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## Research

**Keywords:** rural, middle-aged and elderly people, poverty caused by illness, medical security

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# **Analysis of the Poverty Reduction Effect of Medical Security on Poverty caused by Illness of the Middle-aged and Elderly Poor people in rural China**

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**Abstract: Background** The Chinese government has adopted a series of medical security policies to reduce health poverty. This study analyzes the poverty caused by illness (PCI) of the middle-aged and elderly poor population (MAEPP) in rural China, and simulates the poverty reduction effect (PRE) of medical security on medical expenses. **Methods** The FGT index is used to measure the PCI of the MAEPP in eastern, central, and western regions of China before and after medical security compensation, and further simulate the PRE of medical security under different compensation ratios. **Results** The rural MAEPP in the eastern, central and western regions have different levels of PCI. The eastern region is higher than that in the central and western regions; the expenditure-based poverty caused by outpatient expenses is higher than the cost of

hospitalization and self-treatment, and the self-treatment burden of the poor is large; The higher the compensation rate of medical security, the better the effect of poverty reduction. **Conclusions** Medical security has played a positive role in improving poverty. The PRE of medical security policies in different regions are different, and outpatient compensation in medical security has a better effect on poverty reduction.

**Keywords:** rural; middle-aged and elderly people; poverty caused by illness; medical security

## **Introduction**

Out-of-pocket medical expenses (OOPME) caused by health problems can bring financial risks to families, and even cause catastrophic health expenditures (CHE) and poverty, which are recognized worldwide. Emily's research in Australia showed that due to OOPME, the incidence of CHE in the lowest decile group is twice that of the highest decile group, and low-income groups face a higher risk of poverty[1]. It is

estimated that 100 million people (1.7% of the population) fall into poverty every year due to OOPME, and 90% of them live in low-income countries[2].Khan found that 3.5% of Bangladesh's population (5.1 million) fell into poverty each year due to OOPME, the incidence of poverty and the depth of poverty increased, and the resulting CHE were mainly concentrated in the poor and rural areas. area[3]. In India, OOPME accounted for 62.6% of total health expenditures, and it is one of the countries with the highest OOPME in the world. Due to OOPME, the incidence of poverty increased from 16.44% to 19.05% in 2014. The gap of poverty increased from 19.13% to 22.69%[4]. Reducing the risk of poverty through medical security is the main practice of all countries in the world, and its implementation effect has attracted widespread attention. Korenma evaluated the effectiveness of Massachusetts' implementation of the Affordable Care Act by constructing a poverty standard system. The results of the study showed that public health insurance can reduce the incidence of poverty by one third. For low-income families who participate in private health insurance, Medicaid can only reduce the incidence of poverty by 9.4%[5]. Aryeetey's research results show that Ghana's National Health Insurance Plan can reduce OOPME by 86% and reduce the incidence of poverty by 7.5%[6].

The lack of capital investment in low- and middle-income countries and the relatively imperfect medical security system have made the problem of PCI more prominent. As the largest developing country in the world, although China has a wide coverage of medical security, it also has the problem of low security level. The poverty

problem caused by OOPME is still more prominent. As of 2019, the incidence of poverty in China has dropped to 0.6% [7]. Among the remaining poor population, "the proportion of the elderly, the sick, and the disabled has reached 45.7%, the accessibility of medical treatments is low, and problems such as expensive medical treatments are prominent"[8]. Disease is its fastest and most common cause of poverty. At the same time, China implements different medical security policies for urban and rural areas. Rural areas have lower levels of medical security, and they face a higher risk of poverty. Aiming at high-risk groups of healthy poverty, the Chinese government has adopted a series of medical security policies to reduce the occurrence of such risks. The medical security policy mainly consists of three levels of medical insurance. The first layer is the basic medical insurance, which plays the role of main body guarantee, and compensates hospitalization and outpatient expenses in a certain proportion. The second layer is serious illness insurance. Government departments have formulated the scope of serious diseases and corresponding reimbursement policies. Within this scope, after basic medical insurance reimbursement, the self-paid medical expenses that still need to be paid by individuals can be solved through serious illness insurance. The poor have the right to receive more compensation. The poor enjoy a lower deductible, a larger proportion of medical insurance reimbursement, and a preferential policy that does not limit the maximum amount of medical insurance reimbursement. The third layer is medical assistance, which is mainly aimed at self-paid medical expenses that are not covered by the first two types of medical insurance. It is solved by raising funds through multiple channels such as financial special investment and charitable donations.

In addition, there are other types of safeguards, such as supplementary medical insurance, and government-funded commercial insurance for the poor. Poor rural residents enjoy multi-level and comprehensive medical security.

The economic development of China's eastern, central and western regions is uneven, so a series of medical security policies implemented are also slightly different. For example, Xiangyang City, Hubei Province(located in central China) has added supplementary medical insurance to the rural poor in addition to the above three levels of medical security. The compensation ratio of medical insurance to hospitalization medical expenses reaches 90%, and the actual self-paid medical expenses of individuals are controlled within 5000 yuan, and the excess part is paid by supplementary medical insurance[9]. Guangzhou City, Guangdong Province(located in eastern China) implements classified assistance for outpatient and hospitalization expenses for groups with special difficulties. According to the amount of medical expenses incurred, the reimbursement is implemented in stages, and the highest reimbursement rate for hospitalization expenses for elderly poor patients can reach 95% [10]. The differences in medical security policies in various provinces in China have made the implementation effects of policies different, and the implementation effects of medical security policies on different groups of people are also different. This is confirmed by empirical research by scholars. The research of Chou[11] showed that the “triple medical security” policy in Guizhou minority areas (located in western China) has a significant effect on poverty reduction for the rural poor. However, the research of Ding

and Su[12] found that the rural medical security system in Shanxi Province (located in central China) has not improved or even worsened the income distribution of low-income groups, while high-income groups have benefited more shares from the improved medical security level. Cheng [13] used the FGT index to further analyze the poverty reduction effect of social security on the elderly in China's urban and rural areas, and found that the poverty situation of the elderly in urban and rural areas who enjoy medical security has improved significantly. The PRE of the rural medical security system is weaker than that of the urban medical security system, but there are also studies showing that medical assistance increases the risk of poor rural families falling into the vicious circle of poverty diseases[14]. From the perspective of rare diseases, Yang[15] measured the level of expenditure-based poverty caused by rare diseases in Chinese families and found that the per capita medical expenses of rare disease families accounted for 61.14% of per capita income, while the compensation ratio was only 23.93%. The actual PRE of government medical insurance is not satisfactory.

Based on the above facts, we found that there are still some problems that need further investigation. First of all, the existing literature is mostly based on the entire poor population when evaluating the effect of medical security on poverty reduction, and does not consider the special group of MAEPP in rural areas, who are at higher risk of returning to poverty due to illness and illness-induced poverty. Secondly, China's medical security is mainly composed of outpatient and hospitalization. Outpatient

reimbursement is mainly for common diseases and chronic special diseases, while hospitalization reimbursement is mainly for diseases with more serious conditions. The effects of the two in poverty reduction need to be further decomposed and evaluation. At present, there are few literatures from this perspective. At the same time, although various provinces have different medical security policies, provinces with similar economic development levels have similar medical security levels, and China's eastern, central and western regions have shown regionalized economic development.

Therefore, in response to the above problems, this study uses the FGT index to measure the PCI of the rural MAEPP in different regions, and further analyzes the differences in expenditure-based poverty caused by outpatient, hospitalization, and self-treatment expenses in different regions. At the same time, this study also simulated the effects of poverty reduction in different regions under different medical security levels. This provides a reference not only for China, but also for other regions in the world with similar conditions to implement effective medical insurance policies to reduce the risk of poverty.

## **Data sources and methods**

### 1.1 Data source

The data of this study comes from the 2018 China Health and Retirement Longitudinal Study (CHARLS), which uses a multi-stage probability-proportional-to-size sampling (PPS) method to collect high-quality micro-data on the families and individuals of middle-aged and elderly people aged 45 and above in China. The data of

this study comes from the 2018 China Health and Retirement Longitudinal Study (CHARLS), which uses the Probability-Proportional-to-Size Sampling (PPS) method to select middle-aged and elderly households and individuals aged 45 and above in China as the research objects, which effectively simulates the distribution characteristics of the population in China are well represented. According to the question "GD003\_W4\_1 Is your household a registered Pinkunhu?" screen the registered poor. Extract the basic conditions, medical expenditures and medical security data of the poor. The samples with many missing variables were deleted, and the two-sided 1% tailing treatment was performed on the numerical variables. Finally, 856 rural registered poor people were obtained, and the proportions of the eastern, central and western regions<sup>1</sup> were 49.12%, 35.09%, and 15.79%, respectively. This is consistent with the data on the regional distribution of the poor population in the Poverty Monitoring Report of Rural China in 2018<sup>2</sup>, and has a good representation.

## 1.2 Research methods

PCI refers to the fact that family members incur large medical expenditures due to critical diseases or accidents, causing a heavy disease economic burden and a reduction in income sources for the family, making the entire family life in a state of poverty. At present, there is no unified method to define the PCI. Among them, "income-family

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<sup>1</sup> According to the "China Health Statistics Yearbook", the eastern, central and western regions include 11 provinces (municipalities) of Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan. The central region includes 8 provinces, Heilongjiang, Jilin, Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan. The western region includes 12 provinces (autonomous regions and municipalities) in Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang.

<sup>2</sup> The poverty population in the eastern, central and western regions of the Poverty Monitoring Report of Rural China in 2018 accounted for 55.2%, 36%, and 8.8% of the country's total poverty population respectively.

medical expenditure < poverty standard " is the most common method to define it[16]. This study uses this standard to define the PCI. The income in this study is the per capita household income, which is the total household income/number of household members. The total household income includes the wage income, productive and operative income, property income, transfer income of all household members.

Poverty measurement is the basis for poverty research and poverty decision-making, and directly affects the orientation of poverty alleviation policies and the evaluation of actual effects. The estimation of poverty involves the determination of poverty line and the construction of poverty indicators. This article uses the rural poverty standard of \$ 452.59(1USD≈6.6172RMB) published by the government in 2018 as the basis for dividing the poverty line to identify the population of PCI. The comprehensiveness of poverty evaluation requires that poverty measurement indicators can comprehensively reflect the poverty situation. Sen index is the forerunner of comprehensive poverty indicator research, but it has problems such as numerical jumps for the poor if they get rid of poverty. Although the SST index makes up for the above problems, it lacks the ability to discern the degree of poverty difference. The FGT index solves the above problems very well. It measures the poverty situation from the incidence of poverty, the depth of poverty and the intensity of poverty respectively[17], The index can conduct a comprehensive assessment of poverty. In addition, this study mainly measures expenditure-based poverty due to illness. Therefore, the FGT index is combined with the measurement of expenditure-based poverty due to illness. The

specific expression is as follows:

$$F_{\alpha} = \frac{1}{n_{\alpha}} \sum_{i=1}^m \left( \frac{Z - Y_i + K_i}{Z_i} \right)^{\alpha}$$

Among them,  $F_{\alpha}$  denotes an expenditure-based poverty measurement index.  $n$  denotes the population of each area.  $m$  denotes the number of people below the poverty line.  $Z$  denotes the 2018 national poverty line.  $Y_i$  denotes the income of the  $i$ -th individual incurring PCI, here refers to the per capita income of the household.  $K_i$  denotes the medical expenses of the  $i$ -th individual incurring PCI. When  $\alpha=0$ ,  $F_0$  is the incidence of expenditure-based poverty, that is, the breadth of poverty, which refers to the size of the poor population. The more the poor population, the larger the scope of poverty reduction. At this time,  $n_0=n$ . When  $\alpha=1$ ,  $F_1$  is the poverty depth index, which refers to the gap between the income of the poor and the poverty line. The larger the gap, the lower the living standard of the poor and the greater the poverty reduction cost. At this time,  $n_1=m$ . When  $\alpha=2$ ,  $F_2$  is the poverty intensity index, which refers to the uneven distribution of the income of the poor. The greater the income gap, the greater the difficulty of poverty reduction. At this time,  $n_2= m$ .

## Result

### 2.1 Medical expenses of the rural MAEPP

From the perspective of medical expenses in various regions, the annual per capita total medical expenses of the rural MAEPP in the eastern, central and western regions accounted for 61.06%, 71.25%, and 56.93% of the family's per capita income

respectively. At the same time, the per capita out-of-pocket ratio of the total medical expenses was 70% the above. It shows that the rural MAEPP have a heavy burden of medical expenditures, and the proportion of medical insurance compensation is low, and they are more likely to incur poverty caused by illness or return to poverty due to illness. On the whole, the eastern region has the highest medical expenses, and the actual medical security compensation ratio is relatively low, and the central region has the highest medical security level. Differences in income levels and medical security levels in the eastern, central and western regions have led to differences in poverty levels in various regions. Among the various components of medical expenses, outpatient expenses are the largest, indicating that the burden of medical expenses of rural MAEPP mainly comes from outpatient services. The per capita income of registered poor is higher in the east than in the west than in the middle. The per capita income of the households has reached more than 5,000 yuan, significantly higher than the national poverty line. Through further data analysis, it is found that 52.98% of the 855 registered poor people have already been lifted out of poverty. The income gap between people who have been lifted out of poverty and those who have not been lifted out of poverty is the largest in the western region, and the smallest in the central region. To ensure stable poverty reduction, the country's original poverty alleviation policy remains unchanged for a certain period of time, so it still has research significance.

Table 1.

## 2.2 PCI of rural MAEPP

From the perspective of regional differences in the effect of medical security compensation. First, the expenditure-based poverty level caused by outpatient and hospital expenses in the eastern region is higher than that in the central and western regions. Before medical security compensation, the expenditure-type poverty depth caused by outpatient in the eastern region was 1.76 and 2.11 times that of the central and western regions respectively. After medical security compensation, the poverty depth in the eastern region was 1.98 and 2.69 times that of the central and western regions, respectively, and the poverty gap was further widened. It shows that the rural MAEPP in the eastern region have high outpatient costs and large out-of-pocket medical expenditures, resulting in their incomes well below the poverty line, and the PRE of medical security is not as good as that of the central and western regions. The expenditure-based poverty intensity caused by outpatient expenses is also higher in the eastern region than in the central and western regions. After the medical security compensation, the gap between the east and the west has further widened, and the intensity indicators are 10.70 and 1.04 respectively. It shows that the gap between the total outpatient expenses of rural poor residents in the eastern region and their OOPME is relatively large, and the distribution is relatively wide, which further widens the income gap among the poor. It shows that the current poverty reduction effects of medical security policies in the eastern region have not been effective. To improve the expenditure-based poverty caused by outpatient expenses in the eastern region, greater costs are required, and poverty reduction is relatively more difficult.

The second is that the expenditure-based poverty caused by hospitalization expenses in various regions shows changing characteristics. Before the hospitalization expenses were incurred, the poverty level of poor rural residents in the west was higher than that in the eastern and central regions, and after the expenses were incurred, the poverty level in the western regions was lower than that in the eastern and central regions. It shows that the cost of hospitalization in the eastern region is higher than that in other regions, causing the income of poor rural residents in the eastern region to drop significantly and the poverty depth deepens. After medical security compensation, the poverty intensity in the western region was slightly higher than that in the eastern region, and the poverty intensity in the eastern and western regions were 1.95 and 1.87 respectively, indicating that hospitalization compensation in the western region has further increased the poverty gap among the poor.

Third, the expenditure-based poverty caused by self-treatment in all regions is relatively high, and the gap is small. After medical security compensation, the poverty level is still at a relatively high level, indicating that the cost of self-treatment for poor rural residents in various regions is high, and the level of medical security is low, leading to large OOPME and exacerbating the poverty situation of the poor.

From the perspective of the difference in the cost structure of the medical security compensation effect, the expenditure-based poverty caused by outpatient expenses is higher than that of hospitalization and self-treatment. When outpatient expenditures occurred, the average expenditure-based poverty depth in each region was 2.38, poverty

intensity was 18.44, while the poverty depth and intensity indicators caused by hospitalization expenditure were 1.25 and 3.45, and self-treatment were 1.28 and 3, respectively. It shows that the rural MAEPP have a heavy burden of outpatient expenditure, which is an important factor that makes the poverty situation of the elderly poor people more severe. After receiving medical security compensation, the poverty level caused by outpatient expenses has also fallen the most, with an average decrease of 44.5% in each region, while the average decrease in hospitalization and self-treatment was 34.06% and 3.29%, respectively. It shows that compared with hospitalization and self-treatment expenses, medical security has a better effect on outpatient poverty reduction, and outpatient compensation can significantly reduce the depth of poverty and narrow the income gap among the poor. Table 2.

### 2.3 Simulation of the poverty reduction effect of medical security

Due to the lack of sufficient data, this article is a static simulation, that is, the medical expenses of the rural MAEPP does not change with the reimbursement ratio of the medical security. With the increase in the proportion of medical security reimbursement, the level of the PCI has been declining, and as the proportion of reimbursement increases, the poverty level decreases more. Table 3. Mainly reflected in three aspects.

First, from the perspective of the overall PRE, when the reimbursement ratio reaches 40%, 60%, and 80%, the average drop in outpatient expenditure-based poverty in each region is 20.67%, 23.33%, and 27.00%, respectively. The average decrease in

hospitalization was 14.33%, 14.33%, and 18.33%. It shows that the higher the level of medical security, the better the effect of poverty reduction.

Second, from the perspective of regional poverty reduction effects, the eastern region has the largest reduction in PCI. It shows that the improvement of medical security level has a greater impact on poor rural residents in the eastern region. It can significantly improve their poverty situation and reduce the problem of increasing income gap among poor people caused by medical expenditure. The expenditure-based poverty intensity caused by hospitalization expenses in the western region is higher than that in the eastern region. It shows that hospitalization expenses in the western region are widely distributed among the poor, causing the poverty gap to further widen.

Third, from the perspective of the PRE of various indicators, the effect of medical security on improving intensity of poverty is greater than the depth of poverty and the rate of poverty. For example, when the outpatient reimbursement ratio rises from 60% to 80%, the intensity of poverty in each region drops by 61.33%, the depth of poverty drops by 27%, and the rate of poverty drops by 7.33%. This shows that medical insurance is more effective in improving poverty.

## **Discussion**

The level of economic development in the eastern region is relatively high, but the PCI of rural MAEPP is more severe, and the poverty level after medical security compensation is relatively high. The main reasons are as follows: First, the eastern region has a higher level of economic development, correspondingly higher living costs,

and higher medical expenses, which aggravates the poverty of the poor, and there is a trend of increasing poverty depth and intensity. Although the per capita income of poor rural residents in the eastern region is higher than that in the central and western regions, the PRE brought about by income growth is no longer sufficient to compensate for the reduction in income caused by medical expenditures and the worsening poverty effect caused by the increase in income gap[18]. At the same time, medical expenses are growing rapidly, especially in the eastern region, which is significantly higher than that in the western region (outpatient expenses for rural poor populations in the east are \$ 1070.51/year, and \$ 458.79/year in the west). Although the level of medical security is relatively high, However, the self-treatment burden of patients is also relatively large, and the level of medical security has less impact on the medical burden of the poor, which reduces the poverty reduction function of medical security[19]. Research showed that the incidence of poverty of poor families in the eastern region after medical expenses reimbursement was significantly lower than that in the central region[20]; Second, the medical and health supply system in the eastern rural areas is relatively complete. For example, the number of medical and health technical personnel and the number of beds in medical and health institutions per 1,000 rural population in Zhejiang Province were 7.40 and 4.84 respectively in 2018, and Heilongjiang Province were 4.20 and 4.12, while Guangxi Province were 4.10 and 3.66 respectively. The accessibility of medical and health services in the eastern region is relatively high. At the same time, the frequency of medical consultations among rural residents in the east is relatively high, with Zhejiang Province reaching 10.94 times a year, while Guangxi only 5.19

times[21]. Therefore, compared with the central and western regions, the utilization rate of health services in the eastern region is higher, and MAEPP in rural areas are more likely to suffer from PCI; Third, the western region and some underdeveloped regions are the key poverty alleviation areas of the country due to their relatively backward economy, and more central fiscal funds are invested in the central and western regions. In 2020, the central government had issued \$415.57 million in subsidies for medical assistance, and 90% had be invested in the central and western regions[22]. Therefore, the eastern region must substantially increase the level of medical security, and further increase the medical security for poor rural residents, especially those in deep poverty, and pay attention to compensation for outpatient clinics. The poverty intensity caused by hospitalization expenses in the western region is higher. On the one hand, it may be due to the large income gap of the poor in the western region, which leads to a large gap in the affordability of hospitalization medical expenses. On the other hand, hospitalization expenses need to reach a certain amount to be reimbursed through medical insurance, as well as the reimbursement ratio and scope of reimbursement, and other layers of restrictions have blocked the elderly and poorer groups from the medical insurance benefits[23]. Therefore, medical security in the western region should pay attention to hospitalization compensation for poor rural residents. For residents with deep poverty, it may be accompanied by worse health conditions, and more policy support should be given to this part of the population. Give full play to the comprehensive protection role of a variety of other social assistance policies.

For the rural MAEPP, the expenditure-based poverty level caused by outpatient expenses is greater than hospitalization expenses, and the expenditure-based poverty caused by self-treatment cannot be ignored. From the perspective of hospitalization, poor patients are afraid of high medical expenses in hospitalization and use less or no hospitalization services, and the relatively poor accessibility of medical services in rural poor areas will increase the use of outpatient services to a certain extent. Moreover, both medical insurance and medical assistance are mainly based on hospitalization compensation, and hospitalization services receive greater compensation. From the perspective of outpatient and self-treatment, the medical security reimbursement ratio is low. In addition to the higher level of medical security for special chronic diseases, medical insurance has lower guarantees and more restrictions on the reimbursement of common diseases and frequently-occurring medical expenses. The ability to share economic risks of disease is weak, which makes security fail to play a role in reducing poverty and even exacerbates poverty to a certain extent[24]. In a county in China, the maximum reimbursement for outpatient expenses per person per year is \$ 15.58, and the excess part is borne by oneself. The medical poverty reduction fund in this place also mainly guarantees hospitalization and outpatient chronic diseases[25]. Purchasing medicines in pharmacies on their own is the main health service utilization method that patients can choose to effectively control medical expenses. However, this part of the cost is mainly self-paid, which is a considerable expense for poor families. Research shows that the cost of self-treatment of the elderly accounts for 43.10% of the total cost, and more than 90% of the cost of self-treatment needs to be paid by themselves[26].

Therefore, specific medical security measures should be taken in light of the characteristics of poor rural residents seeking medical care. Expand the scope of outpatient medical insurance reimbursement, appropriately increase the proportion of outpatient reimbursement, and strengthen the outpatient compensation for common diseases of the rural poor elderly. Only in this way can we further prevent mild illnesses from gradually developing into serious illnesses due to untimely visits, and effectively exert the poverty reduction effect of medical insurance. At the same time, the role of non-government fund-raising for self-treatment expenses of the poor should be brought into play to reduce the burden of medical security funds.

Medical security has effectively reduced the depth and intensity of poverty of the rural MAEPP, and its effect on improving poverty is greater than its effect on reducing the incidence of poverty. This is consistent with the research results of Chou[11]. Triple medical security has a more obvious effect on alleviating the poverty of the rural poor. Some studies have pointed out that basic medical insurance has a better effect on improving catastrophic health expenditures of families with higher medical expenses[27]. This phenomenon shows that medical security can effectively reduce the rate and degree of poverty, and realize the anti-poverty function. Medical security can increase the medical service demand of patients, promote the improvement of health capital and then promote the recovery of labor capacity and income, reduce out-of-pocket medical expenditures, and increase disposable income, thereby reducing poverty and narrowing the gap within the poor[19]. In this study, medical security has a small

effect on the rate of poverty reduction. The first is that the object of this study is the registered poor people for rural MAEPP. The overall poverty level is relatively deep, and the level of medical security may not be enough to make the income level of the poor people above the poverty line. As the proportion of medical insurance reimbursements increases, the poorer people pay less for their own medical expenses and have more funds for health investment and other productive activities, the better effect of poverty reduction. Therefore, medical security policies in various regions should be tilted towards the rural MAEPP. On the basis of ensuring the sustainability of the medical security fund, optimize the distribution method of the medical security fund, and establish a security method that links the security level with the poverty level of the poor. Implement hierarchical poverty alleviation to improve the serious problem of poverty differentiation caused by illness.

This study analyzes the effect of medical security on poverty reduction of the rural MAEPP due to PCI, which has certain reference significance for related poverty research, but there are still some limitations. First of all, First of all, due to the different poverty standards and measurement indicators adopted, there may be some differences in the research results, but discussing poverty from multiple angles can help to understand the poverty situation in all aspects. Tan[28] used the minimum social security line as a standard and used the FGT index to analyze the effect of social assistance policies on poverty alleviation for poor families. The results show that medical assistance has reduced the incidence of poverty by 28.27%, and the depth and

intensity of poverty have dropped by 39.88% and 48.38% respectively. Based on the perspective of improving catastrophic health expenditures, Xie[27] analyzed the PRE of medical security policies on the poverty-stricken population under different thresholds. It is found that basic medical insurance is more effective in improving catastrophic health expenditures of families with higher medical expenses. Second, Since the CHARLS only provides sample annual medical expense data, and does not have information about which medical insurance reimbursements for the final medical expense data, it cannot distinguish the contribution of different types of medical insurance to the effect of poverty reduction. But at the same time, we have also fully considered that any single medical insurance can play a limited role in improving poverty, and various countries have adopted a variety of medical reduction measures for the poor to resist the risk of health poverty. Therefore, it is more practical to analyze the effect of comprehensive medical security on improving the poor. Secondly, the CHARLS only has 2018 data related to the issue of the registered poor, so it can only analyze the poverty reduction effect of the medical security policy this year. There is no dynamic analysis of the PRE of medical security policies. We also recognize this problem. Later, we will combine the follow-up tracking data of the database and other data disclosed by the government to conduct more in-depth research on the poverty situation.

## **Conclusion**

This study found that medical security can effectively alleviate the poverty of the

poor. There are differences in the poverty reduction effects of medical security policies in the eastern, central and western regions, and outpatient compensation in medical security can have a better poverty reduction effect.

## **Abbreviations**

PCI: Poverty caused by illness

MAEPP: Middle-aged and elderly poor population

PRE: Poverty reduction effect

OOPME: Out-of-pocket medical expenses

CHE: Catastrophic health expenditures

CHARLS: China Health and Retirement Longitudinal Study

## **Declarations**

### *Consent for publication*

Not applicable.

### *Availability of data and materials*

The datasets analysed during the current study are available in the China Health and Retirement Longitudinal Study (CHARLS) repository, <http://charls.pku.edu.cn/>.

### ***Competing interests***

The authors declare that they have no competing interests

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### ***Authors' contributions***

Li LIU is responsible for writing the article; Xue YU and Ailing CHEN are responsible for data collection; Rui LIU and Peihua CHENG are responsible for data analysis; Jing DENG has made precise revisions to the full text. All authors read and approved the final manuscript.

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## Reference

- [1] Callander E J, Fox H, Lindsay D. Out-of-pocket healthcare expenditure in Australia: trends, inequalities and the impact on household living standards in a high-income country with a universal health care system. *Health Economics Review (Health Econ Rev)*. 2019;9(1).
- [2] Wagstaff A, Flores G, Smitz M F, Hsu J, Chepynoga K, Eozenou P. Progress on impoverishing health spending in 122 countries: a retrospective observational study. *Lancet Glob Health (The Lancet. Global health)*. 2018;6(2):e180-e192.
- [3] Khan J A M, Ahmed S, Evans T G. Catastrophic healthcare expenditure and poverty related to out-of-pocket payments for healthcare in Bangladesh—an estimation of financial risk protection of universal health coverage. *Health Policy and Planning*. 2017;32(8):1102-1110.

[4] Sriram S.PNS93 A NEGLECTED DIMENSION OF FINANCIAL PROTECTION FOR UNIVERSAL HEALTH COVERAGE: HEALTH EXPENDITURES AND POVERTY. *Value in health*.2020;23(Supl.1):S300.

[5] Korenman S R D.Including Health Insurance in Poverty Measurement the Impact of Massachusett.*Journal of Health Economics*.2016;50:27-35.

[6] Aryeetey G C, Westeneng J, Spaan E, Jehu-Appiah C, Agyepong I A, Baltussen R.Can health insurance protect against out-of-pocket and catastrophic expenditures and also support poverty reduction? Evidence from Ghana' s National Health Insurance Scheme.*International Journal for Equity in Health(Int J Equity Health)*.2016;15(1).

[7] National Bureau of Statistics. Statistical bulletin of national economic and social development of the people's Republic of China in 2019.2019. [http://www.stats.gov.cn/tjsj/zxfb/202002/t20200228\\_1728913.html](http://www.stats.gov.cn/tjsj/zxfb/202002/t20200228_1728913.html). Accessed 15 Sep 2020.

[8] People's Daily, "People's Daily" published an article signed by Ning Jizhe: Decisive progress has been made in building a moderately prosperous society in all respects, and we must speed up the shortcomings to achieve the goal.2020. [http://www.stats.gov.cn/tjgz/tjdt/202007/t20200724\\_1778194.html](http://www.stats.gov.cn/tjgz/tjdt/202007/t20200724_1778194.html). Accessed 15 Sep 2020.

[9] X Y. Municipal People's Government. Notice of the Office of the Municipal People's Government on Improving the Basic Medical Security Policies for the Rural Poor Population.2018. [http://www.xf.gov.cn/sm/bmfw/sbfb/shfl/zctz/201810/t20181010\\_1420300.shtml](http://www.xf.gov.cn/sm/bmfw/sbfb/shfl/zctz/201810/t20181010_1420300.shtml).

[10] General Office of Guangzhou Municipal People's Government. Notice of the General Office of Guangzhou Municipal People's Government on Printing and Distributing Guangzhou Medical Assistance Measures.2019. [http://www.gz.gov.cn/gfxwj/szfgfxwj/gzsrnzfbgt/content/post\\_5612736.html](http://www.gz.gov.cn/gfxwj/szfgfxwj/gzsrnzfbgt/content/post_5612736.html).

[11] Chou YL, Zhang ZC. Research on Anti-Poverty by Medical Security in Guizhou Minority Areas. *Journal of Chinese Academy of Governance*.2016;(03):69-75.

[12] D SQ, S RZ. A Research on the Realization Path and Policy Impact of Poverty Alleviation Effect of China's Rural Medical Insurance System——Based on the realization mechanism of income redistribution. *Insurance Studies*.2019;(10):114-127.

[13] Cheng J. Effects of Poverty Reduction of Social Security for Urban-Rural Elderly Population. *Social Security Studies*.2012;(03):52-66.

[14] An H, Zhao YY. Research on the Social Relief Mechanism for Poor Families in Rural Areas in Ethnic Minority Areas-Based on the Perspective of Developmental Social Relief. *Social Sciences in Guangxi*.2020;(05):78-83.

[15] Yang YN, Xiao JH. The Effect of Medical Burden of Rare Diseases on Expenditure Poverty. *Chinese Journal of Health Policy*.2019;12(01):19-28.

- [16] Wang CQ. Poverty Reduction and the Effect of Social Assistance Policy on Poverty Caused by Illness: An Analysis of CFPS Data. *Journal of Public Administration*.2017;10(03):99-115+215-216.
- [17] Lu KQ. Poverty Indices: Construction and Re-construction. *Sociological Studies*.2007, (04): 1-22+243.
- [18] S W, F X, X B. Research on Regional Precision Poverty Alleviation from the Perspective of Heterogeneity. *Journal of Hebei University of Economics and Business*.2019;40(05):70-76.
- [19] Z ZF. Research on anti-poverty of medical security under the background of targeted poverty alleviation policies. *Probe*.2017;(02):81-85.
- [20] Li S, Zhan P, Yang C. The Poverty Reduction Effect of China's Public Transfer Income in Rural Areas. *Journal of China Agricultural University Social Sciences*.2016;33(05):71-80.
- [21] National Health Commission. *China Health Statistics Yearbook*. Beijing: Peking Union Medical College Press,2019.
- [22] The State Council Information Office. Promote poverty reduction through health and medical insurance to ensure basic medical care for the poor.2020. [http://www.nhsa.gov.cn/art/2020/11/20/art\\_14\\_3993.html](http://www.nhsa.gov.cn/art/2020/11/20/art_14_3993.html).
- [23] L CY. The practice path of health poverty alleviation in rural area under the background of targeted measures poverty alleviation: A case study of Miao county, Guizhou province. East China University of Science and Technology, 2018.
- [24] Bao ZY, Zhao YF. A Study of the Poverty Reduction Effect of Rural Residents' Medical Insurance: An Empirical Analysis Based on PSM. *Journal of Jiangxi University of Finance and Economics*.2018;(01):90-105.
- [25] Li J.A Study on the Current Policy of Providing Better Healthcare to Avoid Poverty in Rural Areas of China—A Case Study of D County. Nanjing University.2019.
- [26] Yue HY. Research on Medical Expenditure and Influencing Factors of the Elderly ——Based on 2015 CHARLS Data. GuiZhou University of Finance and Economics. 2019.
- [27] X MM, L YC, W GZ. Study on the effect of medical security policy for poor people——From the perspective of improving catastrophic health expenditure. *Soft Science of Health*.2020;34(09):28-32.
- [28] T X. Research on the Effect of Rural Social Relief and Poverty Alleviation from the Perspective of Expenditure Poverty. *Journal of Southwest MiaoZu University(Humanities and Social Science)*.2018;39(8):192-199.