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Life Satisfaction of Older Chinese: The Role of Health and Health Insurance

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Abstract: The Chinese government has launched a series of health reforms to establish universal health insurance coverage, particularly for vulnerable groups, including older adults. However, the current public health insurance system is highly fragmented, consisting of different programs with different levels of premiums and benefits. We analyse whether the universal health insurance system increases the life satisfaction of middle-aged and older Chinese people and to what extent the type of health insurance affects the life satisfaction of this group. Our study is based on data from the China Health and Retirement Longitudinal Study, a nationally representative longitudinal survey of Chinese aged 45 and above, in 2011, 2013, and 2015. We find that the life satisfaction of middle-aged and older adults does not depend on having any health insurance coverage but varies with the type of health insurance coverage, controlling for potential confounding variables such as health status, occupation, *hukou* status, education, and other demographic variables. Individuals covered by the most generous program, the Government Medical Insurance, reported a higher life satisfaction. In comparison, individuals covered by the Urban Employee Medical Insurance, the Urban Resident Medical Insurance, and the New Rural Cooperative Scheme reported a lower life satisfaction by 0.155, 0.106, and 0.112 standard deviations, respectively. Our results suggest that establishing a more equitable health insurance system should be the next step in health reforms in China.

Keywords: Life satisfaction; Health insurance; Older adults; Health; China

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1 Introduction

Over the past three decades China has experienced rapid economic growth and a dramatic demographic transition. China's real GDP per capita multiplied over five times between 1990 and 2015 (Easterlin et al. 2017). This rapid economic growth was accompanied by a rapid ageing of the population (World Health Organization 2015). The proportion of older Chinese adults aged 60 years and above reached 18% of the total population in 2018 and is projected to rise to 34% in 2050 (National Bureau of Statistics of China 2018). Life expectancy at birth in China increased from 67 years in 1980 to 75 years in 2015 and is expected to be 80 years in 2050 (World Bank 2016). Older Chinese adults enjoy longer lives, but how has their life satisfaction been affected by China's dramatic economic and social transformation? Has the life satisfaction of older adults living in China improved?

Although older Chinese adults have experienced substantial economic development and longer life expectancy, there is no clear evidence of an uptrend in their life satisfaction. Life satisfaction in China is found to be flat and even to have declined in past decades (Bartolini and Sarracino 2015; Easterlin et al. 2012, 2017). Li and Raine (2014), using multiple national and representative samples, find that Chinese people have experienced a marked decline in life satisfaction in the last two decades. Easterlin et al. (2017) apply four survey data and report a U-shaped pattern in life satisfaction from 1990 to 2015, with life satisfaction falling since 1990 to 2005 and subsequently recovering. Older adults have suffered more during the economic transition and their life satisfaction decreased between 1990 to 2010 (Yu et al. 2016).

Two main factors are linked to the trajectory of life satisfaction in China: increasing inequality and the dissolution of the social security net during the economic transition (Appleton and Song 2008; Easterlin et al. 2012, 2017; Wang et al. 2015; Wu and Li 2013). Urban residents express concerns of unfairness in income and insecurity in the social welfare system and unemployment, which reduces their subjective wellbeing, although their household income has risen (Knight and Gunatilaka 2010). The social security system, which was reformed from being employer-based to insurance-based, contributes to this uncertainty, which in turn decreases life satisfaction (Easterlin et al. 2012; Knight and Gunatilaka 2010). Such inequality and insecurity have been particularly observed among vulnerable groups, such as older adults and the economically disadvantaged (Chyi and Mao 2012; Easterlin et al. 2012; Li et al. 2013; Wang et al. 2015).

Older adults tend to be particularly concerned with the dissolution of traditional social security and the high costs of health services in the market-oriented health system. On the one

hand, they face higher risks of deteriorating health as they age. More than 100 million people aged 60 and above in China reported having at least one chronic disease (e.g., stroke, heart disease) and approximately 5 million older adults had a mental health issue (e.g., depression and dementia) (World Health Organization 2015). Having access to affordable health services is especially important for older adults, and essentially guarantees their quality of life (Sidel 1993; World Health Organization 2015). On the other hand, the costs of health services continuously increase under economic restructuring and the market-oriented health service system (Gao et al. 2002; Yip and Hsiao 2009). Increasingly, older adults are unable to afford health treatment or fall into poverty due to catastrophic out-of-pocket (OOP) payments for health care (Cheng et al. 2015; World Bank 2016). Approximately 31% of rural older adults reported unaffordability of proper medical services in 2008 (Li et al. 2014). In an urban area study, 62% of older urban adults reported having an illness in the past two weeks but did not have access to any medical services, and 14% of them mentioned financial insecurity or unaffordability as the main reason for this (Sun et al. 2014). As a result, the unaffordability of health care can contribute to low life satisfaction among older adults.

Responding to this situation, the Chinese government has launched a series of reforms to establish a universal health security net and to provide access to affordable basic health care for all citizens, including older adults. Older adults in particular have benefited from the expanded health care system. In 2012, 98.4% of older people reported being covered by some form of public health insurance (World Health Organization 2015). However, in the current fragmented health insurance system, the premiums and reimbursement rates vary across different health insurance programs (such as the Government Medical Insurance (GMI) and New Rural Cooperative Medical Scheme (NCMS)) (Meng et al. 2015; Zhang et al. 2017). Therefore, it is important to study whether universal health insurance coverage reduces risks and insecurity, and, therefore, increases the life satisfaction of older adults.

While existing studies mainly focus on the relationship between income and life satisfaction (Knight and Gunatilaka 2010; Smyth et al. 2010; Wang et al. 2015) or the effects of specific health insurance coverage on the utilisation of medical services in the general population (Liu and Zhao 2014; Sun et al. 2014; Wagstaff et al. 2009; Yip and Hsiao 2009), the impacts of different types of health insurance on life satisfaction and health status remain unclear. There is limited research on the relationship between health insurance coverage with various packages and the life satisfaction of middle-aged and older adults. This study helps fill this gap by taking advantage of a longitudinal survey, the China Health and Retirement Longitudinal

Study (CHARLS), which provides nationally representative data on middle-aged and older Chinese, to explore the interaction between life satisfaction, types of health insurance, and health status in China. Our study will inform the development of health insurance reforms in China.

2 Literature Review

A large literature studies the paradox of life satisfaction and economic growth in developed countries and new market economics, that is, economic development and income growth do not result in a continuous increase in life satisfaction (Clark and Oswald 1996; Easterlin 1974; Diener and Biswas-Diener 1999). Absolute income growth is found to bring an increase in wellbeing over time while, in the short term, growth is associated with a drop in life satisfaction and other dimensions of wellbeing (Graham et al. 2017; Graham and Lora 2010). One explanation of this paradox is that dramatic economic growth and restructuring of the economy tend to increase insecurity and inequality, as some are left behind in the process (Graham and Pettinato 2002; Graham and Lora 2010). Macroeconomic conditions such as unemployment are found to have an impact on subjective wellbeing (Blanchflower and Oswald 2004; Di Tella et al. 2003; Easterlin et al. 2012; Easterlin 2013). High unemployment drives a decrease in life satisfaction not only due to the high dissatisfaction among unemployed people but also as a result of the insecurity and anxiety of employed persons who are concerned about the labour market and the social security system (Di Tella et al. 2001). Disparity of life satisfaction is generated by the dissolution of traditional social security systems, as the redistribution between rich and poor and over the life cycle is weakened during the dismantling, which generates inequality and poverty, and impacts wellbeing (Kenworthy 1999; Kenworthy and Pontusson 2005; Sjöberg 2010). Older adults and low-income groups, both vulnerable groups, tend to have difficulties in adapting to rapid changes in the economy, and are therefore more concerned about insecurity and uncertainty during the changes (Easterlin 2012).

Access to health insurance works as a safety net against insecurity arising from health shocks and uncertain health expenditure, which is particularly important for older adults who are more likely to face the risks of deteriorating health and financial dependency (Blanchflower et al. 2009; Keng and Wu 2004; Tran et al. 2017). Health insurance coverage is expected to reduce OOP expenses and financial losses from health-related financial shocks. Health insurance enrolees tend to utilise medical services more and report better health status and wellbeing (McWilliams et al. 2004; Fitzpatrick et al. 2004). At the same time, a sense of

security is gained through health insurance coverage, and this is positively related to older adults' psychological wellbeing and physical health (Keng and Wu 2014). Tran et al. (2017) verify that the lack of health care coverage in the US has a detrimental effect on the happiness of the general population after controlling for individuals' self-assessed health and other socio-economic factors. Qi and Zhou (2010) use cross-sectional data from the China Health and Nutrition Survey (CHNS) and find that Chinese older adults, both urban and rural residents, are less likely to feel lonely and hold a more positive attitude towards their life if they are covered by the Government Medical Insurance (GMI). Therefore, we expect that health insurance coverage is particularly important for older adults, as it provides a critical safety net for risks and leads to higher life satisfaction.

China's life satisfaction trajectory is similar to that of the Eastern European countries that experienced social and economic transition after the fall of the Soviet Union (Easterlin 2012, 2014; Easterlin et al. 2017). In both cases, restructuring led to significant economic reforms and dramatic changes in the social security system, which explains the decline of and disparities in life satisfaction (Easterlin 2012; Guriev and Melnikov 2018). China's economic boom was accompanied by a shift from a planned economy to a free market economy and dramatic changes in the traditional institution-related social welfare system (Cai 2011). For example, permanent and secured employment ('*iron rice bowl*') and employment-related benefits (e.g. health care and childcare) guaranteed by the government or work units weakened in the 1990s. Instead, a market-oriented and profit-driven system replaced the previous permanent and secured one (Cai and Wang 2010; Cai 2011). Life satisfaction patterns in China have been found to mirror the rise of insecurity in welfare nets during the transition (Li et al. 2013).

The dissolution of the existing health care system during the market reforms created a series of strains on Chinese society. Increasingly, people reported a lack of health insurance coverage and a heavy burden of health care costs during the transition (Easterlin et al. 2012; Hsiao 2004; Yip and Hsiao 2009). Moreover, the market-oriented economic reform not only ended the universal health care provided by the government or work unit (*danwei*), but also dismantled traditional health care schemes in rural areas (including the Cooperative Medical Scheme). Approximately 80% of rural residents reported not being covered by any health insurance in 2003 (Ministry of Health in China 2004). The situation was even worse for older adults. In 2000, only 33.2% of people aged 60 years and over were covered by health insurance. A significant proportion of older people in urban and rural areas reported having no access to affordable health care (World Health Organization 2015). As mentioned above, older adults

tend to be concerned with the insecure health care system and insufficient health care provisions (Eggleston et al. 2008; Ding 2017; Shen and Yeatts 2013). The lack of health insurance coverage is one of the main reasons for the decrease in the health status of older adults (Easterlin et al. 2012) and is therefore likely to impact their life satisfaction.

Since the 2000s, the Chinese government has implemented a series of health care reforms to reduce health-related financial risks and provide universal health insurance (Yip et al. 2012). Two new health insurance programs, the New Rural Cooperative Medical Scheme (NCMS) for rural residents and the Urban Resident Basic Medical Insurance (URBMI) for urban residents with no formal employment (including the elderly, students, and the self-employed), were introduced in 2003 and 2007 respectively. These programs, together with the Government Medical Insurance (GMI) for employees employed by government offices or state institutions and the Urban Employee Medical Insurance (UEMI) for urban employees, milestone the establishment of the health insurance safety net in China.[1] Older adults have benefited from the expanded health insurance system. In 2012, 98.4% of older people reported being covered by some form of public health insurance (World Health Organization 2015). However, the benefits provided by these programs, especially outpatient services, vary widely across schemes and are often insufficient (Hu et al. 2008; Su et al. 2018). Taking Beijing as an example,[2] in 2014 the outpatient reimbursement rate for enrolees of UEMI was 90% for costs exceeding a deductible amount of CNY1,800 while the reimbursement rate for NCMS enrolees was substantially lower (50% with a deductible amount of CNY100). The reimbursement rates for inpatient services also differed across health insurance schemes. For instance, NCMS enrolees could reimburse 75% if the costs exceeded a deductible amount of CNY300 while the reimbursement rate of the UEMI was 90%, with a deductible amount of CNY1300. The diverse reimbursement levels in the fragmented health insurance schemes have also been documented in several empirical studies. Outpatient reimbursement rates among UEMI enrolees were higher than those of URBMI enrolees in 2011 (Zhang et al. 2017). Tian et al. (2015) use data from the Basic Medical Insurance Household Survey 2007–2011 and find that the average

[1] Founding sources differ across health insurance types. The UEMI is funded by an 8% payroll contribution, of which 6% are paid by employers and 2% by employees. The URBMI receives 70% of its funding from the government subsidies and 30% from individual premiums. The NCMS is 80% is founded by government subsidies and 20% by individual premium (Meng et al, 2015). The GMI is 100% founded by the government (World Bank, 2010).

[2] The criteria of reimbursement rate of health insurance depend on the types of health insurance, the retirement status of the health insurance enrolees, the costs of medical services, and the tier of medical institutes. Here we describe the reimbursement level of first-tier medical institutes (e.g. county hospital). Please see details at https://beijing.chashebao.com/yiliao/12149.html.

reimbursement rate in inpatients of UEMI was substantially higher than that of URBMI and NCMS.

Some studies focus on how specific health insurance programs impact individuals' health status and health service utilisation in China (Liu and Zhao 2014; Wagstaff et al. 2009; Sun et al. 2014). In particular, the release of the NCMS for rural residents has attracted significant attention. The NCMS has been found to have a limited impact on the utilisation of outpatient services among older adults (Shi and Zhang 2013). Other scholars verify that enrolment in the NCMS does not reduce OOP expenses for medical services of enrolees, but it does promote the utilisation of medical services (Cheng et al. 2015; Babiarz et al. 2010). In 2008, 31% of rural older adults reported not being able to afford medical services and only 37% of the expenses of inpatient services were reimbursed under the NCMS, although the majority of rural residents were covered by the NCMS (Li et al. 2014). Regarding the UBMI for urban residents with no formal employment, Liu and Zhao (2014) find that the program significantly increases the utilisation of medical services but does not significantly decrease OOP expenses.

In response to the fragmentation of health insurance, the Chinese government began pilot reforms and encouraged local governments to merge the NCMS with the URBMI and merge the GMI with the UEMI, in order to narrow the gaps between various types of health insurance in reimbursement rates and premiums. For example, since 2014, Shandong province has merged the NCMS and URBMI and established a new scheme, the Urban and Rural Resident Medical Insurance (URRMI) (Provincial Government of Shandong Province 2014). Some local governments (e.g. Beijing, Jiangsu) have started to provide Supplementary Medical Insurance or subsidies to GMI enrolees to promote the merging process from GMI to URBMI. While some regions or cities have completed the merging process, the pace and state of implementation of health insurance reforms vary across China.

Existing studies mainly focus on the impact of specific health insurance on health status or utilisation of health services among older adults (Cheng et al. 2015; Shi and Zhang 2013). There is limited research on how health insurance coverage with diverse premiums and reimbursement rates is correlated with older adults' life satisfaction when controlling for key covariates. This paper therefore aims to answer two questions: (1) Do older adults experience high levels of life satisfaction under China's universal health insurance system?; (2) Do changes in health insurance status increase or decrease the life satisfaction of older adults in China after controlling for their health status?

3 Data and Methods

3.1 Data

The data used in this study are from the nationally representative China Health and Retirement Longitudinal Study (CHARLS) survey, which was conducted by the Institute of National Development at Peking University. We use data from the national baseline collected in 2011, and from the two available follow-up surveys in 2013 and 2015. CHARLS applies a multi-stage probabilistic sampling method for the sample collection to represent urban and rural residents aged 45 and over in China.[3] CHARLS collects a wide range of indicators, including life satisfaction, health (subjective and objective), health insurance, and other demographic and socio-economic information (e.g. gender, education, household registration status (*hukou*), marital status, occupation).

The sample used in this study is restricted to middle-aged and older respondents aged 45 and above who answered the survey questions on health insurance. In total, there are 15,189 valid responses in the 2011 wave, 16,168 in the 2013 wave, and 17,639 in the 2015 wave. Table 1 summarises the definitions of key variables and provides the descriptive statistics of the sample.[4] The average age of the individuals in our sample is 61.7 years, and 47.9% are males. Most respondents are married (84.0%) and have rural household registration status (70.3% with rural hukou status vs. 29.7% with urban hukou status).

3.1.1 Subjective Wellbeing

The dependent variable in this study is the score of self-rated life satisfaction, elicited with the following question: 'Please think about your life as a whole. How satisfied are you with it?' There are five possible responses: 'completely satisfied', 'satisfied', 'somewhat satisfied', 'not satisfied', and 'not at all satisfied'. This self-rated indicator has been widely applied in studies of life satisfaction, happiness, and subjective wellbeing (Ding 2017; Ferrer-i-Carbonell and Frijters 2004; Jin et al. 2018; Tran et al. 2017; Wang et al. 2015).[5] Subjective measurement of life satisfaction has been found to provide good validity and reliability (Veenhoven 1996a, 1996b, 2002). We group the five ordinal categories of life satisfaction into three categories: 'not satisfied' and 'not at all satisfied' = 1 (dissatisfied); 'somewhat satisfied' = 2 (somewhat satisfied); and 'satisfied' and 'completely satisfied' = 3 (satisfied). Table 2 reports the sample

[3] See Zhao et al. (2013) for details of the CHARLS survey design and sampling method.
[4] The descriptive statistics are weighted using the individual sampling weights provided in CHARLS.
[5] In this study, the terms 'life satisfaction', 'happiness', and 'subjective wellbeing' are used interchangeably, although differences in these concepts have been noticed (Diener 2006; Veenhoven 2002).

distribution of life satisfaction. Among all the middle-aged and older adults, 13.3% were dissatisfied with their life as a whole, 62.8% were somewhat satisfied, and 23.9% were satisfied.

3.1.2 Health Insurance Indicators

The CHARLS survey provides rich health insurance information. In this study, we focus on the different types of public health insurance.[6] CHARLS elicits the current enrolment status of the respondents' health insurance. We categorise the answers into five types: coverage of the Government Medical Insurance (GMI), coverage of the Urban Employee Medical Insurance (UEMI), coverage of the Urban Resident Basic Medical Insurance (URBMI), coverage of the NCMS (New Rural Cooperative Scheme), and no public health insurance (see Table 1).[7] 67.9% of respondents reported being covered by NCMS, which is consistent with the distribution of *hukou* status of the sample (70.3% with rural *hukou* status), while 4.5% reported having no public health insurance coverage. As some local governments have explored merging GMI into UEMI and providing Supplementary Medical Insurance (SMI) to those enrolees who transferred their coverage from GMI to UEMI (The Office of State Council of China 2000), we use SMI as an additional type of health insurance and include a binary variable indicating whether an individual has SMI as a control variable in the regression models.

3.1.3 Health Measures

Health status is an important element of quality of life for older adults: health status correlates more strongly with happiness than any other single factor (Borg et al. 2006; Sabatini 2014; Graham 2008; Graham et al. 2017; Gwozdz and Sousa-Poza 2010). Older adults' better health status, including their self-rated health and objective health status, positively drives their subjective wellbeing (Clark and Oswald 2002; Easterlin 2004). We measure health status using both subjective and objective measures. The first health variable refers to self-rated health status, which is widely used in studies of wellbeing (Borg et al. 2006; Gwozdz and Sousa-Poza 2010; Tang 2014; Van Doorslaer et al. 2000; Yi and Vaupel 2002). It is measured by the responses to the question: 'Would you say your health is very good, good, fair, poor, or very poor?' on a five-point scale from 1 (very poor) to 5 (very good). Although the previous literature shows that subjective self-rated health status is a more powerful indicator of wellbeing than objective health (Kunzmann et al. 2000; Smith et al. 2002), we also include

[6] Only 0.5% of respondents reported being covered by private health insurance.

[7] A few respondents reported being covered by multiple health insurance programs. For these respondents, we applied the questions of health insurance type in reimbursement of expenses in outpatient and inpatient services to double-check the status of health insurance coverage.

indicators of objective health status to comprehensively capture the health status of older adults. Two other indicators of health status are related to difficulties in performing activities of daily living (ADL) and instrumental activities of daily living (IADL). ADL is measured by six questions related to difficulty in performing daily tasks, including dressing, bathing or showering, eating, getting into or out of bed, using the toilet, and controlling urination and defecation. IADL is measured by four questions associated with difficulty in performing household chores, preparing hot meals, shopping, and taking medications.[8] Because with increasing age more people suffer from ADL or IADL disability, which impacts older adults' wellbeing, these indicators have been widely used in studies of older adults' subjective wellbeing and health (Cummings 2002; Johnson and Wolinsky 1993; Sin et al. 2015; Yi and Vaupel 2002).

Table 2 reports the distribution of life satisfaction by type of health insurance and health status. We find that there is a disparity in life satisfaction across enrolees with different types of health insurance. Holders of GMI reported the lowest rates of dissatisfaction (3.1%), followed by holders of URBMI (9.1%), while those with no health insurance reported the highest rates of dissatisfaction (22.9%). Among all middle-aged and older adults, those with better health status were more satisfied with life than those with poor health; 24.8% of individuals with more than one ADL limitation were dissatisfied with their life compared to 12.8% of individuals with no ADL limitations.

3.1.4 Other Explanatory Variables

We include a set of variables, including demographic variables and socio-economic status, in the model to control for potential confounding factors. Important determinants of life satisfaction identified in the existing literature include demographic variables (e.g. age and marital status) (Gwozdz and Sousa-Poza 2010; Mroczek and Spiro 2005), income (Easterlin et al. 2010; Graham and Pettinato 2002; Graham 2012; Smyth et al. 2010; Wang et al. 2015), occupation (Wu and Tsay 2018), living arrangements (Jin et al. 2018), and life events (Chen 2001). We include log household income per capita to control for the impact of income on life satisfaction. Considering that occupation is an important determinant of having health insurance in China, we include a set of dummy variables indicating occupation status.[9] On the

[8] There are slight differences in the questions related to difficulty of performing daily activities in the three waves of CHARLS. Hence, we only use those ADL and IADL questions that are available in all three waves.

[9] The variables of occupation status refer to the individual's current employment status or last employment status if unemployed or retired. We categorise occupation into employed by the government, employed by enterprises, employed by individual firms, agricultural worker, self-employed, never worked, and others.

other hand, as household registration status (rural *hukou* vs. urban *hukou*) is another factor determining access to different types of health insurance (Zhang et al. 2017), we also include *hukou* status in the model. Losing a spouse in the past 5 years is also included to control for the impacts of major life events on life satisfaction (Infurna et al. 2017). In addition, a dummy variable indicating whether the individual was living with children is added into the model, following existing studies (Jin et al. 2018). Other socio-economic and demographic control variables include age, square of age, gender, marital status, education level, and retired or not. Year fixed effects and provincial fixed effects are controlled to avoid unobservable year and regional effects.

Table 1 Definitions and descriptive statistics of key variables

	Definitions	Mean	Std. dev.	Min.	Max.
Life satisfaction	1 = not satisfied; 2 = somewhat satisfied; 3 = satisfied	2.106	0.601	1	3
Health insurance types					
GMI	1 = covered by Government Medical Insurance; 0 = otherwise	0.020	0.141	0	1
UEMI	1 = covered by Urban Employee Medical Insurance; 0 = otherwise	0.167	0.373	0	1
URBMI	1 = covered by Urban Resident Basic Medical Insurance; 0 = otherwise	0.069	0.254	0	1
URRMI	1 = covered by Urban & Rural Resident Medical Insurance; 0 = otherwise	0.020	0.141	0	1
NCMS	1 = covered by New Rural Cooperative Medical Scheme; 0 = otherwise	0.679	0.467	0	1
No health insurance	1 = no public health insurance; 0 = otherwise	0.045	0.206	0	1
Covered by SMI	1 = covered by Supplementary Medical Insurance; 0 = otherwise	0.002	0.049	0	1
Health status					
Self-rated poor health status	1 = poor health; 0 = otherwise	0.242	0.428	0	1
Activities of daily living					
No ADL or IADL difficulty	1 = no ADL or IADL difficulty; 0 = otherwise	0.868	0.33	0	1
Only IADL difficulty	1 = difficulty with at least one IADL but no ADL difficulty; 0 =	0.066	0.248	0	1
ADL difficulty	1 = with at least one ADL limitation; 0 = otherwise	0.066	0.249	0	1
Demographic variables					
Age	Age of respondent in years	61.674	10.467	45	103
Age^2	Square of age of respondent	3913.542	1370.005	2025	10609
Male	1 = male; 0 = female	0.479	0.500	0	1
Marital status					
Married	1 = married; 0 = otherwise	0.840	0.367	0	1
Widowed	1 = widowed; 0 = otherwise	0.138	0.348	0	1
Never married or divorced	1 = never married or divorced; 0 = otherwise	0.022	0.147	0	1
Middle school and above education	1 = middle school and above; 0 = otherwise	0.361	0.480	0	1
Socio-economic status and others					
Household income per capita (log)	Natural logarithm of household income per capita	1.992	3.467	0	13.816
Urban *hukou*	1 = urban *hukou* status; 0 = rural *hukou* status	0.297	0.457	0	1
Occupation					
Government employee	1 = employed by government; 0 = otherwise	0.066	0.248	0	1
Enterprise employee	1 = employed by private or state-owned enterprise; 0 = otherwise	0.084	0.278	0	1

Individual-firm employee	1 = employed by individual firm; 0 = otherwise	0.103	0.304	0	1
Agricultural worker	1 = agricultural worker; 0 = otherwise	0.605	0.489	0	1
Self-employed	1 = self-employed; 0 = otherwise	0.091	0.287	0	1
Others	1 = other occupations; 0 = otherwise	0.045	0.207	0	1
Never worked	1 = never worked; 0 = otherwise	0.006	0.078	0	1
Retired	1 = is retired; 0 = not retired	0.366	0.482	0	1
Lost spouse in past 5 years	1 = lost spouse in past 5 years; 0 = otherwise	0.032	0.177	0	1
Living with children	1 = living with children; 0 = otherwise	0.256	0.436	0	1

Note: Statistics are weighted using the individual sampling weights provided in CHARLS.

Table 2 Distribution of life satisfaction by public health insurance and health status (%)

	Life satisfaction			
Health insurance	Dissatisfied	Somewhat	Satisfied	Total
GMI	3.11%	66.89%	30.00%	1,034
UEMI	9.44%	70.11%	20.45%	5,490
URBMI	9.05%	70.78%	20.18%	2,189
URBMI	13.43%	63.01%	23.57%	789
NCMS	14.37%	60.77%	24.87%	33,359
No health insurance	22.86%	53.76%	23.38%	2,898
Health status				
Self-rated poor health	25.96%	57.99%	16.05%	11,532
Activities of daily living				
No ADL or IADL	12.83%	63.80%	23.82%	42,439
Only IADL difficulty	18.05%	57.15%	24.80%	2,872
ADL difficulty	24.76%	52.41%	22.83%	2,464
Total	13.29%	62.81%	23.90%	48,996

Note: Statistics are weighted using the individual sampling weights provided in CHARLS.

3.2 Methods

Following previous studies (Graham et al. 2017; Gwozdz and Sousa-Poza 2010), we apply a regression model to estimate the impact of health insurance on life satisfaction:

$$\text{Life satisfaction}_{it} = \alpha_0 + \beta_1 \text{Health insurance}_{it} + \beta_2 \text{Health}_{it} + X_{it}\gamma + \mu_i + \sigma_t + \varepsilon_{it} \quad (1)$$

where the subscripts i and t denote the individual and year, respectively. $\text{Life satisfaction}_{it}$ stands for self-reported life satisfaction. $\text{Health insurance}_{it}$ represents the type of public health insurance plan the individual is enrolled in. Health_{it} represents health status, including objective and subjective status. X_{it} denotes a vector of individual-, household-, and regional-level control variables. In the remaining variables, μ_i denotes the unobserved individual fixed effect, σ_t is the year fixed effect, and ε_{it} is the residual.

The ordered logistic model meets the characteristics of our main dependent variable, life satisfaction, which has three levels. However, Ferrer-i-Carbonell and Frijters (2004) argue that the estimation results of the ordinary least squares model (OLS) are similar to the ordered logit or ordered probit models for life satisfaction. OLS modelling has also been widely applied in recent studies of life satisfaction (Graham et al. 2011; Knight and Gunatilaka 2010; Wang et al. 2015). As the OLS model reports the marginal effects directly, we choose to report the results of the OLS model as the main analysis. We show the result of the ordered logistic model to estimate the impacts of health insurance on life satisfaction as a robustness test. We also apply the multinomial logistic model as a robustness test, following previous literature (Han

and Hong 2011; Schnettler et al. 2012).[10] The results are roughly consistent across the different models.

The panel structure of CHARLS allows for a two-way fixed-effects estimation to control for time-invariant unobserved effects. There are two approaches for addressing the problem of unobserved heterogeneity: fixed-effects or random-effects modelling. The choice as to whether to employ random- or fixed-effects modelling is commonly resolved by applying the Hausman test to test for statistical differences between these random- and fixed-effects estimators (Halaby 2004). In our study, the Hausman tests favoured the fixed-effects model over the random-effects model. Fixed-effects modelling has the advantage that unobserved heterogeneity caused by time-constant variables does not bias the estimation as it only estimates intra-individual variations over time.[11] This estimation exclusively focuses on intra-individual variations and discards information relating to inter-individual variation. In our sample of middle-aged and older adults, 15% reported changes in health insurance status from the 2011 to the 2013 wave while 19% reported changes from the 2013 to the 2015 wave (see Table 3). Thirty-five percent reported changes in health insurance across the three waves in total. By applying fixed-effects modelling, we capture how changes in health insurance coverage are correlated with the life satisfaction of middle-aged and older adults.

Table 3 Health insurance changes, 2011–2013 and 2013–2015

Changes in health insurance	2011–2013	2013–2015
No insurance → Insurance*	4.82%	2.02%
Insurance → No insurance	2.20%	7.45%
GMI → Other insurance types	1.24%	0.84%
Other insurance types → GMI	0.96%	1.68%
NCMS → UEMI/URBMI/URRMI	2.90%	2.78%
UEMI/URBMI/URRMI → NCMS	1.44%	2.24%
Other changes	1.69%	1.67%
No changes	84.75%	81.35%
Total	100% (14, 396)	100% (13,788)

Note: *Insurance refers to having some form of public health insurance, including GMI, UEMI, URBMI, URRMI, and NCMS.

We also follow Plümper and Troeger (2007) to display the relative performance of the fixed-effects model. Plümper and Troeger suggest that the fixed-effects model should be applied, unless the between-to-within ratio exceeds 2.8 for at least one variable of interest. Table A.1 in the Appendix presents the between-to-within ratios of key variables in our model. The ratios show that the fixed-effects model is appropriate as the ratios of all the key variables

[10] Please see Table 6 for the estimates of the ordered logistic model and Table 7 for the multinominal logistic model.

[11] Please refer to Halaby (2004) and Wooldridge (2005) for details of fixed-effects estimations.

of interest are all below 2.8. One potential concern is that unobserved individual characteristics might increase the likelihood of having better health insurance and a higher level of life satisfaction, or that individuals with higher life satisfaction might be more likely to obtain better health insurance. In other words, having different types of health insurance could be endogenous. We address this potential endogeneity in different ways. First, using coarsened exact matching (CEM), we pre-process the data to match respondents with GMI to respondents with other types of health insurance (UEMI, URBMI, URRMI, and NCMS) or no health insurance (Blackwell et al. 2009; Iacus et al. 2012). Then, we apply OLS to the matched sample to reduce the variance in the estimates (Ho et al. 2007).

We also argue that it is unlikely that a person with higher life satisfaction can choose to be covered by a certain health insurance program in China. Existing studies document that occupation and *hukou* status are the key determinants of specific health insurance coverage (Li and Zhang 2013; Zhang et al. 2017). Regarding occupation, Meng and Zhang (2001) argue that urban *hukou* status, higher education level, and being male are determinates of attaining a white-collar occupation (which includes professional, managerial, and clerical workers). Studies focusing on occupational mobility find that there is strong intergenerational transmission in occupations. In particular, state employees, especially government officials, have a strong advantage in obtaining better educational and occupational opportunities (including entrance to universities) for their children (Lin and Bian 1991; Meng 2007; Walder et al. 2000). On the other hand, rural residents' opportunity of obtaining urban *hukou* status is restricted by resources, such as education and father's employment status, which are further constrained by family background (Wu and Treiman 2007), although *hukou* constraints have gradually been relaxed in recent years (Cai 2011). In summary, instead of being determined by life satisfaction, access to specific health insurance programs in China is determined by an individual's occupation and *hukou* status, which are closely linked to his/her family background.

4 Results

4.1 The Impact of Health Insurance on Life Satisfaction

We first examine the effects of general health insurance coverage (coverage vs. no health insurance coverage) on life satisfaction in a OLS model and a OLS model with fixed effects (Table 4). The OLS estimates show that health insurance coverage is associated with a higher life satisfaction (0.045 standard deviation) (column (1) in Table 4). The OLS estimates suggest

that individuals with no health insurance have a lower life satisfaction than those in the reference group with coverage of health insurance. However, this link is not significant in the OLS model with fixed effects, which focuses on intra-individual variations over time (column (2) in Table 4). We conclude that health insurance coverage does not necessarily contribute to higher life satisfaction.

Table 4 The effects of health and health insurance (coverage vs. no coverage) on life satisfaction, OLS, and FE OLS

	OLS coefficient (1)	*t*-value	FE OLS coefficient (2)	*t*-value
Health insurance (ref.= no health insurance)				
Covered by health insurance	0.045**	2.42	–0.025	–0.91
Covered by SMI (ref.= no SMI)	–0.117**	–2.12	–0.052	–0.61
Health status				
Self-rated poor health status (ref.=fair/good health)	–0.269***	–25.97	–0.098***	–6.38
Activities of daily living (ref.=no difficulty)				
Only IADL difficulty	–0.043**	–2.31	–0.029	–1.09
ADL difficulty	–0.107***	–4.76	–0.085**	–2.39
Demographic variables				
Age	0.010*	1.81	0.047**	2.22
Age^2	–0.0003	–0.68	–0.0004**	–2.53
Male (ref.=female)	0.005	0.67		
Marital status (ref.= never married or divorced)				
Married	0.233***	5.26	0.165*	1.84
Widowed	0.205***	4.34	0.084	0.85
Middle school and above (ref.= below middle school)	–0.024**	–2.37	0.051	0.91
Socio-economic status and others				
Household income per capita (ln)	0.003**	2.28	0.005**	2.98
Urban *hukou* (ref.= rural *hukou* status)	–0.010	–0.72	0.026	0.50
Occupation (ref.= never worked)				
Government employee	0.035	0.89	0.044	0.61
Enterprise employee	–0.005	–0.13	0.038	0.54
Individual-firm employee	–0.044	–1.15	0.058	0.84
Agricultural worker	–0.017	–0.48	0.024	0.37
Self-employed	0.010	0.25	0.021	0.30
Others	–0.005	–0.12	0.007	0.10
Retired (ref.=not retired)	0.021	1.55	–0.03	–1.18
Lost spouse in past 5 years (ref.= did not lose spouse in past 5 years)	–0.016	–0.47	0.003	0.05
Living with children children) (ref.= not living with children)	–0.015	–0.45	0.022	1.40
Time fixed effects	Yes		Yes	
Province fixed effects	Yes		Yes	
N	25,904		25,904	
Overall R^2	0.097		0.046	
Within R^2			0.100	

Notes: * $p<0.1$, ** $p<0.05$, *** $p<0.01$; standard errors are clustered at the household level; gender variable is omitted in the FE model.

We then examine the relationship between different health insurance types and life satisfaction. Table 5 presents the OLS estimates for life satisfaction in column (1). The OLS estimates suggest that individuals with no health insurance have lower life satisfaction (–0.06) than those in the reference group with Government Medical Insurance (GMI). In other words, the GMI coverage is positively associated with a higher life satisfaction, controlling for a large set of covariates. With respect to health status, poor self-rated health status is associated with a lower life satisfaction (–0.27 standard deviation). Having an IADL difficulty and a ADL difficulty are negatively associated with life satisfaction (lower by –0.04 and –0.11 standard deviations, respectively).

We then examine the link between health insurance and life satisfaction in a OLS model with fixed effects which focuses on intra-individual variations over time. The estimation results are provided in column (2) of Table 5. A change in GMI coverage to the Urban Employee Medical Insurance (UEMI) is negatively associated with life satisfaction, controlling for a set of confounding variables, individual fixed effects, and time fixed effects. Change to UEMI coverage is associated with a decrease in life satisfaction of –0.155 standard deviations. In addition, changes in health insurance coverage from GMI to the Urban Resident Basic Medical Insurance (URBMI) and to the New Rural Cooperative Medical Scheme (NCMS) are significantly associated with a decrease in life satisfaction at the 10% significance level (–0.106 and –0.112 standard deviations, respectively). Enrolment in GMI is associated with a higher probability of having a higher life satisfaction in the fixed-effects OLS. Regarding health status, poor self-reported health is associated with a lower life satisfaction of –0.098 standard deviations, while having more than one ADL difficulty is negatively and significantly correlated with life satisfaction, with –0.084 standard deviations. The magnitude of the estimated effects of health insurance is larger than that of self-reported health status or having ADL difficulties on life satisfaction, although the negative links between poor health status and life satisfaction are consistent with existing studies (Frey and Stutzer 1999; Gwozdz and Sousa-Poza 2010; Ng et al. 2017). With respect to covariates, household income per capita and age are positively and significantly correlated with life stratification, which is consistent with existing studies of older adults' life satisfaction in China and Germany (Graham et al. 2017; Gwozdz and Sousa-Poza 2010).

Table 5 The effects of health and health insurance on life satisfaction, OLS, and FE OLS

	OLS coefficient (1)	*t*-value	FE OLS coefficient (2)	*t*-value
Health insurance (ref.= GMI)				

UEMI	–0.016	–0.57	–0.155***	–3.20
URBMI	–0.052	–1.614	–0.106*	–1.60
URRMI	0.006	0.15	–0.090	–1.27
NCMS	–0.018	–0.62	–0.112*	–1.92
No health insurance	–0.064**	–1.96	–0.086	–1.40
Covered by SMI (ref.= no SMI)	–0.116**	–2.09	–0.046	–0.53
Health status				
Self-rated poor health status (ref.=fair/good health)	–0.269***	–25.93	–0.098***	–6.37
Activities of daily living (ref.=no difficulty)				
Only IADL difficulty	–0.043**	–2.30	–0.029	–1.08
ADL difficulty	–0.107***	–4.75	–0.084**	–2.38
Demographic variables				
Age	0.010*	1.80	0.048**	2.24
Age^2	–0.0003	–0.68	–0.0004**	–2.55
Male (ref.=female)	0.005	0.61		
Marital status (ref.= never married or divorced)				
Married	0.232***	5.23	0.165*	1.84
Widowed	0.204***	4.32	0.085	0.86
Middle school and above (ref.= below middle school)	–0.025**	–2.401	0.051	0.91
Socio-economic status and others				
Household income per capita (ln)	0.003**	2.24	0.005***	2.98
Urban *hukou* (ref.= rural *hukou* status)	–0.006	–0.33	0.024	0.45
Occupation (ref.= never worked)				
Government employee	0.028	0.71	0.044	0.61
Enterprise employee	–0.009	–0.22	0.041	0.58
Individual-firm employee	–0.046	–1.21	0.059	0.86
Agricultural worker	–0.020	–0.56	0.026	0.40
Self-employed	0.009	0.25	0.024	0.33
Others	–0.006	–0.16	0.008	0.12
Retired (ref.=not retired)	0.021	1.54	–0.029	–1.25
Lost spouse in past 5 years	–0.016	–0.47	0.003	0.05
(ref.= did not lose spouse in past 5 years)				
Living with children children)	–0.015	–1.38	0.021	1.38
(ref.= not living with children)				
Time fixed effects	Yes		Yes	
Province fixed effects	Yes		Yes	
N	25,904		25,904	
Overall R^2	0.097		0.046	
Within R^2			0.101	

Notes: * $p<0.1$, ** $p<0.05$, *** $p<0.01$; standard errors are clustered at the household level; gender variable is omitted in the FE model.

4.2 Robustness Checks and Extensions

We also apply an ordered logistic model with fixed effects and a multinominal logistic model with fixed effects to examine the relationship between health, health insurance, and life satisfaction. Tables 6 and 7 present the results. In both alternative models, we find consistent results that changing coverage from GMI to other types of health insurance or to having no public health insurance coverage is negatively associated with life satisfaction. Specifically, individuals who change their enrolment from GMI to UEMI, URBMI, URRMI, NCMS, or to

having no health insurance tend to report lower life satisfaction (Table 6). Changes from GMI to UEMI, URBMI, URRMI, NCMS, or to having no health insurance coverage are positively associated with being dissatisfied with life (reference category: somewhat satisfied). The estimates for the link between health insurance coverage and being satisfied are not significant (reference category: somewhat satisfied) (Table 7).

Table 6 Robustness checks: The effects of health and health insurance on life satisfaction, FE ordered logistic model

	FE ordered Coef.	z-value
Health insurance (ref.= GMI)		
UEMI	–1.935**	–3.45
URBMI	–0.665*	–1.93
URRMI	–0.587*	–1.70
NCMS	–0.606**	–2.02
No health insurance	–0.564*	–1.83
Health status		
Self-rated poor health status (ref.=fair/good health)	–0.320***	–5.23
Activities of daily living (ref.=no difficulty)		
Only IADL difficulty	–0.080	–0.72
ADL difficulty	–0.180**	–1.29
Control variables		
Time fixed effects	Yes	
Province fixed effects	Yes	
N	12,942	
Adj. R^2	0.092	

Notes: * p<0.1, ** p<0.05, *** p<0.01; a full set of controls as in Table 5 is included; gender variable is omitted.

Table 7 Robustness checks: The effects of health and health insurance on life satisfaction, FE multinominal logistic model (ref.=somewhat satisfied)

	Dissatisfied Coef.	z-value	Satisfied Coef.	z-value
Health insurance (ref.= GMI)				
UEMI	2.132**	2.84	–0.381	–1.20
URBMI	2.010**	2.34	–0.173	–0.42
URRMI	1.584*	1.91	–0.220	–0.54
NCMS	1.659**	2.18	–0.237	–0.66
No health insurance	1.586**	2.06	–0.203	–0.55
Health status				
Self-rated poor health status (ref.=fair/good	0.557***	5.484	–0.244**	–2.91
Activities of daily living (ref.=no difficulty)				
Only IADL difficulty	0.038	0.21	–0.159	–1.11
ADL difficulty	0.510**	2.33	–0.102	–0.55
Control variables	Yes		Yes	
Time fixed effects	Yes		Yes	
Province fixed effects	Yes		Yes	
N	10,184			
Adj. R^2	0.162			

Notes: * p<0.1, ** p<0.05, *** p<0.01; a full set of controls as in Table 5 is included; gender variable is omitted.

While two-way fixed effects are applied in Section 4.1 where we report our main results, one concern is that health insurance access could be endogenous. To address this issue, we follow Blackwell et al. (2009) and apply Coarsened Exact Matching (CEM) to match respondents with GMI to those with other types of health insurance or with no public health insurance coverage. We first estimate the effects of having GMI on life satisfaction in a OLS model. The results are reported in column (1) in Table 8. The coefficient for GMI is positive and statistically significant, which is consistent with our previous results in Section 4.1. We then re-run the specification in column (1) in Table 8 after using CEM. As presented in column (2) in Table 8, the results are consistent with our previous estimations. Therefore, we are confident to conclude that our estimates are robust and that changing from other types of health insurance or having no health insurance coverage to GMI positively and significantly increases the probability to be satisfied.

Table 8 Robustness checks: The effects of health and GMI on life satisfaction, OLS, and OLS after CEM

	OLS		OLS after CEM	
	Coef. (1)	*t*-value	Coef. (2)	*t*-value
Health insurance				
GMI (ref.= other insurance types or no insurance)	0.140***	2.96	0.058**	2.06
Health status				
Self-rated poor health status (ref.=fair/ good health)	–0.098***	–6.38	–0.280***	–6.77
Activities of daily living (ref.=no difficulty)				
Only IADL difficulty	–0.029	–1.10	0.107	0.76
ADL difficulty	–0.087**	–2.45	–0.176	–1.43
Control variables	Yes		Yes	
Time fixed effects	Yes		Yes	
Province fixed effects	Yes		Yes	
N	25,904		14,540	
R^2	0.0462		0.1025	

Notes: * $p<0.1$, ** $p<0.05$, *** $p<0.01$; standard errors are clustered at the household level; a full set of control variables as in Table 5 is controlled.

4.3 Subsample Analysis

Considering substantial differences in many aspects between urban and rural residents and between the economically advantaged and disadvantaged in China, we further separately examine the insurance effects on life satisfaction by *hukou* status and household income per capita. We also separately examine the effects of health insurance types on life satisfaction by OOP expenditure on medical services. We define household-level OOP expenditure on medical

services as catastrophic if their ratio to total household expenditures exceeds 25% (Van Doorslaer et al. 2007).[12] The results are shown in Table 9.

As shown in columns (1) and (2) in Table 9, the relationship between health insurance type and an individual's life satisfaction holds for both the urban and the poor subsample. A change in health insurance coverage, GMI to UEMI, is negatively and significantly associated with a decrease in life satisfaction in the urban subsample and in the 50% lower-income quantile subsample and is estimated to be –0.195 standard deviations and –0.196 standard deviations, respectively (with GMI coverage as the reference). In addition, regarding the subsample with catastrophic OOP expenditure, being covered by UEMI, URBMI, and NCMS is negatively and significantly correlated with a lower life satisfaction. The results suggest that being covered by the generous government insurance, GMI, increases the probability of reporting higher life satisfaction, particularly among urban residents, the lower-income group, and those with catastrophic OOP medical expenditure.

Table 9 Life satisfaction and health insurance type subsamples, FE OLS

	Urban subsample		50% lower-quantile subsample		Catastrophic OOP subsample	
	Coef. (1)	*t*-value	Coef. (2)	*t*-value	Coef. (3)	*t*-value
Health insurance (ref.= GMI)						
UEMI	–0.195**	–3.43	–0.196**	–2.64	–0.163**	–3.11
URBMI	–0.124	–1.38	–0.088	–0.93	–0.120*	–1.74
URRMI	–0.118	–0.86	–0.085	–0.84	–0.114	–1.53
NCMS	–0.090	–0.97	–0.120	–1.38	–0.136**	–2.19
No health insurance	–0.141	–1.46	–0.093	–1.05	–0.102	–1.56
Health status						
Self-rated poor health status (ref.=fair/good health)	0.018	0.34	–0.093***	–5.08	–0.098***	–5.92
Activities of daily living (ref.=no difficulty)						
Only IADL difficulty	0.063	0.60	–0.023	–0.76	–0.038	–1.31
ADL difficulty	–0.337**	–3.18	–0.079**	–2.05	–0.102**	–2.61
Control variables	Yes		Yes		Yes	
Time fixed effects	Yes		Yes		Yes	
Province fixed effects	Yes		Yes		Yes	
N	4,293		20,402		24,177	
Overall R^2	0.0149		0.0208		0.0485	
Within R^2	0.1231		0.0939		0.1061	

Notes: * $p<0.1$, ** $p<0.05$, *** $p<0.01$; standard errors are clustered at the household level; a full set of control variables as in Table 5 is controlled except *hukou* status for the urban *hukou* subsample; gender is omitted; Lower 50% quantile refers to individuals with a household income per capita in the lower 50% quantile; Catastrophic OOP refers to individuals where total OOP expenditure in medical services (including in-patient and out-patient) exceeds 25% of total household expenditure.

[12] We also examine an alternative definition of catastrophic OOP assuming a threshold of 25% of total OOP expenditures in medical services to total non-food household expenditures. The results are similar to those found in column (3) in Table 8. The results are available upon request.

5 Conclusion

Based on panel data from the nationally representative CHARLS survey, 2011–2015, we examined the extent to which having different types of health insurance contributes to life satisfaction of middle-aged and older adults in China. We find that the change from no health insurance to some form of health insurance coverage does not necessarily contribute to a higher life satisfaction in OLS fixed-effects modelling. However, coverage by a generous health insurance package (e.g. the Government Medical Insurance, GMI) predicts a higher level of life satisfaction among middle-aged and older adults. When controlling a set of covariates, individual and time fixed effects, we find that individuals who change their health insurance coverage from GMI to either the Urban Employee Medical Insurance (UEMI), the Urban Resident Basic Medical Insurance (URBMI), or the New Rural Cooperative Medical Scheme (NCMS) report lower life satisfaction, by –0.155, –0.106, and –0.112 standard deviations, respectively. Poor self-rated health status and functional difficulties are also negatively associated with life satisfaction. We conducted several robustness tests to address potential omitted variable bias and endogeneity in the relationship between health insurance and life satisfaction, and to confirm our findings using alternative model specification used in other studies. The results are consistent with our general findings.

We also conducted subsample analysis and find that the life satisfaction of urban residents and the lower-income group is negatively and significantly linked with the UEMI coverage (relative to GMI), which implies that urban residents and lower-income groups are more sensitive to uneven distribution in reimbursement and benefits between UEMI and GMI compared to other groups. Regarding the subsample with catastrophic OOP expenditure, enrollment in UEMI, URBMI, or NCMS negatively and significantly decreases life satisfaction. Our results confirm the fragmentation of China's public health insurance system (Meng et al. 2015; Zhang et al. 2017) and document its negative impact on life satisfaction among middle-aged and older adults.

The results of this study suggest important policy implications. The has conducted ambitious health reforms since 2009, which aim to set up a comprehensive health insurance system to provide universal health insurance coverage and reduce the financial burden of all Chinese residents, particularly vulnerable groups such as older adults. Although nearly all older adults (98.4%) were covered by the public health insurance scheme in 2012 (World Health Organization 2015), universal health insurance coverage does not necessarily increase life satisfaction in the current fragmented health insurance system. We find significantly lower

levels of life satisfaction for middle-aged and older adults who changed from the generous GMI to other types of health insurance. Our findings from this study imply that the next step for health reforms in China should be to reduce the uneven distribution of benefits across health insurance schemes and establish a more equitable health insurance system.

Appendix 1

Table A.1 Summary statistics of key variables across three waves

Variable	Standard deviation		Between/within
Life satisfaction	Overall	0.632	1.373
	Between	0.533	
	Within	0.388	
GMI	Overall	0.147	1.500
	Between	0.129	
	Within	0.086	
UEMI	Overall	0.325	2.639
	Between	0.321	
	Within	0.122	
URBMI	Overall	0.213	2.004
	Between	0.203	
	Within	0.101	
URRMI	Overall	0.127	1.075
	Between	0.098	
	Within	0.091	
NCMS	Overall	0.445	2.319
	Between	0.426	
	Within	0.184	
No health insurance	Overall	0.248	1.335
	Between	0.214	
	Within	0.160	
Self-rated poor health status	Overall	0.632	1.414
	Between	0.533	
	Within	0.388	
No ADL or IADL difficulty	Overall	0.336	1.412
	Between	0.281	
	Within	0.199	
Only IADL difficulty	Overall	0.249	1.108
	Between	0.190	
	Within	0.171	
ADL difficulty	Overall	0.243	1.388
	Between	0.204	
	Within	0.147	

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