The impact of depression on household consumption under the current health insurance system

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Abstract: Using data from the China Family Panel Studies (CFPS) 2018, this paper examines the impact of depression on household consumption and explores whether the health insurance system can smooth out household consumption fluctuations due to depression. The findings show that depression leads to a significant increase in households' medical expenditures and a significant decrease in food, clothing, household goods, transportation and communication expenditures, but total expenditures remain almost unchanged; the current health insurance system is unable to smooth out the above consumption fluctuations.

1. Introduction

In China, depression has become a serious public health problem. The results of the first nationwide epidemiological survey of mental disorders, which lasted for three years (2013-2015), showed that the lifetime prevalence of depression (the proportion of patients who have had depression in their lifetime in the total population) in China was 6.9%, and the 12-month prevalence (the proportion of patients who have had depression in 12 months in the total population) was 3.6% [1]. From 1990 to 2017, the prevalence of depression in China increased from 3224.6 to 3990.5 per 100,000 people, an increase of 24.7% [2].

Depression causes tremendous physical and psychological stress to patients, and also imposes a heavy economic burden on families and society. In 2018, the total economic cost of depression in the United States reached $326.2 billion, an increase of 37.9% compared to 2010 [3]. Thus, the rising prevalence of depression is not only a public health issue, but also an important issue for economic development and social welfare.

In recent years, Chinese society has become more concerned about depression, and in 2019, the government included the promotion of mental health in the Health China Action (2019-2030), which promotes the prevention of depression and other mental illnesses from the perspectives of individuals, families, the government and society. However, people with depression and their families still lack appropriate medical coverage and social support.

Currently, the Chinese public has a low level of knowledge about depression [4] and a more negative attitude towards mental illness [5]. Neurologists have been the mainstay of mental health services in China, driven by insufficient mental health knowledge and a sense of stigma [6]. Meanwhile, mental health service resources in China are severely short and unevenly distributed; according to the National Mental Health Work Plan (2015-2020), there are 1,650 mental health professional institutions, 228,000 psychiatric beds with an average of 1.71 beds per 10,000 population (global average of 4.36 beds per 10,000 population), and more than 20,000 psychiatrists with an average of 1.49 psychiatrists per 100,000 population (global average of 2.03 per 100,000 population in upper middle-income level countries). Moreover, compared to physical illnesses, mental illnesses such as depression are neither covered by commercial health insurance nor are they fully covered by basic health insurance. The National Drug List for Basic Medical Insurance, Work Injury Insurance and Maternity Insurance (2020), which will come into effect on March 1, 2021, has added some antidepressant drugs compared to the previous version, and some cities have also included depression

as a chronic disease in their medical insurance outpatient clinics. Some cities have also included depression as an outpatient chronic disease, such as Zhengzhou, Henan Province, Yueyang, Hunan Province, Fuzhou, Fujian Province, and Lianyungang, Jiangsu Province. However, even though depression is included as a special outpatient disease, patients are still subject to many restrictions when seeking medical treatment, such as: some cities require patients to apply to designated medical institutions and go through the procedures before they can be billed in real time by the medical insurance, and the maximum annual payment amount is extremely limited. In addition, many cities in China do not include depression as an outpatient chronic disease, and some imported antidepressants are only reimbursed when the patient is hospitalized, and psychological counseling is still not covered by medical insurance. The treatment needed by depressed patients is long-term, and the high cost of antidepressant drugs and psychological counseling has led some patients to poverty, which further aggravates depression, thus creating a vicious cycle of "illness-poverty".

During the 2021 National People's Congress, Li Xiaoqin, a delegate to the National People's Congress, proposed to include depression and psychological counseling in health insurance coverage. This paper wants to explore: how will depression affect household consumption in the context of the existing health insurance system? Can the current health insurance system smooth out the consumption fluctuations of households due to depression? We hope that the quantitative analysis in this paper will provide insights and suggestions for the design and implementation of changes in the health insurance system provisions related to depression.

2. Literature review

There is a rich literature examining the relationship between health shocks (illness, injury, and death) and household consumption, but the available findings are inconsistent. Some literature argues that health shocks do not affect household consumption; Kai Liu (2016), based on data from the China Health and Nutrition Survey (CHNS) from 1993 to 2011, finds that total income and total consumption of rural households are fully resistant to health shocks even in the absence of a new rural cooperative medical system, and that household labor supply is an important insurance mechanism against health shocks [7]. More literature argues for quantitative and structural changes in household consumption in response to health shocks. In China, among studies targeting rural households, Ding Jihong et al. (2013) used the China Health and Nutrition Survey (CHNS) 1991-2009 rural household panel data to show that the incidence of disease and population aging significantly dampened rural households' consumption demand for durable goods [8] , while Chu Keben et al. (2018) and Liu Songtao et al. (2020) both used the China Family Panel Studies (CFPS) panel data, find that health shocks significantly increase total and health care expenditures of rural households [9,10]; in studies for urban households, Zhao Shaoyang (2010) uses the Urban Residents Basic Medical Insurance Tracking Survey (URBMI) in 2007 and 2008, noting that disease shocks significantly increase households' health care expenditures and reduce their consumption levels, but the actual decline in household consumption was only 26% of the total burden of disease, suggesting that urban Chinese households can achieve partial insurance against disease shocks [11]; studies that distinguish between Chinese household income levels find that food consumption of middle- and high-income households is less affected by health shocks than low-income households, and that low-income households are more sensitive to and have more severe consequences from disease shocks (Zheng Yujing and Chen Hua, 2017; Cai Xuexiong et al. 2019) [12,13]; studies that distinguish the age of Chinese household heads find that the health status of older household heads is an important source of health risk for households, that total consumption, food and non-food consumption are lower for households with high health risk, and that households stabilize food consumption by adjusting non-food consumption (He Xingqiang and Shi Wei, 2014; Cai Xuexiong et al., 2019) [12,14]; other national studies have shown that following a health shock, households in Singapore (Terence-C Cheng & Li Jing, 2019), Vietnam (Sophie Mitra et.al, 2016) and Zambia (Peter Hangoma et.al, 2018) will cut food consumption to cope with increased health expenditures and labor income will decrease [15-17], while households in

Indonesia do not experience significant changes in food and non-food consumption even as they increase health expenditures and reduce non-farm income (Robert Sparrow et.al, 2014) [18].

The literature examining the impact of mental illness on household consumption is relatively sparse. In the United States, Arati Dahal & Fertig Angela (2013), using data from the Panel Survey of Income Dynamics (PSID) in the United States from 1999 to 2009, found a negative impact of mental illness on household spending, with specific effects varying by mental illness, expenditure category, gender, and marital status. In particular, single and married women with mental illness reduced education expenditures, suggesting that mental illness can potentially reduce lifetime utility [19].Patryk Babiarz & Yilmazer Tansel (2017) use data from the 1999 to 2013 Panel Survey of Income Dynamics (PSID) in the United States to show that compared to serious physical illness mental illness led to a more substantial decline in labor income than Households experiencing psychological or mental problems experience a 6-8% reduction in their total consumption expenditure, an 8-15% reduction in food and housing expenditure, and an even larger 19-26% reduction in expenditure on travel and vacation [20]. In China, using panel data from the China Family Panel Studiesy (CFPS) for 2012 and 2016, Liang Tengjian et al. (2018) found that both major depressive disorder and serious physical illness significantly reduce household non-food consumption and total consumption, but that household food consumption has priority and does not fluctuate significantly [21].Chee-Ruey Hsieh& Qin Xuezheng (2018) used data from the 2012 China Family Panel Studies (CFPS) and found a positive association between depression and medical expenditures, with women, rural residents, those with low educational attainment, and the elderly bearing more of the medical costs of depression. Also, high medical costs due to depression may be driven by cost shifts from mental health care to general health care, as mental illnesses often coexist with other non-communicable diseases, such as diabetes and hypertension [22].

There is a large literature discussing the impact of health insurance on household expenditures in China, some of which, using earlier data, argues that while health insurance coverage is extensive, there is still a long way to go to translate this coverage into cost-effective services (Xiaoyan Lei & Lin Wanchuan, 2009; Chuanchuan Zhang, Lei Xiaoyan, 2017) [23, 24], and no significant changes in health care expenditures of insured households have occurred (Zang, Wenbin et al., 2012) [25]. However, in recent years, a growing body of literature has argued that the effects of health insurance are significant: on the one hand, they are reflected in the "anti-poverty effect" of health insurance, which can reduce the degree of income decline of low-income people when they suffer from health shocks and reduce the risk of poverty for sick households. Urban health insurance can significantly smooth the impact of health shocks on the fluctuation of food consumption and medical expenditure (Zheng Yujing and Chen Hua, 2017)[13] , and new rural cooperative medical insurance helps farmers to smooth consumption and reduce the proportion of food expenditure when they encounter health risks (H. Brown Philip et.al, 2009)[26] , and has a significant mitigation effect on the risk of poverty due to illness of farmers (Khurshid Alam & Mahal Ajay, 2014; Shen Zheng, 2018; Yu Xinliang et.al, 2020) [27-29]. On the other hand, it is reflected in the ability of health insurance to improve the quality of health care services and improve the standard of living of the health insurance population. Medical insurance significantly reduces the financial burden of medical care for chronically ill and elderly groups (Zhou Qin and Liu Guoyen, 2014) [30], can help maintain the family's agricultural activities and investment in human capital of offspring, which can reduce the impact on personal income in the long run (Kai Liu, 2016) [7], and will also change the traditional concept of medical care for the group of insured women, prompting them to choose better quality medical services (Cai Xuexiong et al., 2019)[12].

Regarding the impact of health insurance on household consumption of people with mental illness, Patryk Babiarz & Yilmazer Tansel (2017) found that in the United States, health insurance is an important tool for smoothing household consumption for people with mental illness. When experiencing mental problems, uninsured households reduce their total consumption by about 30% compared to only 2% for those with insurance, and food consumption decreases by 33% for uninsured households compared to 9% for those with insurance [20]. In China, Liang Tengjian et al. (2018) found that formal health insurance partially compensated for medical expenses caused by severe physical illness, but could not mitigate the impact of major depressive disorder on household consumption,

which is related to the very low access to medical care for depressive disorder and the current health insurance system in China [21].

A review of the literature shows that although the number of people with mental illness has increased in recent years, studies related to it in terms of household consumption and health insurance are still relatively few and the findings are inconsistent. Depression is one of the most prevalent psychiatric disorders in the country and, according to the Diagnostic and Statistical Manual of Mental Disorders (5th edition) (DSM-5), its core clinical manifestations are depressed mood, loss of interest, and lack of energy, accompanied by other cognitive, physical, and behavioral symptoms such as inattention, insomnia, unresponsiveness, decreased behavioral activity, and feelings of fatigue, with each episode lasting at least 2 weeks [31]. Thus, depression may lead to feelings of worthlessness and burnout in patients. Compared to psychologically healthy individuals, those with depressive tendencies derive less utility from consumption and may spend less money and time on consumption. At the same time, depression can lead to increased medical expenditures for the patient's family, and to smooth out such fluctuations, the family may also actively reduce food as well as other expenditures. Considering that the current health insurance system only partially reimburses medical expenses related to depression and that the proportion of depressed people who seek regular medical care is extremely low, health insurance plays a very limited role.

Therefore, synthesizing the existing literature and taking into account the current situation in China, the following hypothesis is proposed to be tested.

H1: Depression leads to an increase in household medical expenditures and a decrease in other expenditures, leaving total expenditures essentially unchanged.

H2: The existing health insurance system is unable to smooth out the fluctuations in household consumption due to depression.

3. Data sources and models setting

3.1 Data sources

The data used in this paper are from the China Family Panel Studies (CFPS). The survey was conducted by the China Social Science Survey Center of Peking University, with a sample covering 25 provinces/municipalities/autonomous regions, and aimed to reflect social, economic, demographic, and educational and health changes in China by tracking and collecting data at three levels: individual, household and community.

The CFPS survey assesses respondents' mental health using the Center for Epidemiologic Studies Depression (CES-D). The CES-D questionnaire (Radloff, 1977) [32]   is the most frequently used self-assessment instrument for depression and depressive symptoms and contains four subscales: somatic symptoms (i), interpersonal (j), depressed mood (k), and positive mood (l). The first three measure negative emotions, while the latter measures positive emotions. Respondents were asked to rate how often they experienced the specified emotions in the past week, with options ranging from 0 to 3 for each question (0 = rarely, 1 = rarely, 2 = occasionally, 3 = often). Thus, the CES-D scores can be calculated from the responses as follows.

$$CES - D = \sum_i Score_i + \sum_j Score_j + \sum_k Score_k + \sum_l (3 - Score_l) \tag{1}$$

In the CFPS survey, the scale is available in various formats. In 2012 and 2016, the CESD20 containing 20 questions was used. However, feedback from the field survey indicated that the scale appeared to be overloaded with questions in the CFPS individual questionnaire, with low respondent acceptance and biased results. Therefore, the streamlined mode of the scale was changed in mid-2018, reducing the questions from 20 to 8. The CFPS used percentile equating to generate a comparable score of CESD20sc for 20 questions. As the responses in the CFPS survey were changed to a scale of 1 to 4 (1=rarely, 2=rarely, 3=occasionally, 4=often). Therefore, the CES-D scores used in this paper were calculated as follows.

$$CES - D = CESD20sc - 20 \qquad (2)$$

According to Radloff (1977, 1991) [32,33], in the Community Mental Health Assessment Survey in the United States, scores of 16 and 28 correspond approximately to the 80th and 95th percentile of the CES-D score distribution, and thus these two thresholds are used to define depressive symptoms and depression. Following this approach, the 80th and 95th percentiles of the CES-D score distribution in the CFPS 2018 national sample correspond to approximately 20 and 28 points, meaning that a CES-D score of 20 to 27 indicates that the person has depressive symptoms and a score of 28 and above indicates possible depression.

The key explanatory variable in this paper is the respondent's depressive status, which has three possible profiles: mental health, depressive state, and depression. The explanatory variables are respondents' household expenditures reported in the CFPS survey, including total household expenditures as well as the breakdown of food expenditures, medical expenditures, clothing expenditures, household goods expenditures, transportation and communication expenditures, cultural, educational and recreational expenditures, and housing expenditures. The control variables include the following two main categories: first, individual characteristics variables, including gender, age, household registration status, educational status, marital status, work status, and the presence of chronic diseases; and second, household characteristics variables, including household size, total household income, household savings, and household debt.

Based on the 2018 CFPS dataset, samples younger than 16 and older than 99, samples with a household size of 1, and samples with missing information on key variables such as gender, age, CES-D score, and household expenditure were excluded, resulting in 25,673 observations.

3.2 Variable description and model setting

Table 1 provides descriptive statistics for the key variables, with columns 1 to 4 representing the total sample and subsamples for each of the three mental health categories (mental health, depressive state, and depression). As can be seen from the table, there are considerable group differences between the means of the three subsamples and statistically significant differences between the depressive state/depression group and the mental health group. As the level of depression increases, the household's medical expenditures gradually increase and total expenditures, as well as the breakdown of expenditures other than medical expenditures, significantly decrease. At the same time, the sub-sample of psychologically sub-healthy households had lower savings and income and higher household debt. Matthew Ridley et.al (2020) in Science journal stated that there is a bidirectional relationship between poverty and poor mental health [34], where poverty induces depression and depressed expenditures exacerbate poverty, possibly creating a "disease-poverty" vicious cycle. In the sample of depressive states, 57.5% were female and in the sample of depression, 63.9% were female. It is evident that women are more likely to be depressed compared to men, and this is confirmed by the literature [35]. The mean ages of the three subsamples were 48, 49 and 53 years, indicating that older people are at a higher risk of depression than younger people, and that society needs to be more vigilant with the current increasing level of ageing in China. The comparison of the subsamples also leads to the conclusion that depression is more prevalent among those with rural households, low education, unemployment, and failed marriages, and that depression is more likely to be co-morbid with other chronic diseases.

Table 1. Description of variables and descriptive statistics.

Variable	Definition	(1) full sample	(2) mental health	(3) depressive state	(4) depression
Total household consumption	Total current period consumption (¥)	79616.093 (89308)	82347.845 (88498)	71915.923** (93298)	63893.952*** (86437)

Food consumption	(¥)	21296.547 (19759)	22269.735 (19933)	18511.384*** (19178)	15805.346*** (17232)
Medical consumption	(¥)	6722.839 (16159)	6480.51 (15762)	7338.36*** (16817)	8294.246*** (19158)
Clothing consumptions	(¥)	3377.171 (5310)	3554.229 (5400)	2914.544*** (5160)	2272.067*** (4182)
Household goods consumptions	(¥)	10449.168 (34256)	10768.62 (30758)	9577.455* (42790)	8557.456** (49186)
Transportation and communication consumption	(¥)	6134.616 (7239)	6351.742 (7281)	5493.903*** (7071)	4962.527*** (6918)
Cultural, educational and recreational consumptions	(¥)	7275.117 (13575)	7619.143 (14110)	6233.969*** (11494)	5474.905*** (10870)
Housing consumption	(¥)	10967.395 (33673)	11214.258 (34276)	10355.194 (32952)	9321.616* (26772)
Sex	1=male, 0=female	0.493 (0.5)	0.517 (0.5)	0.425*** (0.494)	0.361*** (0.481)
Age	(years)	48.818 (15.331)	48.326 (15.386)	49.31** (14.928)	53.982*** (14.639)
Household registration	1 = urban, 0 = rural	0.499 (0.5)	0.52 (0.5)	0.435*** (0.496)	0.389*** (0.488)
Access to education	1-8 = illiterate, semi-literate - PhD	2.726 (1.401)	2.833 (1.412)	2.474*** (1.338)	1.975*** (1.181)
Marital status	1=married, 0=unmarried, cohabiting, divorced, widowed	0.858 (0.349)	0.866 (0.341)	0.842*** (0.364)	0.804*** (0.397)
Work situation	1=employed, 0=unemployed	0.759 (0.428)	0.765 (0.424)	0.763 (0.425)	0.674*** (0.469)
Chronic illness	1=yes, 0=no	0.177 (0.382)	0.148 (0.355)	0.253*** (0.435)	0.358*** (0.48)
Family size	(person)	4.349 (1.981)	4.365 (1.99)	4.326 (1.954)	4.187*** (1.935)
Household income (log)	Total income for the period (¥)	99447.927 (175865)	105493.35 (185977)	81463.085*** (134542)	67124.909*** (118736)
Household savings (log)	Total cash and deposits (¥)	62120.446 (185851)	68339.323 (196114)	40174.261*** (114222)	37943.456*** (192382)
Family debt.(log)	Non-housing financial liabilities (¥)	18351.181 (101262)	17542.02 (105976)	20714.39 (83514)	22788.91* (77286)

Note: Statistics reported are sample means, with standard deviations in parentheses. ***, **, * indicate statistically significant differences between the depressive state group/depression group and the mental health group at the 1%, 5% and 10% significance levels, respectively.

Based on the previous definition of the relevant variables, model (1) was constructed to explore the effects of different mental health states on total and sub-consumption of residential households.

$$LnConsumption_i = \alpha + \beta D_1 + \gamma D_2 + \sum \delta_i \, Control_i + \mu_i \qquad (3)$$

Of these, the explanatory variables $Consumption_i$ are the household consumptions reported by the respondent in the CFPS survey, including total household consumptions and the breakdown of food consumptions, medical consumptions, clothing consumptions, household goods consumptions, transportation and communication consumptions, cultural, educational and recreational consumptions, and housing consumptions. D_1 and D_2 are dummy variables reflecting the respondent's mental health status; if the CES-D score is 20 to 27, D_1 is assigned a value of 1, indicating that the respondent may in a depressive state; if the CES-D score is 28 and above, D_2 is assigned a value of 1, indicating that the respondent may be suffering from depression. $Control_i$ Are the control variables mentioned in the previous section, and μ_i is a random perturbation term.

In addition, a dummy variable of medical insurance is added to model (1), assigned a value of 1 if the resident has any medical insurance such as new rural cooperative medical insurance, urban residents' basic medical insurance, or urban employees' medical insurance, and 0 otherwise, and a cross-multiplicative term of the respondent's mental health status and medical insurance is introduced to investigate whether medical insurance can smooth the effect of depression on the resident's total household consumption and sub-consumption.

$$LnConsumption_i = \alpha + \beta_1 D_1 + \beta_2 D_1 \times Insurance + \gamma_1 D_2 + \gamma_2 D_2$$
$$\times Insurance + Insurance + \sum \delta_i \, Control_i + \mu_i \qquad (4)$$

At this point, the effect of depressive states and depression on household consumption is $(\beta_1 + \beta_2 \times Insurance)$ and $(\gamma_1 + \gamma_2 \times Insurance)$, and the role of health insurance in this can be understood by looking at the corresponding coefficients.

4. Empirical results and analysis

Table 2 reflects the impact of depressive state/depression on household consumption. As can be seen from the table, household health care consumptions are significantly higher for both being in a depressive state and depression, and even slightly higher for being in a depressive state than for depression. Compared to those with depression, those in a depressed state are less ill and have less feelings of worthlessness and burnout, so they seek medical care more actively. Food consumption of households decreases significantly for both depressive states and depression, with a greater decrease of 9% for depressed individuals, which is consistent with the findings of Patryk Babiarz & Yilmazer Tansel (2017) in the United States [20]. Generally, depression leads to depressed mood and decreased appetite in individuals, so the depressive state/depression group will have lower food consumptions than the mental health group. Consumptions on clothing, household items and transportation and communication decreased significantly in the depression group, while there was a decreasing but non-significant trend in the depressive state group. This suggests that as depression deepens, households will cut back more on other consumptions to compensate for the increase in medical consumptions in order to smooth out overall household consumption.

When a member is in a depressed state, total household consumption decreases significantly by 3%. In the depressed state, there is no significant change in household consumptions in any of the other breakdowns except for food consumptions and medical consumptions, and the decline in food consumptions exceeds the increase in medical consumptions, so total household consumptions are in a declining state. The total household consumption of depressed patients only decreased by 1.3% and not significantly, depression caused a change in the structure of household consumption, medical

consumption increased significantly, food consumption, clothing consumption, household goods consumption, and transportation and communication consumption decreased significantly, but the total consumption remained almost the same, which verified hypothesis 1.

Table 2. Impact of depression status on household consumption.

	Total consumption	Food	Medical	Clothing	Household goods	Transportation and communication	Cultural, educational and recreational	Housing
Depressive state	-0.03** (0.013)	-0.065*** (0.014)	0.271*** (0.046)	-0.05 (0.033)	-0.007 (0.038)	0.016 (0.029)	-0.076 (0.062)	-0.029 (0.028)
Depression	-0.013 (0.02)	-0.09*** (0.022)	0.268*** (0.071)	-0.26*** (0.05)	-0.166*** (0.059)	-0.104** (0.044)	0.085 (0.096)	-0.004 (0.044)
Sex	-0.022** (0.009)	-0.003 (0.01)	0.03 (0.034)	-0.123*** (0.024)	-0.065** (0.028)	-0.007 (0.021)	-0.389*** (0.046)	0.007 (0.021)
Age	-0.004*** (0.01)	-0.003** (0.01)	0.01*** (0.001)	-0.021** (0.001)	-0.013*** (0.001)	-0.015*** (0.001)	-0.02*** (0.002)	-0.001 (0.001)
Household registration	0.197*** (0.01)	0.4*** (0.011)	-0.059 (0.036)	0.092*** (0.026)	0.061** (0.03)	-0.089*** (0.023)	0.632*** (0.049)	0.237*** (0.022)
Access to education	0.068*** (0.004)	0.056*** (0.005)	0.112*** (0.015)	0.059*** (0.01)	0.037*** (0.012)	0.06*** (0.009)	0.363*** (0.02)	0.043*** (0.009)
Marital status	0.128*** (0.013)	0.14*** (0.015)	0.133*** (0.048)	0.221*** (0.034)	0.145*** (0.04)	0.106*** (0.03)	0.939*** (0.066)	0.09*** (0.03)
Work situation	-0.116*** (0.011)	-0.237*** (0.013)	-0.299*** (0.041)	0.099*** (0.03)	0.111*** (0.034)	0.074*** (0.026)	0.098* (0.056)	-0.076** (0.026)
Chronic illness	0.078*** (0.012)	-0.017 (0.014)	0.831*** (0.045)	0.005 (0.032)	0.093** (0.037)	0.035 (0.028)	0.193*** (0.061)	0.08*** (0.028)
Family size	0.035*** (0.002)	0.037*** (0.003)	0.142*** (0.009)	0.083*** (0.006)	0.015** (0.007)	0.051*** (0.006)	0.506*** (0.012)	0.053*** (0.005)
Household income (log)	0.41*** (0.005)	0.371*** (0.006)	0.183*** (0.019)	0.525*** (0.013)	0.478*** (0.016)	0.398*** (0.012)	0.705*** (0.026)	0.302*** (0.012)
Household savings (log)	0.009*** (0.001)	0.016*** (0.001)	0.022*** (0.004)	0.047*** (0.003)	0.047*** (0.003)	0.029*** (0.002)	0.077*** (0.005)	0.004* (0.002)
Family debt (log)	0.026*** (0.001)	0.001 (0.001)	0.042*** (0.004)	0.015*** (0.003)	0.052*** (0.003)	0.037*** (0.002)	0.055*** (0.005)	0.019*** (0.002)

Note: ***, **, * indicate significant at the 1%, 5% and 10% levels of significance, respectively, with standard errors in parentheses. Same below.

Table 3 shows the regression results after the inclusion of the Medicare cross-sectional term. None of the cross terms for depressive status/depression and health insurance were significant in the total sample, indicating that the current health insurance system is unable to smooth out fluctuations in household medical consumptions that increase and other consumptions that decrease as a result of depressive status/depression, and hypothesis 2 is confirmed. Consumptions on food, household goods, and transportation and communication decreased more significantly in the depression group compared to the depressive state group. The next step is to further differentiate between urban and rural samples for the study.

In the urban sample, total household consumptions rise by 7.7% in the depressive state group without health insurance and fall by 3.4% (0.077-0.111) in those with health insurance, suggesting that health insurance mitigates the increase in total household consumptions in the depressive state group, but not significantly in the depressive group. In housing consumptions, the depressed group without health insurance declines by 50.8%, while those with health insurance only decline by 6.1% (-0.508 + 0.447), probably because the cost of renting in the city is higher, there is more room for decline after illness, and those with health insurance have some livelihood security to slow the decline.

In the rural sample, total household consumptions in the depressive status group were also smoothed by health insurance and were more significant than in the urban sample. Among medical consumptions, the depressive state group with health insurance increased by 67.9% compared to those without health insurance, which is similar to the study by Terence-C Cheng & Li Jing (2019) [15], suggesting that those with insurance spend more than those without insurance after suffering an illness shock. This may indicate that rural insured people tend to seek more expensive medical care when they are in a depressed state. And, those in a depressed state are more likely to seek help from a reimbursable neurologist than a psychiatrist [6]. A similar, but not significant, trend was observed in the depression group. In China, less than one in ten people with mental disorders have ever received any type of mental health service [36]. This extremely low treatment rate suggests that household medical consumptions for depressed patients are grossly underestimated. In addition, health insurance significantly increased consumptions on transportation and communication in the depressive state and depression groups, by 35.5% and 36.7%, respectively, possibly because health insurance is a safeguard and those with health insurance are more likely to travel for medical treatment. This was not significant in the urban sample because health insurance coverage was higher in the urban sample, there was no variability in the sample, and also patients in the cities required much lower transportation communication consumptions to access medical care than rural patients, so the results were not significant.

Table 3. Impact of depression status on household consumption under Medicare.

		Total	Food	Medical	Clothing	Household goods	Transportation and communication	Cultural, educational and recreational	Housing
Full sample	Depressive state x medical insurance	0.017 (0.046)	-0.024 (0.051)	0.17 (0.165)	0.11 (0.118)	0.142 (0.137)	0.067 (0.103)	0.007 (0.225)	0.077 (0.102)
	Depression x medical insurance	-0.014 (0.062)	0.08 (0.069)	0.198 (0.225)	-0.026 (0.16)	0.173 (0.187)	0.159 (0.14)	-0.139 (0.306)	0.131 (0.139)
	Depressed state	-0.045	-0.044	0.121 (0.158)	-0.148 (0.113)	-0.136 (0.132)	-0.044 (0.099)	-0.077 (0.215)	-0.099 (0.098)

		(0.044)	(0.049)						
	Depression	0.01 (0.059)	-0.165** (0.066)	0.103 (0.213)	-0.23 (0.152)	-0.319* (0.177)	-0.244* (0.133)	0.223 (0.29)	-0.121 (0.132)
	Control variables	control	control	control	control	control	control	control	control
Urban sample	Depressive state x medical insurance	-0.111* (0.061)	-0.085 (0.063)	-0.297 (0.235)	-0.093 (0.159)	-0.024 (0.195)	-0.219 (0.15)	-0.271 (0.302)	-0.028 (0.148)
	Depression x medical insurance	-0.064 (0.09)	0.001 (0.094)	-0.03 (0.347)	-0.186 (0.235)	0.194 (0.287)	-0.117 (0.222)	-0.315 (0.446)	0.447** (0.218)
	Depressed state	0.077 (0.058)	0.009 (0.06)	0.585*** (0.223)	-0.011 (0.151)	0.042 (0.185)	0.192 (0.143)	0.163 (0.288)	-0.032 (0.14)
	Depression	-0.005 (0.085)	-0.154* (0.088)	0.338 (0.326)	-0.076 (0.221)	-0.339 (0.27)	-0.09 (0.208)	0.323 (0.42)	-0.508** (0.205)
	Control variables	control	control	control	control	control	control	control	control
Rural sample	Depressive state x medical insurance	0.145** (0.068)	0.027 (0.08)	0.679*** (0.232)	0.283 (0.174)	0.298 (0.193)	0.355** (0.141)	0.249 (0.332)	0.187 (0.141)
	Depression x medical insurance	0.035 (0.086)	0.142 (0.102)	0.369 (0.294)	0.093 (0.22)	0.146 (0.245)	0.367** (0.178)	0.064 (0.42)	-0.098 (0.178)
	depressed state	-0.168*** (0.066)	-0.086 (0.078)	-0.398* (0.224)	-0.272 (0.168)	-0.304 (0.187)	-0.297** (0.136)	-0.296 (0.321)	-0.173 (0.136)
	Depression	-0.024 (0.082)	-0.18** (0.097)	-0.091 (0.28)	-0.359* (0.21)	-0.31 (0.233)	-0.397** (0.17)	0.016 (0.401)	0.161 (0.17)
	Control variables	control	control	control	control	control	control	control	control

5. Robustness tests

To test the robustness of the previous regression results, the sample is adjusted using the following three methods:(1) Re-regressing using CFPS 2016 data, the results are shown in Tables 4 and 5, similar to the 2018 regression results, with the difference that health insurance is able to mitigate the decline in food consumptions of rural households due to depression under the 2016 sample. (2) The CFPS 2018 sample data were subjected to a 1% before-and-after tailing process. (3) Direct regression using

Radloff's (1977, 1991) [32, 33] findings using 16 and 28 points as cutoffs for depressive status and depression. The regression results of the latter two methods are similar to the previous article and will not be repeated due to space limitations.

Table 4. Impact of depression status on household consumption.

	Total consumption	Food	Medical	Clothing	Household goods	Transportat-ion and communica-tion	Cultural, educational and recreational	Housing
Depressive state	-0.027* (0.015)	-0.061*** (0.017)	0.335*** (0.055)	-0.098*** (0.037)	-0.031 (0.034)	-0.055 (0.031)	0.06 (0.078)	0.06 (0.078)
Depression	-0.031 (0.023)	-0.112*** (0.027)	0.364*** (0.088)	-0.184*** (0.06)	-0.125** (0.055)	-0.033* (0.05)	-0.013 (0.125)	-0.013 (0.125)
Control variables	control	control	control	control	control	control	control	control

Table 5. Impact of depression status on household consumption under Medicare.

		Total consumption	Food	Medical	Clothing	Household goods	Transportat-ion and communic-ation	Cultural, educational and recreational	Housing
Full sample	Depressive state x medical insurance	-0.028 (0.054)	0.023 (0.063)	0.089 (0.203)	-0.131 (0.138)	-0.06 (0.127)	0.174 (0.116)	-0.18 (0.29)	-0.1 (0.108)
	Depression x medical insurance	-0.023 (0.078)	0.048 (0.091)	-0.047 (0.292)	-0.428 (0.199)	0.218 (0.182)	-0.193 (0.166)	-0.32 (0.417)	0.183 (0.155)
	Control variables	control	control	control	control	control	control	control	control
Urban sample	Depressive state x medical insurance	-0.036 (0.074)	0.029 (0.081)	-0.046 (0.299)	-0.032 (0.194)	-0.008 (0.177)	0.069 (0.163)	-0.132 (0.388)	-0.11 (0.148)
	Depression x	-0.106 (0.113)	0.012 (0.124)	-0.065	-0.392 (0.297)	0.254 (0.27)	-0.204 (0.249)	-0.323 (0.592)	0.381 *

	medical insurance			(0.458)					(0.226)
	Control variables	control	control	control	control	control	control	control	control
Rural sample	Depressive state x medical insurance	0.098 (0.079)	0.09 (0.098)	0.394** (0.273)	0.249 (0.198)	0.108 (0.182)	0.266** (0.165)	-0.28 (0.433)	0.062 (0.159)
	Depression x medical insurance	0.076 (0.108)	0.149* (0.133)	0.246 (0.37)	0.279 (0.268)	0.171 (0.247)	0.155 (0.224)	0.266 (0.587)	0.181 (0.216)
	Control variables	control	control	control	control	control	control	control	control

6. Conclusions and recommendations

Depression is a mental illness that has become increasingly prominent with the development of the times and the severity of life pressures, and has impacted on the normal lives of patients and their families. Using data from the China Family Panel Studies (CFPS) 2018, this paper examines the impact of depression on household consumption and explores whether the health insurance system can smooth out household consumption fluctuations due to depression. The findings show that depression leads to a significant increase in households' medical consumptions and a significant decrease in food consumptions, clothing consumptions, household goods consumptions, and transportation and communication consumptions, but total consumptions remain almost unchanged; the current health insurance system cannot smooth the above consumption fluctuations.

Based on the results of the empirical study, this paper proposes the following recommendations: (1) Medical policies should be in line with the development of the times and include outpatient treatment for depression and psychological counseling in the scope of medical insurance reimbursement. This will not only fulfill the original purpose of medical insurance, greatly reduce the financial burden of depression patients and their families, and highlight the "bottom-up" protection function of the social insurance system, but also help drive the investment of mental health resources and promote the improvement of related medical facilities and treatment systems. (2) At the same time, the state should actively carry out mental health education and publicity campaigns to eliminate social prejudice against mental illness and guide existing and potential depressed patients to adopt correct medical behavior, so as to achieve early detection, early treatment and early recovery, just like other common physical illnesses. (3) Strengthen physical and psychological attention and financial assistance for people vulnerable to the disease, interrupt the vicious cycle between poverty and depression, and work to break the cycle of poverty caused by the disease and return to poverty due to the disease.

References

[1] Yueqin Huang, Wang Yu, Wang Hong, et al. Prevalence of mental disorders in China: a cross-sectional epidemiological study [J]. The Lancet Psychiatry, 2019, 6(3): 211-224.

[2] Xinwen Ren, Yu Shicheng, Dong Wenlan, et al. Burden of depression in China, 1990-2017: Findings from the global burden of disease study 2017 [J]. Journal of Affective Disorders, 2020, (268): 95-101.

[3] Paul-E Greenberg, Fournier Andree-Anne, Sisitsky Tammy, et al. The Economic Burden of Adults with Major Depressive Disorder in the United States (2010 and 2018) [J]. PharmacoEconomics, 2021, 39(6): 653-665.

[4] H Ma. Integration of hospital and community services-the '686 Project'-is a crucial component in the reform of China's mental health services [J]. Shanghai Arch Psychiatry, 2012, 24(3): 172-174.

[5] Wang YJ, Guo ZJ, Wang HL, et al. Principal component analysis of factors influencing attitudes toward mental illness among urban and rural residents in Henan Province[J]. Modern Preventive Medicine, 2019, 46(22): 4113-4116.

[6] C Liu, Liu M, Jiang R, et al. Prevalence and Recognition of Depressive Disorder in Three Medical Outpatient Departments of General Hospitals in Beijing, China[J]. J Nerv Ment Dis, 2016, 204(7): 537-541.

[7] Kai Liu. Insuring against health shocks: health insurance and household choices [J]. Journal of Health Economics, 2016, (46): 16-32.

[8] Ding J. H., Ying M. L., and Du Z. Chao. A study on consumption behavior of rural households in China: an analysis based on the perspective of health risk and medical coverage [J]. Financial Research, 2013, (10): 154-166.

[9] Chu, K.B., Liu, D.Y., Duan, W. B. Mechanisms of rural households' smoothed consumption under health shocks and the relationship between external protection and household self-insurance [J]. Nankai Economic Research, 2018, (02): 39-55.

[10] Liu S T, Liang Y X, Wang L P. The impact and mechanism of health shocks on household consumption of rural residents in China - Empirical evidence from CFPS IV [J]. Journal of Hunan Agricultural University (Social Science Edition), 2020, 21(05): 77-85.

[11] Zhao Shaoyang. A study of disease shocks and urban households' consumption insurance capacity--an empirical analysis based on data from a tracking survey of urban households [J]. China Population Science, 2010, (05): 66-74.

[12] Cai Xuexiong, Guo Xinqin, Shi Shengxu. Women's health shocks and household consumption consumption structure-an empirical analysis based on CGSS2015 data [J]. Economic Issues, 2019, (12): 16-22.

[13] Zheng YJ, Chen H. Can "urban insurance" mitigate the impact of health shocks [J]. Research in Financial Economics, 2017, 32(04): 118-128.

[14] He XQ, Shi W. Health risks and urban residents' household consumption [J]. Economic Research, 2014, 49(05): 34-48.

[15] Terence-C Cheng, Li Jing, Vaithianathan Rhema. Monthly spending dynamics of the elderly following a health shock: Evidence from Singapore [J]. Health Economics, 2019, 28(1): 23-43.

[16] Peter Hangoma, Aakvik Arild, Robberstad Bjarne. Health Shocks and Household Welfare in Zambia: an Assessment of Changing Risk [J]. Journal of International Development, 2018, 30(5): 790-817.

[17] Sophie Mitra, Palmer Michael, Mont Daniel, et al. Can Households Cope with Health Shocks in Vietnam? [J]. Health Economics, 2016, 25(7): 888-907.

[18] Robert Sparrow, Poel Ellen-Van, Hadiwidjaja Gracia, et al. Coping with the Economic Consequences of Ill Health in Indonesia [J]. Health Economics, 2014, 23(6): 719-728.

[19] Arati Dahal, Fertig Angela. An econometric assessment of the effect of mental illness on household spending behavior [J]. Journal of Economic Psychology, 2013, (37): 18-33.

[20] Patryk Babiarz, Yilmazer Tansel. The impact of adverse health events on consumption: understanding the mediating effect of income transfers, wealth and health insurance [J]. Health Economics, 2017, 26(12): 1743-1758.

[21] Liang Tengjian, Liu Qi, Guo Zhifang. Mental illness shocks and rural households' consumer insurance - with a discussion on the mediating effects of economic costs and insurance mechanisms [J]. Journal of Harbin Institute of Technology (Social Science Edition), 2018, 20(06): 130-136.

[22] Chee-Ruey Hsieh, Qin Xuezheng. Depression hurts, depression costs: the medical spending attributable to depression and depressive symptoms in China [J]. Health Economics, 2018, 27(3): 525-544.

[23] Xiaoyan Lei, Lin Wanchuan. The New Cooperative Medical Scheme in rural China: does more coverage mean more service and better health? [J]. Health Economics, 2009, 18(S2): 25-46.

[24] Chuanchuan Zhang, Lei Xiaoyan, Strauss John, et al. Health Insurance and Health Care among the Mid-Aged and Older Chinese: Evidence from the National Baseline Survey of CHARLS [J]. Health Economics, 2017, 26(4): 431-449.

[25] Zang W B, Liu G E, Xu F, et al. The impact of basic medical insurance for urban residents on household consumption in China [J]. Economic Research, 2012, 47(07): 75-85.

[26] Philip H. Brown, de Brauw Alan, Du Yang, et al. A Brief Analysis of New Rural Cooperative Medical Care and Farmers' Consumption Behavior [J]. China Labor Economics, 2009, 5(02): 1-29.

[27] Yu XL, Shang guan YW, Shen YP, et al. Poverty due to illness: How do health shocks affect income levels? A discussion of the poverty alleviation effect of health insurance [J]. Economic and social system comparison, 2020, (04): 30-40.

[28] Shen Zheng. A study on the effect of New Agricultural Cooperative on alleviating poverty of farm households due to illness - based on survival analysis perspective[J]. Western Economic Management Forum, 2018, 29(01): 53-62.

[29] Khurshid Alam, Mahal Ajay. Economic impacts of health shocks on households in low and middle income countries: a review of the literature [J]. Globalization and health, 2014, 10(1): 21-31.

[30] Zhou Q, Liu G E. Health shock: What role does the current health insurance system actually play? [J]. Economic Review, 2014, (06): 78-90.

[31] American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (5th Ed.) [M]. Beijing: Beijing Publishing House, 2015.

[32] Lenore-Sawyer Radloff. The CES-D Scale [J]. Applied Psychological Measurement, 1977, 1(3): 385-401.

[33] L Sawyer Radloff. The use of the center for epidemiologic studies depression scale in adolescents and young adults [J]. Journal of youth and adolescence, 1991, 20(2): 149-166.

[34] Matthew Ridley, Gautam Rao, Frank Schilbach. Poverty, depression, and anxiety: Causal evidence and mechanisms [J]. Science (American Association for the Advancement of Science), 2020, 370(6522): 1289-1290.

[35] Alex-B Neitzke. An Illness of Power: Gender and the Social Causes of Depression [J]. Culture, Medicine, and Psychiatry, 2016, 40(1): 59-73.

[36] M-R Phillips, Zhang J, Shi Q, et al. Prevalence, treatment, and associated disability of mental disorders in four provinces in China during 2001-05: an epidemiological survey [J]. Lancet, 2009, 373(9680): 2041-2053.