What fragile factors hinder the pace of China's alleviation efforts of poverty-stricken population?

Ye Li (✉ liye8459@163.com)

Harbin Medical University

Xinye Qi

Harbin Medical University

Linghan Shan

Harbin Medical University

Xiao Tan

Shenzhen hospital of guangzhou university of Chinese medicine(futian)

Jiahui Wang

Harbin Medical University

Zheng Kang (✉ kangzheng0086@126.com)

Harbin Medical University

Ning Ning

Harbin Medical University

Libo Liang

Harbin Medical University

Lijun Gao

Harbin Medical University

Mingli Jiao

Harbin Medical University

Yu Cui

Harbin Medical University

Yanhua Hao

Harbin Medical University

Qunhong Wu (✉ wuqunhong@163.com)

Harbin Medical University

Research

Keywords: Medical impoverishment, poverty alleviation, financial protection, China

Posted Date: August 11th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-55995/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Objective: China has made remarkable achievements in poverty alleviation. However, with the change in economic development and age structure, the population stricken by poverty due to medical expenses and disability accounted for 42.3% and 14.4% of the total poverty-stricken population, respectively. The efforts to reduce the catastrophic health expenditure among Chinese residents are not optimistic. Poverty alleviation efforts might only focus on the people who are currently poor but ignores the increase in poverty that may occur. Accordingly, it is crucial to accurately pinpoint the characteristics of people who are about to become poor due to illness. Therefore, we prospectively analyzed the incidence of impoverishment by medical expense at the provincial, family, and different medical insurance scheme levels to identify the precise groups that are vulnerable to medical-related poverty.

Method: This study obtained the data from the Chinese government's Fifth National Health Service Survey for 2013. This survey is conducted every five years and has the most nationally representative sample obtained through a multi-stage, stratified, and random sampling method. To clean the data, we excluded incomplete records and those with logic errors, leaving 93,570 households (273,626 people) for the final sample. The method recommended by World Health Organization (WHO) was adopted to calculate impoverishment by medical expense, and logistic regression was adopted to evaluate its determinants.

Results: The poverty rates in western region had much higher poverty rates than the other two regions, and the eastern region had the lowest. The rate of medical impoverishment (MI) was higher in the western region (7.2%) than that in the central (6.5%) and eastern (5.1%) regions. Compared with people enrolled in other medical insurance schemes, those enrolled in the Medical Insurance for Urban Employees Scheme (UE-BMI) and a mixture of schemes had better capacity to deal with the burden brought by diseases. The New Cooperative Medical Scheme (NCMS) was associated with the highest rate (9.1%) of MI cases. A comparison of the MI groups revealed that the top three diseases associated with MI were malignant tumor, congenital heart disease, and mental disease. Households with members suffering from NCDs, and with members who were inpatients were all more likely to suffer from MI. NCMS-enrolled households had greater exposure to the risk of MI, at 1.84 times that of UE-BM-enrolled households. Poorer households were 15.8 times more likely to suffer from MI than richer households.

Conclusion: The joint roles of economic development, health service utilization, and welfare policies result in medical impoverishment for different regions. Poverty and health service utilization are indicative of households with high incidence of medical impoverishment. Chronic diseases lead to medical impoverishment. The inequity existing in different medical insurance schemes leads to different degrees of risk of MI. A combined strategy to precise target multiple vulnerabilities of poor population should be more effective.

Introduction

China has made remarkable achievements in poverty alleviation. The poverty rate of the rural population has drastically dropped from 97.5% in 1978 to 3.1% in 2017;¹ but since 2012, the speed of decline has slowed down. By the end of 2017, due to imbalances in the aspects of age, economy, and geography, the poverty rate of 167,700 villages in the most poverty-stricken counties has exceeded 20%, nearly seven times the national poverty rate of 3.1%.² A study on poverty in China showed that multi-dimensional poverty is more serious than income poverty alone. Specifically, the incidence of poverty due to education, disease, and so on are higher than those due to low income, and poor health is considered to be the greatest factor pushing vulnerable households into poverty.³ The population stricken by poverty due to medical expenses and disability accounted for 42.3% and 14.4% of the total poverty-stricken population, respectively.⁴ So far, the efforts to reduce the catastrophic health expenditure among Chinese residents are not optimistic. A previous nationwide household study in 2008 showed that the incidence of catastrophic health expenditure was at 13.0% and that of medical impoverishment was at 7.5%.⁵

The Chinese government has identified three batches of treatment strategies to alleviate this persistent poverty among the population—a batch of centralized treatment of major diseases, a batch of contracted service management programs for chronic diseases, and a batch of guarantees for severe diseases. However, there are still some weak links. With the age structure of chronic diseases showing a clear younger trend in recent years, more and more middle-aged people are trapped in poverty due to the economic burden of long-term treatment of these diseases, especially for those with relatively low economic status.⁶ However, this group of vulnerable people does not belong to the reported poverty-stricken population. This undoubtedly poses a great challenge for China's goal of lifting all people out of poverty by 2020. Poverty alleviation efforts might only focus on the people who are currently poor but ignores the increase in poverty that may occur. Accordingly, it is crucial to accurately pinpoint the characteristics of people who are about to become poor due to illness. Therefore, we prospectively analyzed the incidence of impoverishment by medical expense at the provincial, family, and different medical insurance scheme levels to identify the precise groups that are vulnerable to medical-related poverty.

Method

Data source and sampling methods

We obtained the data from the Chinese government's Fifth National Health Service Survey for 2013. This survey is conducted every five years and has the most nationally representative sample obtained through a multi-stage, stratified, and random sampling method. Finally, 31 provinces, 156 districts (or counties), 780 townships, 1,560 villages, and 93,613 households (273,688 people) were included in the survey.⁷

Data collection and quality control

Face-to-face interviews were conducted to collect the information of participants, including the households' basic information, healthcare needs, and healthcare utilization. Data quality was strictly

controlled during the whole survey and investigation process. Every investigator received rigorous training before the investigation. The adult respondents' response rate was 82.1%. To ensure effectiveness of the survey, a subset of the respondents was selected to answer the questionnaire again, reaching a consistency rate of 97.7%. Based on data from the sixth census in 2010, an analysis using the Maria index, delta dissimilarity coefficient, GINI concentration ratio, and fitting degree test showed that the size of the sample family and the proportion of rural versus urban households were not different from that of the whole country, but the proportion of the elderly population was higher than that of the general population.⁷

Data analysis

To clean the data, we excluded incomplete records and those with logic errors, leaving 93,570 households (273,626 people) for the final sample. The method recommended by World Health Organization (WHO) was adopted to calculate impoverishment by medical expense, and logistic regression was adopted to evaluate its determinants. Based on existing literature, we chose household head and household level indicators as independent variables. The household head variable included the household head's gender, education level, marriage, employment status, and insurance scheme type. The household level variable included region, economic level, household size, households with members over 60 years old or younger than five years old, households with non-communicable disease NCD members, and inpatient members.

Results

The rate of poverty and medical impoverishment in different province

The poverty rates in China's 31 provinces differed significantly. Those in the western region had much higher poverty rates than the other two regions, and the eastern region had the lowest. The contribution of MI (medical impoverishment) to overall poverty varied widely across the 31 provinces. In some provinces, such as Inner Mongolia, Shandong, and Heilongjiang, the rate of poverty was low, but they suffered from a high burden of MI. For some provinces with higher poverty rates, such as Tibet and Xinjiang, the rate of MI was not so high. Overall, the rate of MI was higher in the western region (7.2%) than that in the central (6.5%) and eastern (5.1%) regions.

Poverty and medical impoverishment under different medical insurance schemes

The rate of MI varied among people covered by different types of medical insurance schemes. Compared with people enrolled in other medical insurance schemes, those enrolled in the Medical Insurance for Urban Employees Scheme (UE-BMI) and a mixture of schemes had better capacity to deal with the burden brought by diseases. On the contrary, as one of the three basic medical insurance schemes, the New Cooperative Medical Scheme (NCMS) was associated with the highest rate (9.1%) of MI cases, even higher than that of people who were not covered by any medical insurance (4.0%). Considering that the Integrating Basic Medical Insurance for Urban and Rural Residents (IBMIUR) was at the initial stage of

implementation in 2013 and was not yet mature, the ability to help residents deal with the economic burden of diseases was weak (6.3%).

Table 1 Poverty and medical impoverishment under different types of medical insurance systems

Medical insurance type	OOP to total monthly household consumption[%]	Poverty[%]	Impoverishment (%)
UE-BMI	11.4	1.9	1.9
UR-BMI	12.0	11.7	6.0
NCMS	13.6	26.4	9.1
IBMIUR	12.0	14.8	6.3
Mixture of schemes	9.6	5.6	3.4
Other types and none	10.0	11.8	4.0
National Average	12.4	16.2	6.3

Notes: UE-BMI: Medical Insurance for Urban Employees Scheme; UR-BMI: Medical Insurance for Urban Residents Scheme; NCMS: New Cooperative Medical Scheme; IBMIUR: Integrating Basic Medical Insurance for Urban and Rural Residents; Mixture of schemes: enrolled in different medical insurance schemes;

Single or two-dimensional household characteristics associated with the incidence of medical impoverishment

We summarized the top five household characteristics associated with the highest MI incidence and found that households with inpatient members, those with NCD members, and those at a low economic level suffered the highest incidence of MI. When the risk factors were combined, the incidence of MI for these households was nearly six times the national average, especially for the poor households with more than two inpatient members, which had the highest incidence at 35.4%.

Table 2 Top five types of families with one or two characteristic(s) associated with the incidence of medical impoverishment

Top five types of families with one characteristic associated with medical impoverishment		Incidence (%)
1	Family with members who should be hospitalized but were not	14.0
2	Family with more than two inpatient members	13.5
3	Family with relatively lower income	13.5
4	Family with one inpatient member	11.4
5	Family with more than two NCD members	9.5
Top five types of families with two characteristics associated with medical impoverishment		Incidence (%)
1	Poor family with more than two inpatient members	35.4
2	Poor family with members who should be hospitalized but were not	35.1
3	Poor family with one inpatient member	29.4
4	Poor family with more than two NCD members	26.8
5	Poor family with a retired household head	23.3

Top ten diseases for which household hospitalization expenses led to medical insurance

A comparison of the MI groups revealed that the top three diseases associated with MI were malignant tumor, congenital heart disease, and mental disease. The total hospitalization expenses for the above-mentioned diseases all exceeded 7,000 Yuan, and the highest was up to 11,000 Yuan for malignant tumor. Among the top 10 diseases in terms of total hospitalization expense incurred by MI households, chronic diseases ranked first (see Table 3).

Table 3 Top ten diseases in terms of total hospitalization expenses

Disease	Number of households	Total hospitalization expenses (Yuan)
Malignant tumor	184	11,000
Congenital heart disease or other congenital abnormalities	7	9,000
Mental disease	19	7,000
Infectious disease	46	7,000
Fetal or neonatal disease	7	7,000
Injury and poisoning	250	6,850
Benign tumors, tumors in situ	41	6,400
Disease of the blood and blood forming organ	28	5,950
Neurological disease	72	5,240
Endocrine, nutritional metabolic diseases, or immunity-related diseases	111	5,200

Table 4 Determinants of medical impoverishment

	B	S.E.	Wald	Sig.	Exp (B)	95%CI	
						Lower	Upper
Economics quintile							
Quintile 1 vs. 5	2.55	0.08	950.81	0.00	12.83	10.91	15.09
Quintile 2 vs. 5	2.71	0.08	1128.22	0.00	15.05	12.85	17.63
Quintile 3 vs. 5	0.89	0.09	99.64	0.00	2.42	2.04	2.88
Quintile 4 vs. 5	0.07	0.10	0.42	0.52	1.07	0.87	1.31
Household size							
≤2 vs. ≥5	0.72	0.05	180.14	0.00	2.05	1.85	2.28
3-4 vs. ≥5	0.27	0.05	28.39	0.00	1.31	1.19	1.45
HH Marital status: Others vs. Married	-0.14	0.04	10.06	0.00	0.87	0.80	0.95
Educational level of the head of household							
None vs. technical secondary school and above	0.65	0.11	37.25	0.00	1.92	1.56	2.37
Primary school vs. technical secondary school and above	0.61	0.10	34.94	0.00	1.83	1.50	2.24
Junior high school vs. technical secondary school and above	0.57	0.10	31.04	0.00	1.76	1.44	2.15
Senior high school and technical school vs. technical secondary school and above	0.53	0.11	23.84	0.00	1.70	1.38	2.11
Employment status of the head of household							
Employed vs. unemployed and students	-0.27	0.04	49.73	0.00	0.76	0.71	0.82
Retired vs. unemployed and students	-0.04	0.07	0.30	0.59	0.96	0.84	1.10
Medical insurance of the head of household							
UR-BMI vs. UE-BMI	0.52	0.08	39.52	0.00	1.68	1.48	1.97
NCMS vs. UE-BMI	0.61	0.08	66.19	0.00	1.84	1.59	2.13
IBMIUR vs. UE-BMI	0.49	0.08	36.53	0.00	1.64	1.40	1.93
Mixed medical insurance vs. UE-BMI	0.36	0.11	11.29	0.00	1.43	1.16	1.76

Other types and none vs. UE-BMI	0.33	0.12	7.26	0.01	1.39	1.09	1.77
Members with chronic diseases							
0 vs. ≥ 2	-0.50	0.05	93.71	0.00	0.61	0.55	0.67
1 vs. ≥ 2	-0.17	0.04	9.42	0.00	0.87	0.80	0.95
Inpatient members							
0 vs. ≥ 2	-1.39	0.08	336.10	0.00	0.25	0.21	0.29
1 vs. ≥ 2	-0.36	0.08	22.17	0.00	0.70	0.60	0.81
Whether a member went to a clinic: Yes vs. No	-0.28	0.04	63.86	0.00	0.76	0.71	0.81
Members should have been hospitalized but were not: Yes vs. No	-0.46	0.05	72.83	0.00	0.63	0.57	0.70
Members should have seen a doctor but did not: Yes vs. No	-0.21	0.04	32.85	0.00	0.81	0.75	0.87

According to the results of the logistic regression, many factors were related to the occurrence of impoverishment by medical expense. Households headed by a non-married person, a person who was unemployed or a student, or a person with low educational level; and households of small size, with members suffering from NCDs, and with members who were inpatients were all more likely to suffer from MI. In addition, the smaller the number of people suffering from NCDs or receiving medical care in the household, the less risk of MI the household had. Household covered under the UE-BMI had the strongest ability to deal with the economic risk posed by diseases. NCMS-enrolled households had greater exposure to the risk of MI, at 1.84 times that of UE-BM-enrolled households. Poorer households were 15.8 times more likely to suffer from MI than richer households.

Discussion

Regional level: The joint roles of economic development, health service utilization, and welfare policies in medical impoverishment

Households in underdeveloped central and western regions of China are subject to greater risk of MI. It is noteworthy that while some central provinces are not seriously affected by poverty, some households in these areas have suffered severe MI after paying for medical expense. Meanwhile, in the western provinces where the poverty rate is high, the rate of MI is not so high. From this survey, the admission rate in the central region (8.0%) is lower than that in the western region (8.6%), but the average hospitalization expenses in the central region is higher than that in the western region.⁷ The relatively lower utilization of health services in the central region does not contribute to a lighter economic burden. This reflects that

regional differences exist in the design of medical insurance schemes, which lead to different patterns of economic burden.

The overall design of the national poverty alleviation and medical health insurance reform is crucial. In the early stage of China's poverty alleviation efforts, the country adopted several measures to address poverty in different regions. Since 1996, the Chinese government has identified poverty alleviation projects that provide financial assistance to nine provinces in the eastern region and 10 provinces in the western region.⁸ From 1995 to 2012, the average annual growth rate of per capita transfer payments in the western region was 20.3%, higher than that in the central region.⁹ Meanwhile, according to our calculations, the reimbursement rate in the central region (55.9%) was lower than that in the western region (58.2%). Therefore, it is obvious that the economic burden of diseases depends not only on the level of economic development of the region itself, but also on the healthcare needs and service utilization of the people and the design of the medical insurance system and other welfare systems.

Household characteristics: Poverty and health service utilization are indicative of households with high incidence of medical impoverishment

We summarized the top five household characteristics associated with the highest MI incidence and found that households with inpatient members, those with NCD members, and those at low economic levels suffered the highest incidence of MI. When the determinants of MI are combined together, the incidence of MI was nearly six times that of the national average, especially for poor households that have more than two inpatient members—these had the highest incidence of MI at 35.4%. A family's economic level and health insurance utilization were found to be indicative of those most vulnerable to MI.¹⁰ This finding is consistent with some previous studies in Korea, which demonstrated that the rate of catastrophic health expenditure in the poorest group was 18.0%, higher than that in the richest group.¹¹

Disease characteristics: Chronic diseases lead to medical impoverishment

The diseases that led to MI were mainly chronic diseases.¹²⁻¹⁴ Among the top 10 diseases that caused poverty, five were NCD diseases. Malignant tumor presented the highest risk for MI. China has become a place with high incidence of malignant tumors, accounting for about 22% of the global incidence of tumor diseases.¹⁵ Although China has launched since 2012 major disease medical insurance schemes for patients to deal with the economic burden of such diseases, the compensation level and benefit coverage for major diseases still need to increase.¹⁶ Some tumor diseases, such as benign brain tumor, were not even covered by the major disease medical health insurance schemes, contributing to the high economic burden of residents. Moreover, patients suffering from mental illness shared more OOP expenses due to insufficient reimbursement. Those who enrolled under MIUE for mental illness could only enjoy a 53.9% reimbursement rate compared with those who enrolled for diabetes, who enjoyed 81.5%. Meanwhile, due to the long treatment period for chronic diseases, related indirect expenses such as transportation, nursing, and preventive health care expenses, as well as time lost, were not included in the

scope of the reimbursement.¹⁷⁻¹⁸ All these factors contributed to chronic diseases becoming the risk factor that pushed households into MI.

Medical insurance scheme level: The inequity existing in different medical insurance schemes

Our results showed that different medical insurance schemes led to different degrees of risk of MI. NCMS enrollment was associated with the highest risk of MI, with incidences as high as 9.1%, approximately 4.79 times that of UE-BMI enrollment. The integrated medical insurance scheme was designed to alleviate inequity among different groups; however, at the initial stage, MI was still high at 6.3%. The fundamental reason for this inequity among different medical insurance schemes is the imbalanced design of the financing and reimbursement levels and the benefit package, making it impossible for enrollees to achieve equal access to health services. NCMS, with its relatively lower reimbursement level and insufficient benefit package, provided poor economic protection for residents in China.¹⁹ China's rural population is large, and it is a group that suffers from major and chronic diseases that lead to significant medical expenses.²⁰ Due to NCMS's insufficient compensation level, rural residents have become the main high-risk group for impoverishment. Therefore, it is essential to strengthen the top-level design of the medical insurance system and eliminate the imbalance among insurance schemes to alleviate the risk of IM.²¹

Determinants of the incidence of medical impoverishment

Our logistic regression results revealed that the determinants of MI include demographic factors, people's healthcare needs and service utilization, and the type of medical insurance. Having heads of households with higher education level and who are employed and are married was deemed a protective factor against the occurrence of MI, consistent with previous studies. Households with a high economic level were better at dealing with the burden of diseases and enjoyed a higher capacity to pay, enabling them to avoid impoverishment.²² Moreover, the determinants related to health service needs and utilization were confirmed to be significantly associated with the occurrence of MI, including households with NCD members and inpatient members. The more NCD members and inpatient members the households had, the more risk it was for these households to get trapped in MI. However, inadequate use of health services was found to be associated with avoidance of MI. Members of households who had given up on medical treatment prevented the respective households from spiraling into MI because not using health services meant no burden from medical expense. The same conclusion has been demonstrated in a study in Thailand.²³

A combined strategy to make poverty alleviation more effective

By the end of 2017, the size of China's poor population was 30.5 million people.²⁴ Due to wide-ranging factors such as the aging of the population and social, economic, and geographical imbalances, poverty alleviation has proved to be challenging. To achieve comprehensive poverty alleviation by 2020, an average of more than 10 million people need to be lifted out of poverty each year. Now is the time to be

absolutely precise with regard to the steps taken toward poverty alleviation. How to define the precise target population and how to distribute the country's resource to help the people at risk of MI have become top priorities.

Due to multiple vulnerabilities of the poor population, it is no longer meaningful to divide the poor according to the national poverty line. The most vulnerable population can be screened out by accurately identifying specific family characteristics.²⁵ Having low income is one of the main causes of poverty but it is not as significant as poor health. If we continue to use income as the only criterion for identifying the poor, the situation will arise wherein right after some people have been lifted out of poverty, other people fall into poverty because of medical expenses. Therefore, this study provides multidimensional criteria to determine vulnerable families, specifically, poor families with at least one inpatient, those with more than two NCD members, those with members afflicted with tumor diseases, and those whose heads are unemployed, illiterate, or retired.

Establishing an eligibility screening method that uses multi-dimensional criteria could enable the precise identification of the vulnerable poor who are most at risk of MI. Then multiple targeted interventions and poverty alleviation strategies can be carried out to deal with diseases. In addition to the three basic medical insurance systems, MFA—the catastrophic disease medical insurance—should also play a complementary role. It is important to abolish the deductible line and upper limit for the poor, increase the reimbursement ratio, and design special preferential medicine purchases for the poor. In this regard, Australia's approach is worth learning from. Specifically, the Australian government has set a maximum limit of the annual OOP payment of medicines for patients. The upper limit for the normal population (A\$ 1,317.2) is higher than that for the vulnerable population (A\$ 336). Once the medicine payment of a patient (who is vulnerable to poverty) exceeds the upper limit, the excess part is subsidized.²⁶ We should not only improve on the security provided by medical insurance, but also standardize the terms of services of health service providers. In the market economy, doctors may take advantage of information asymmetry between doctors and patients, thereby pursuing personal benefits. As a result, patients would have no choice but to accept all the examinations and treatments prescribed by the hospital, thereby making accumulated costs a bottomless pit. Therefore, it is necessary to standardize the treatment plan by adopting diagnosis-related-group payments for inpatient care. It can not only reduce residents' medical expenses, but also avoid wasting medical funds for poor people.

As the saying goes, "Give a man a fish and you feed him for a day. Teach him how to fish and you feed him for a lifetime." Analogous to this saying, instead of simply providing economic, medical, and housing assistance to the poor, alleviating poverty is more important when it comes to helping poor people support themselves. Therefore, it is important to provide measures to alleviate industrial poverty and employment poverty among the poor. In this light, it is helpful to organize national leading enterprises to cooperate with poverty-stricken counties and expand the marketing channels of agricultural products, for instance, by selling grains and fruits online. Moreover, increasing the income of labor services can be achieved through job subsidies and loan support programs to encourage poor families to participate in cleaning, road protection, water management, disability assistance, old-age care, and so on.²⁷ In addition,

poverty alleviation requires stronger government leadership to set up new systems that would effectively coordinate various departments in the whole society. Indeed, health poverty alleviation needs to be supplemented by industrial and employment poverty alleviation measures.

Declarations

Ethics statement

Ethics clearance was obtained from the Medical Ethics Committee at Harbin Medical University.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests

Funding

This work was supported by the National Social Science Foundation of China (Grant No.19AZD013), the National Natural Science Foundation of China (Grant number 71874045, 71403073, 71804036) and Heilongjiang Provincial Planning Office (Heilongjiang Provincial Public Health Safety and Medical Reform Strategy Research High-end Think Tank)

Authors Contributions

YL, XYQ and LHS designed the study and drafted the manuscript. LHS contributed to data processing. YL, XYQ and XT contributed to result analysis. JHW, NN participated in result analysis. JHW LJJ and YC assisted with the collecting literature. MLJ, LBL and YHH contributed to provide suggestions for this manuscript. QHW, ZK revised the paper. All authors approval of the current version of this manuscript for publications.

Acknowledgements

We acknowledge the outstanding contributions of Ye Li, Linghan Shan and Xinye Qi who all contributed equally to the first author of this article.

Words: 3160

References

1. http://www.xinhuanet.com/politics/2015-10/16/c_1116848645.htm

2. The 13th National People's Congress, Premier Li Keqiang Government Work Report.
3. Guo N, Qian L. Research on multidimensional poverty in contiguous deprived areas of Dabie Mountain in Anhui Province from the perspective of ability poverty [J]. Journal of University of Electronic Science and Technology of China (Social science edition), 2019, 21(06):105-112.
4. Effectively deal with the difficulties and challenges facing poverty alleviation. (People's Watch)
5. Li Y, Wu Q, Xu L, et al. Factors affecting catastrophic health expenditure and impoverishment from medical expenses in China: Policy implications of universal health insurance [J]. Bulletin of the World Health Organization, 2012, 90(9):664-671.
6. Dele O, Abegunde C, Mathers D, Taghreed A, Ortegón M, Strong K. The burden and costs of chronic diseases in low-income and middle-income countries [J]. Lancet 2007, 370:1929–38.
7. National Health and Family Planning Commission Statistical Information Center. 2013 Fifth National Health Service Survey and Analysis Report [M]. China Union Medical University Press, 2015.
8. China Poverty Alleviation Office—A Summary of 20 Years of National Cooperation in Poverty Alleviation. 1995-2012, "Finance Yearbook of China"
9. Zhao Y, Oldenburg B, Mahal A, Lin Y, Liu X. Trends and socioeconomic disparities in catastrophic health expenditure and health impoverishment in China: 2010 to 2016. *Tropical Medicine & International Health* 2019; 25(2).
10. 11. Choi J W, Cho K H, Choi Y, et al. Changes in economic status of households associated with catastrophic health expenditures for cancer in South Korea [J]. Asian Pacific Journal of Cancer Prevention Apjcp, 2014, 15(6):2713-7.
11. Xu Y, Zhou Z, Gao J. Effect of the new health care reform on catastrophic health expenditure in households of patients with chronic diseases in Shaanxi Province: A before-and-after analysis [J]. Lancet, 2017, 390:S94.
12. Sajad V, Aziz R, Farzad F K, Firooz E, Javad J, Abdollah A, Abbas G. Decomposition of Socioeconomic Inequality in Catastrophic Health Expenditure: An Evidence from Iran, Clinical Epidemiology and Global Health, 2019, ISSN 2213-3984.
13. Lee J E, Shin H I, Do Y K, et al. Catastrophic health expenditures for households with disabled members: Evidence from the Korean health panel [J]. J Korean Med Sci. 2016, 31(3).
14. World Health Organization, World Cancer Report 2014 [R].
15. Goss P E, Strasser–Weippl K, Lee–Bychkovsky B L, Fan L, Li J, Chavarri–Guerra Y, Liedke P, Pramesh C S, Badovinac–Crnjevic T, Sheikine Y, Chen Z, Qiao Y, Shao Z, Wu Y, Fan D, Chow L, Wang J, Zhang Q, Yu S, Shen G, He J, Purushotham A, Sullivan R, Badwe R, Banavali S. Challenges to effective cancer control in China, India, and Russia [J]. Lancet Oncol, 2014, 15(5):489-538.
16. Ma M, Li Y, Wu Y, et al. Does the medical insurance system really achieve the effect of poverty alleviation for the middle-aged and elderly people in China? Characteristics of vulnerable groups and failure links [J]. BMC Public Health, 2020, 20:435 <https://doi.org/10.1186/s12889-020-08554-3> (Accepted to appear)

17. Callander E J, Corscadden L, Levesque J F. Out-of-pocket healthcare expenditure and chronic disease –Do Australians forgo care because of the cost? [J]. *Aust J Prim Health*, 2017, 23(1):15.
18. Su M, Si Y F, Zhou Z L. The effects of China's three basic health insurance schemes on the equity of health-related quality of life: A cross-sectional survey using coarsened exact matching [J]. *Lancet*, 2017, 390:S73.
19. Sun X, Zhou M, Huang L, Nuse B. Depressive costs: Medical expenditures on depression and depressive symptoms among rural elderly in China [J]. *Public Health*, 2020,18:141-150.
20. Yang M. Demand for social health insurance: Evidence from the Chinese New Rural Cooperative Medical Scheme [J]. *China Economic Review*, 2018, 52.
21. Wang Z, Li X, Chen M. Catastrophic health expenditures and its inequality in elderly households with chronic disease patients in China [J]. *International Journal for Equity in Health*, 2015, 14(1):8.
22. Somkotra T, Lagrada L P. Which households are at risk of catastrophic health spending: Experience In Thailand after universal coverage [J]. *Health Affairs*, 2009, 28(3): 467-78.
23. Poverty Alleviation Office of the State Council—The path of poverty alleviation and development with Chinese characteristics continues to expand.
24. Li Y, Su B, Liu Y. Realizing targeted poverty alleviation in China: People's voices, implementation challenges and policy implications [J]. *China Agricultural Economic Review*, 2016, 8(3):443-454.
25. National Health and Family Planning Commission Statistical Information Center—Australian Drug Welfare Plan and its Enlightenment to China.
26. Poverty Alleviation Office of the State Council—Guiding Opinions of the Central Committee of the Communist Party of China on the Three-Year Action to Win the Fight Against Poverty.

Figures

Figure 1

The rate of poverty (left) and medical impoverishment (right) in China's 31 provinces. Note: The designations employed and the presentation of the material on this map do not imply the expression of

any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.