of the oldest psychiatric hospitals in the province. There are 1158 general hospitals providing mental health services and 53 psychiatric hospitals in Shandong province. The two psychiatric hospitals selected for this study serve almost 10% of the total mental health patients every year in Shandong (HFPCSD 2015). Furthermore, both hospitals accept mental health patients from all over the country. Importantly, health insurance policy regulations in Shandong province are consistent with national health insurance policy regulations.

Data collection

Our study population was identified based on patients' primary diagnosis from the electronic health records (EHR) data from these two hospitals. The EHR data routinely records information on patients' social-demographic characteristics (such as gender, age, marital status, and place of residence); clinical characteristics (diagnosis based on International Classification of Diseases,10th version,ICD-10); information on expenses (such as expenses made for drugs, examinations, hospital beds, and total hospital expenses), and insurance information (type of insurance, expenses reimbursed by health insurance, and out-of-pocket expenses once discharged). A major strength of the EHR data is that it documents expenses data in a detailed, itemized, and reliable way on all inpatient expenses incurred during hospitalization. All data was collected and recorded by hospital registries, physician workstations, and the insurance settlement department, with minimal recall bias.

The inclusion criteria for mental health patients in our samples were: (1) Mental illness was the primary diagnosis based on ICD-10 codes and (2) Patients over 18 years old who were discharged from these two hospitals between May 2005 and March 2014. Inpatients without a clear initial diagnosis or without clear medical insurance and reimbursement information were excluded from the sample. We also excluded cases with the length of hospital stay exceeding one year. In total, this resulted in a sample with 8305 inpatient cases.

Data analysis

Equity measurement: This study analyzed the equity of health insurance by using the concept of the economic risk of disease, the methods of indirect standardization of health services and the concentration index [13-15]. First, the economic risk of disease was used to examine the economic risk for mental patients before and after compensation provided by health insurance. Second, indirect standardization of health services was used to measure the degree of actual benefit (the actual compensation value from the investigation), the expected benefit based on needs (benefit after controlling for other non-need based factors) and the standardization benefit (the benefit when the needs of health care service are same). Finally, the concentration index was used to measure the horizontal equity of health insurance.

Economic risk of disease: The economic risk of disease is a measure of the proportion of per capita medical expenses accounting for income; with annual net (after-tax) income being the income concept used in this study. The specific formula :

Economic risk of disease = average medical expenses/ average income

Relative medical expenses: The economic risk of disease

for specific groups concerns the ratio of average medical expenses for the specific group to average medical expenses for total population when other conditions remain unchanged. It can also be understood as how many times the economic risk of disease for a specific populaton accounts for that of the total population. The specific formula:

Relative medical expenses = average medical expenses for the specific group/ average medical expenses for the population

Adjusted economic risk of disease: The adjusted economic risk of disease was used to eliminate the influence of the income gap. It is the adjusted economic risk of disease based on the income level of different groups in order to better compare the varations in economic risk of disease between people. Specific formula:

Adjusted economic risk of disease = economic risk of disease*(average medical expenses for the specific group/ average medical expenses for the population)

Changes of economic risk of disease: Changes in economic risk was caused by compensation paid by health insurance. Specific formula:

Changes of economic risk of disease = [(economic risk of disease before compensation-economic risk of disease after compensation)/economic risk of disease before compensation]

The value of economic risk of disease reflects the size of the economic risk of a specific population compared with the whole population. If the value of economic risk of disease is greater than 1, it shows that the economic risk of disease is higher than the average. If the economic risk of disease is less than 1, the economic risk of the disease is lower than average. Therefore, we are able to identify vulnerable groups in particular need of compensation through health insurance.

Indirect standardization of health services

Indirect standardization of health services is based on the assumption that horizontal equity in health care is achieved when resources are allocated according to need [16]. For the first step of the analysis, the health service was estimated using logistic regression on the full set of explanatory variables.

$$y_i^* = \alpha + X'_i\beta + Z'_i\delta + \varepsilon_i$$

X and Z are the vectors of need, and non-need variables, respectively. Table 1 showed the need and non-need variables in the analysis.

For the second step of the analysis, the horizontal inequity index is then calculated. Equity is calculated as predicted probabilities from a logistic regression on need indicators. Combining estimates of coefficients with actual values of the need (X) variables and sample mean values of the non-need (Z) variables, the need-predicted values of utilization, $\hat{y}_i$ are:

$$\hat{y}_i^x = \hat{\alpha} + X'_i\hat{\beta} + Z_i^m{}_i\delta$$

As the need for health care tends to be associated with income, it is necessary to adjust for differences in the distribution of need by income in order to determine the inequality in use that remains. Using the indirect standardization of health service approach [17], it is possible to generate the predicted value of health care for each individual that depends only on need. The predicted value indicates the amount of health care that each individual would have received if she/he had been treated, on average, by the system, as others with the same need characteristics. Estimates of the need-standardized hospitalization expenses, $\hat{y}_i^s$, are obtained as the difference between actual and need-expected utilization, plus the sample mean (y^m).

$$\hat{y}_i^s = y_i - \hat{y}_i^x + y^m$$

Concentration index

The concentration index was used to measure the inequality of health insurance for mental health [18-20]. It is bound between -1 and +1 [20,21]. If the concentration index is 0, benefits for patients are equitable. If the concentration index is positive, health insurance tends to benefit the rich, and, if the

Table1: Need and non-need variables in model for indirect standardization of mental health services.

Variables	Classification
Need variables	
Gender	Male, female
Age	18-39, 40-54, ≥55
Degree of illness	General, urgent, critical
Admission diagnosis	Mental and behavioral disorders due to the use of psychoactive substances; schizophrenia, schizotypal and delusional disorders; mood [affective] disorders; neurotic, stress-related, and somatoform disorders; behavioral syndromes associated with physiological disturbances and physical factors; disorders of adult personality and behavior; mental retardation; others
Hospitalization frequency	Actual value
Non-need variables	
Living region	Rural area, Urban area
Marital status	Single, Non-single
Occupation	No occupation, farmer, worker, retiree, student, other
Income	Actual value
Discharge time	2005, 2006, 20007, 20008, 2009, 2010, 2011, 2012, 2013
Type of insurance	NRCMI, URBMI and UEBMI

concentration index is negative, health insurance tends to benefit the poor. Broadly speaking, the concentration index shows the relationship between health and economic status and its sign indicates the direction of the relationship and its magnitude reflects both the strength of the relationship and degree of variability in the distribution of the health variable [20].

Following Kakwani, the concentration index can be computed as twice the covariance of the health variable and a person's rank in terms of economic status, divided by the mean of the health variable [18,19]:

$$CI = 2/\mu \ \mathrm{cov}\ (yi, Ri)$$

Where CI is concentration index; yi is the hospitalization expenses of mental health patients; Ri is the fractional rank of individual i in the distribution of socio-economic position; μ is the mean of the hospitalization expenses for mental patients' variable and cov represents the covariance. The concentration index was calculated using ADePT software developed by the World Bank.

Results

Economic risk of disease for patients with mental disorders

Although the economic risk of disease for 64.6% of patients was below 0.6, and more than 30% of patients was above 0.6 (above average). The economic risk of disease in about 6% of patients was above 1 (above average). From Table 2, we can see that the economic risk raises along with the increase of out of pocket expenses.

Economic risk of disease for patients with different hospitalization expenses

The hospitalization expenses for more than 90% of patients was above 3000 RMB, and for around 29% of patients with mental disorders it was between 11,000 and 30,000 RMB (Table 3). The expenditure of patients with mental disorders showed a skewed distribution. The proportion of hospitalization expenses > 30,000 RMB accounted for 48.02% of total expenses. An upward trend of economic risk was found with the increase of hospitalization expenses. The economic risk of disease in 30% of patients was above 1. According to the change of the economic risk patients with low expenses and the high expenses rather than medium expenses decreased after the compensation of health insurance.

Economic risk of disease for patients living in different localities

Of the number of hospitalized patients, 56.89% of patients were from urban areas. Before compensation, the hospitalization expenses of urban patients (21,813.04 RMB) was higher than that of rural patients (9754.79 RMB). The economic risk of urban patients (before: 1.31, after: 1.13) was higher than that of rural patients (before: 0.58, after: 0.81). However, the adjusted

Table 2: Economic risk of disease for patients with mental illnesses.

Economic risk of disease	Percentage (%)	Cumulative constituent ratio(%)	OOP(RMB)
0-	23.8	23.8	1352.6
0.2-	25.3	49.1	2725.83
0.4-	15.5	64.6	4087.15
0.6-	27	91.6	5912.04
0.8-	2.8	94.4	7426.19
1.0-	1.7	96.1	9280.94
1.2-	1.1	97.2	11089.19
1.4-	2.8	100	15293.47

Table 3: Economic risk of disease for patients with different hospitalization expenses.

Hospitalization expenses	Percentage of population (%)	Expenses before reimbursement (RMB,%)		Expenses after reimbursement (RMB,%)		Economic risk of disease (ratio)		Economic risk of disease changes (ratio points)	Adjusted economic risk of disease (ratio)		Adjusted economic risk of Diseasechanges (ratio points)
		Mean	%	Mean	%	Before	After		Before	After	
0-500	0.2	338.82	0.001	35.66	0.001	0.02	0.01	-0.01	0.01	0	-0.01
500-1000	0.46	829.51	0.02	162.67	0.01	0.05	0.03	-0.02	0.03	0.02	-0.01
1000-3000	9.04	2188.48	1.18	919.11	1.53	0.13	0.17	0.04	0.15	0.19	0.04
3000-5000	15.22	4005.8	3.65	1640.32	4.59	0.24	0.3	0.06	0.29	0.37	0.08
5000-7000	14.74	5989.68	5.28	2222.4	6.03	0.36	0.41	0.05	0.42	0.48	0.06
7000-9000	12.35	7935.03	5.86	2829.99	6.43	0.47	0.52	0.05	0.55	0.6	0.05
9000-11000	9.39	9914.98	5.57	3212.62	5.55	0.59	0.59	0	0.64	0.64	0
11000-30000	28.79	17652.8	30.41	5879.8	31.14	1.06	1.08	0.03	0.98	1.01	0.02
>30000	9.8	81888.58	48.02	24804.44	44.72	4.9	4.56	-0.34	3.17	2.95	-0.22
Total	100	16712.28	100	5435.67	100	1	1	-	-	-	-

economic risk of disease in rural patients (before: 1.71, after: 2.37) was higher than that of urban patients (before: 0.77, after: 0.67). With the changes made from calculating the adjusted economic risk of disease before, during and after compensation, the economic risk of disease of urban patients decreased whilst for rural patients it increased. This implies that health insurance did not decrease the economic risk of disease for rural patients with mental disorders (Table 4).

Economic risk for mental patients using different types of health insurance

Of the number of hospitalized patients, 45.91% and 45.11% of patients own NRCMI and UEBMI respectively. Before compensation, the hospitalization expenses for those with UEBMI (23589.53RMB) was the highest. The economic risk of UEBMI (before: 1.43, after:1.14) was higher than that of URBMI and NRCMI (URBMI: before: 0.95, after: 0.11; NRCMI: before: 0.59, after: 0.84). However, after adjusting for income, the economic risk of disease for patients with NRCMI (before: 1.46, after: 2.08) was higher than that of URBMI and UEBMI (URBMI: before: 0.49, after: 0.57; UEBMI: before: 0.71, after: 0.51). With the changes made by calculating the adjusted economic risk of disease between before and after compensation, the economic risk of disease of patients with UEBMI decreased (-0.14), whilst for patients with NRCMI (0.62) and URBMI (0.08) it increased. This implies that health insurance did not decrease the economic risk of disease for patients with NRCMI and URBMI (Table 5,6).

Equity of compensation for mental patients using different types of health insurance

After standardization, the compensation amount of UEBMI was the highest - 14,783.01 RMBRMB. The compensation amounts of NRCMI and URBMI were 3114.89 RMB and 6449.96 RMB. The concentration index after standardization of NRCMI was 0.189, which is higher than that of UEBMI and URBMI. This means the distribution of compensation of NRCMI is not balanced, and the level of equity is relatively low. Moreover, the concentration index of the three basic health insurances analysed are positive, which supports the well-known phenomenon of health insurances benefiting the rich patients.

Discussion

This study focused on the inequity of health insurance

Table 4: Economic risk of disease for patients living in different localities.

Living regions	Percentage (%)	Expenses before reimbursement (RMB,%)		Expenses after reimbursement (RMB,%)		Economic risk of disease (%)		Economic risk of disease changes(%)	Adjusted economic risk of disease(%)		Adjusted economic risk of disease changes(%)
		Mean	%	Mean	%	Before	After		Before	After	
Urban area	56.89	21813.04	74.25	6150.33	64.37	1.31	1.13	-0.17	0.77	0.67	-0.1
Rural area	42.52	9754.79	24.82	4407.57	34.48	0.58	0.81	0.23	1.71	2.37	0.67
Total	100	16712.28	100	5435.67	100	-	-	-	-	-	-

Table 5: Economic risk of disease for patients own different types of health insurance.

Health insurance	Percentage (%)	Expenses before reimbursement (RMB,%)		Expenses after reimbursement (RMB,%)		Economic risk of disease(%)		Economic risk of disease changes(%)	Adjusted economic risk of disease(%)		Adjusted economic risk of disease changes(%)
		Mean	%	Mean	%	Before	Mean	%	Mean	%	
NRCMI	45.91	9725.15	27.02	4401.81	38.42	0.59	0.84	0.25	1.46	2.08	0.62
URBMI	8.97	15765.72	8.56	5817.43	9.92	0.95	1.11	0.15	0.49	0.57	0.08
UEBMI	45.11	23589.53	64.41	6022.07	51.65	1.43	1.14	-0.28	0.71	0.57	-0.14
Total	100	16521.96	100	5259.84	100	1	1	-	-	-	-

Table 6: Standarized benefit and concentration index.

Items	NRCMI		URBMI		UEBMI	
	Benefit (RMB)	CI	Benefit (RMB)	CI	Benefit (RMB)	CI
Actual value	3104.72	0.174	5662.41	0.13	13462.65	0.135
Predicted value	3216.85	0.204	5656.56	0.179	12783.61	0.162
Standardized value	3114.89	0.189	6449.96	0.143	14783.01	0.128
CI: concentration index.						

for mental health services. The results showed that the economic risk of mental disorders increased with the rising of hospitalization expenses. The economic risk of disease for rural patients was higher than that of urban patients after adjustment for income, and the economic risk of disease of patients using the NRCMI insurance scheme was higher than that of the URBMI and UEBMI schemes. The may be due to the fact that the income of rural residents is lower than that of urban residents. Moreover, with a lower income, their tendency to make use of health services is lower. From this, disease will then become more serious due to under-treatment initially. To cure or control disease, a significant cost has to be spent, which means a higher economic risk. However, the economic risk of disease of patients with UEBMI decreased, and rural patients with NRCMI increased after compensation paid by the health insurance. Moreover, results showed that health insurance reduces the economic risk of disease for urban patients, but does not reduce the economic risk of disease for rural patients. This is consistent with the results of a previous study which found that NRCMI did not decrease the economic burden of inpatients [22]. This is maybe the compensation rate of UEBMI was higher than that of NRCMI. Moreover, the siginicant income gap in China: per capita disposable income in 2013 was $4347.6 for urban residents and only $1434.8for rural residents [23].

For the benefit equity, the concentration index of patients with NRCMI is 0.174, which is higher than that of URBMI and UEBMI. This indicates that equity for NRCMI is relatively low. A previous study performed in 2010 showed that the problems of benefit equity within basic health insurances was a serious issue [24], namely, that health services utilization for patients with a high income is relatively high; and the hospitalization expenses of low-income patients exceeds significantly the per capita income. Feng (2012) also found that the incidence of catastrophic health expenditures among the low-income population is high, and the economic risk of disease is large [25]. The concentration index of the three basic medical insurances analsyed are positive, which means that basic medical insurances benefit those with a higher income more than those with a lower income. Namely, with the same health service needs, poorer people are not as able to make full use of all types of mental health resources than rich people, and the compensation costs paid by health insurance for the poor is significantly lower than that for the rich. This is consistent with the results from previous analyses (2013) on the benefits of China's basic health insurance in 2013 [26,27]. Furthermore, the actual compensation rate of UEBMI reached more than 80%. In the endeavour to achieve equity of health insurance, one major concern is whether or not health insurance is able to improve health benefit for the vulnerable elderly. In this study, urban people with UEBMI and URBMI benefit more than that of rural people. However, in Vietnam, a study found that the low-income group benefited more from health insurance in terms of using inpatient services than the high-income group in Vietnam [4]. Poor people are less likely than better off people to be able afford large co-payments in the context of high medical costs, especially where they have to pay the whole cost before they can get a small amount of money reimbursed. They are therefore less likely to use services at times of need. In Vietnam, although the same concern of escalating medical expenses has been raised and debated in the recent years [28,29], the situation is not as serious as in China. The co-payment level in Vietnam was much lower than in China. This may further reduce the financial burden faced by the poor people. The Health Care Fund for the Poor has been found to increase utilization of health services, especially inpatient services [30]. With the fact that the benefit equity of UEBMI with higher reimbursement rate was higher, when designing health insurance plans, policy makers should ensure the benifit equity,especially for poor patients. Furthermore, in the integration process of NRCMI and URBMI, policy makers should also rethink and analyze the effect of policies on the level of equity within the health insurance system so as to narrow the benefit gap currently, and ultimately promote a unified equitable health insurance system in China.

Our study has some limitations. First, we use data from two large mental health hospitals from Shandong province, and the sample may not be representative of the entire country. Second, we used inpatient administrative data to examine the equity of compensation of health insurance, while outpatient and community mental health services are quite important in China. Future study should look at both outpatient and community mental health service utilization.

Conclusions

In the field of mental health, the compensation of health insurance for hospitalization expenses is inequitable. The equity of NRCMI is relatively low, and the three basic health insurances schemes benefit the rich more than the poor. Therefore, promoting the integration of NRCMI and URBMI, and increasing the compensation rate of NRCMI is an urgent task in order to reduce the socio-economic inequality within mental health.

Author Contributions

All authors were responsible for the structure of this paper. JX conducted literature search, data analysis and drafted the paper. All authors contributed to the conception and design, interpretation of the data, critical revisions of the paper, and approved the final version for submission.

Acknowledgments

We are grateful to the staff in Shandong Mental Health Hospital in Jinan and Daizhuang Psychiatric Hospital in Jining, Shandong, for their assistance in collecting data on health resource utilization. The content of this publication is solely the responsibility of the authors.

Funding

This work was supported in part by Independent Innovation Foundation of Shandong University in China (project no. 2012JC038).

Competing interests

All authors declare no competing interests.

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Submitted 25 March, 2017
Accepted 28 April, 2017